Some tests for TGD inspired view about remote mental interactions

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Contents

1 Inroduction

TGD [1, 2, 3, 4] based model for remote mental interactions [J3] relies on the same fundamental mechanism as the models for motor action, sensory perception, and long term memory. Together with the fractality of consciousness this implies that the tests of the model are rather general, and can be seen tests for TGD inspired view about consciousness and biosystems as macroscopic quantum systems. I have classified the tests according to the following categories, although there is a certain amount of overlap inherent to any such classification.

1. TGD inspired theory of consciousness

1. p-Adic physics as physics of cognition and intention: p-adic fractal stastistics as a signature of intentionality and breaking of second law.
2. p-Adic length scale hypothesis, life and consciousness: universal metabolic currencies and cognitive currencies (p-adic cognitive codes).
3. Self hierarchy.
4. Sharing of mental images.

2. Biosystems as macroscopic quantum systems

1. The notion of magnetic body and fractal hierarchy of magnetic bodies.
2. Sensory organs as seats of sensory qualia.
3. Time mirror mechanism of long term memory.
4. Remote metabolism.

3. The new physics implied by the many-sheeted spacetime

1. The notion of topological light ray (ME), in particular negative energy ME.
2. The notion of induced gauge field, in particular that of classical Z^0 field.

2 TGD based view about consciousness

2.1 p-Adic physics as physics of cognition and intention

The basic objection against quantum models of free will is that they cannot explain precisely targeted intention. They predict only probability distribution for the outcomes of quantum jumps and this means randomness.

In TGD intentions are represented at spacetime level as p-adic spacetime sheets and the transformation of intention to action correspond to a quantum jump in which a p-adic space-time sheet transforms to a real one. The two space-time sheets have large number of common rational points. An essential element needed is the possibility of negative energy spacetime sheets (spacetime is 4-D surface in the 8-D imbedding space). Negative energy MEs (topological light rays) having phase conjugate laser beams as the most plausible standard physics correlates are essential.

The generation of p-adic ME which transforms to negative energy ME in intention-to-action quantum jump gives for a system involved positive energy and also a definite momentum as a recoil effect. Transitions to higher energy states do not occur spontaneously so that there is no background masking the intended transition. Thus precisely targeted intention is doing something which does *not* occur at all spontaneously (and is impossible in standard quantum physics)!

Wormhole magnetic fields consisting of pairs of magnetic flux tubes with opposite time orientations transformed from real to p-adic form and vice versa might be fundamental for the motor activities of the magnetic body, and allow it to easily transform its bodyparts to mere thoughts about body parts and vice versa.

The basic predictions are following.

a) Breaking of the second law

Intention-to action transitions break the second law of thermodynamics below the relevant p-adic time scale and this can be tested. For instance, system near a population inverted laser producing laser beam with a frequency which corresponds to some universal p-adic frequency $f(k_{eff}) = 2^{-k_{eff}/2+127} \times 10$ Hz or to zero point kinetic energy of some ions, in particular electron or proton acting as universal metabolic currency, might draw energy from the laser and break second law. There is experimental evidence for the breaking of second law below time scale of .1 seconds: this is perhaps the most important biological time scale (duration of memetic codon) [5].

b) Living system processes follow intentional (p-adic) rather than random statistics.

Intuitively intentionality corresponds to local randomness superposed with long term determinism due to the conscious planning. Intentional system can decide to behave determistically. p-Adic fractal statistics realizes this intuition mathematically. The point is that rational spacetime points which are very near to each other p-adically are very far from each other in real sense and vice versa. What is small p-adically is large in real sense and vice versa. Therefore p-adic continuity for a p-adic spacetime sheet implies local chaos and long range correlations for the real spacetime sheet resulting from it in intention-to-action quantum jump. One implication is that cognitive growth proceeds from long to short time scales whereas physical growth proceeds from short to long time scales. For instance, learning and realizing a motor action is like building a 4-D statue by starting from a rough sketch.

Statistically intentionality differs from randomness in the following manner. If one measures the state of the system N times during time interval T at evenly spaced time intervals, randomness would predict that the frequencies for different outcomes converge to probabilities as N grows. For p-adic fractal statistics this does not occur and real probability concept fails, much like the attempt to measure the length of fractal coast of Britain fails. In p-adic case however the frequencies for N and $N + kp^n$, $k \in \{1, k-1\}$ and n large enough number are near to each other. One can perform this intentionality test for any system, be it molecule or magnetosphere, and determine the value of p and resolution dependence of the statistics is the signature of intentionality.

The tests wold involve independent series of measurements with different values of N about same system during same time interval and comparison of frequencies for various outcomes. The value of p could be determined.

c) Number theoretic information measures.

The notion of p-adic probability is based on the replacement of the ordinary logarithm $log(x)$ with p-adic logarithm $log(|x|_p)$, where $|x|_p$ is the p-adic norm of the rational number x (for instance, p^n has real norm p^n and p-adic norm p^{-n} for prime p and p-adic norm 1 for p-adic primes different from p). This logarithm is always well defined for frequencies since they are certainly rational numbers. The corresponding entropy can be also negative and in this case the interpretation is that the ensemble carries information. This entropy can be defined also for real ensembles and the value p can be determined by maximizing

the value of tne information measure.

d) Universal cognitive codes.

The notion of universal cognitive code emerged as a generalization of the memetic code associated with the secondary time scale $L(2,127)$ associated with the Mersenne prime $M_{127} = 2^{127} - 1$. By p-adic length scale hypothesis $p \simeq 2^k$, k prime of power of prime, gives rise to a hierarchy of n-ary p-adic length/time/frequency/energy... scales characterized by the square root of power $p^n \simeq 2^{nk} \equiv 2^{k_{eff}}$. The additional very natural hypothesis is that these time scales correspond to durations of cognitive codons with k or $k-1$ bits depending on whether $p > 2^k$ or $p < 2^k$ holds true. The most general hypothesis is that all values of $k_{eff} = nk$ are possible.

In the case of EEG series of resonance frequencies defined by p-adic time scales $T(n,k) = 2^{nk/2-127} \times .1$ seconds defining duration of cognitive codon are predicted. The duration of bit is $T(n,k)/k$ or $T(n,k)/(k-1)$. These time scales indeed correspond to frequencies near or equal to EEG resonances frequencies. Also their sums and differences seem to appear in EEG [6, J1]. This would mean that there is enormous amount of clasical information transferred from brain to personal magnetic body and probably also other magnetic bodies, such as magnetic Mother Gaia.

The k bits would correspond to k harmonics of the fundamental frequency such that a harmonic with intensity above critical value representing bit 1. Cognitive codes could define generalizations for the "features" introduced by Freeman consisting of field pattern with a temporal synchrony over a spatial region but involving spatial variation. One should try to identify a hierarchy of features with durations given by p-adic time scales and perhaps by their superpositions (in particular, sums and differences)

Memetic code with 126 full bits and duration of memetic codeword of .1 seconds is one especially interesting example and the hypothesis that intronic portion of DNA represents memetic codewords consisting of 21 DNA triplets should be testable. Microtubular code would be naturally based on $13^2 = 169$ codewords and would be associated with the $k = 169$ space-time sheets associated with the Earth's magnetic field.

2.2 p-Adic length scale hypothesis and consciousness

p-Adic length scale hypothesis quantifies the notion of the many-sheeted space-time. Perhaps the most important predictions are following.

a) Universal metabolic currencies

The difference of energies for a particle transferred between two space-time sheets is absorbed or emitted in the process. Also negative energy photon can be emitted. If the energy is essentially zero point kinetic energy (no external forces or external forces are same) the resulting photons have universal energy spectrum defining universal metabolic currencies. .5 eV for ATP$\rightarrow$ ADP is one of the quanta and associated with the dropping of proton.

b) Universal EEG and other frequencies.

That EEG resonance frequencies are superpositions of p-adic frequencies and thus universal is a precise and readily testable prediction. Of course, EEG frequency range is only a special case. Cyclotron frequency hypothesis assigns these frequencies to definite p-adic length scales which one could try to identify at the level of biological structures. Biosystems are predicted to control the local magnetic fields so that cyclotron frequencies are near to the universal frequencies.

2.3 Sharing of mental images

The notion of entanglement generalizes in TGD framework. Classical and p-adic nondeterminisms make possible time-like entanglement with timelike separation between two systems. The new view about subsystem forced by the topological nontriviality of spacetime means that subsystems of unentangled systems can entangle. In the standard field theory context one would speak about resolution dependent notion of entanglement: the entanglement of subsystems is not visible in the length scale of the systems. The new kind of entanglement allows fusion and sharing of mental images with shared mental image realizing a kind of stereo consciousness. The challenge would be to invent tests for these two new types of entanglement.

Cleve Backster has found that plants and even bacteria react to emotional reactions and events like death of other life form [7]. Backster summarizes his findings using the notion of primary perception. Primary perception could be interpreted as sharing of mental images. The physical correlates of primary perception (such as p-adic frequencies) could be studied further. One could test whether even so called dead matter is able to react in a similar manner. A further interesting test would relate to the presence of possible "causal anomalies" meaning that the reaction of a system comes before the event with respect to geometric time (compare with the experiments of Radin and Bierman [8]).

2.4 Self hierarchy

The presence of higher level selves, say those associated with the magnetic body of Earth and receiving information from several brains, could explain why remote viewer is able to attach with a correct target knowing only the coordinates of the target as numbers without any direct significance for him. Higher level self would entangle with the target and remote viewer with a higher level self. An alternative mechanism is based on sharing of mental images, which need not be directly conscious to remote viewer but occur subconsciously.

The experiments of Mark Germine [9] are consistent with the idea that higher level self receives conscious information from several brains so that the event which caused surprise when it appeared in brain A for the first time does not cause so much surprise when it occurs in brain B. Also the unconscious sharing of mental images explains the findings. Perhaps a variant of this experiment distinguishing between the two options might be developed.

3 Biosystems as macroscopic quantum systems

3.1 The notion of magnetic body

The notion of magnetic body is one of the most radical deviations of TGD approach from standard views of neuroscience. Magnetic body has astrophysical size and actually decomposes to a fractal hierarchy of magnetic bodies. Same mechanism for realization of intention as desires represented by negative energy MEs entangling magnetic body with the material body of the past and inducing neural and other activities as a reaction, applies to motor action, sensory perception, and long term memory, and remote mental interactions.

a) Libet's fndings [10] provide support for this hypothesis. The time of backwards referral (.3-.5 seconds for humans) could correspond to p-adic time scale characterizing our sensory magnetic body. P300 response would suggest

that it corresponds to the p-adic length scale $L(k = 257)$, roughly 2.2 circumferences of Earth. The theory predicts a hierarchy of this kind of time scales. For instance, animals below humans in cognitive hierarchy should correspond to shorter p-adic time scales predicted by the theory. This could be perhaps tested.

b) Magnetic body consists of superconducing magnetic flux quanta (not necessarily tubes as I have been used to say). Superconductivity in macroscopic or even astrophysical length scales might be tested someday. Adding isotope of ion to a brain could induce appearence of the same isotope in the brain of a close friend.

c) Matter could appear in places where it should not be by leaking from magnetic flux tubes to atomic spacetime sheets. Nobelist Langmuir might have observed this effect for a century ago while trying unsuccessfully to create vacuum [11]. The experiments of Sue Benford suggest also similar leakage phenomena [12]. In the experimental proposal of Lian Sidoroff other analogous findings are mentioned. The irradiation with coherent light at frequencies corresponding to the differences of zero point kinetic energies could induce the leakage. The list of these frequencies can be given for a given ion so that the theory is testable.

c) Does magnetic body mimick the spectrum of universal p-adic frequencies?

The idea of universal cognitive codes inspires the hypothesis that the cyclotron frequencies in the local Earth's magnetic field and for its scaled up variants define frequencies near to the p-adic resonances frequencies of EEG. For biologically important ions the cyclotron frequencies are indeed near to the p-adic frequencies. The dropping of ions between magnetic flux tube space-time sheets corresponding to different values of p-adic prime ($k_{eff} = 169, 167, 166 = 2 \times 83, 163$ seems to explain EEG frequencies and the frequencies in the range of audible frequencies [J1]. The same mechanism explains also Gariaev's findings about radio emissions induced by laser irradiation of DNA [13].

The tests would involve a systematic study of existing information about narrow EEG bands and looking whether the superpositions of p-adic frequencies appear in EEG.

d) A further mechanism of intentional action relates to the motor activities of the magnetic body. If the magnetic field corresponds to the magnetic field of superconductor of type I near criticality, the magnetic flux quanta form complex fractal structure consisting of narrow stripes so that magnetic fluxes and therefore also cyclotron frequencies scale like $1/L(k)$. Criticality is obviously ideal for the proposed realization of the magnetic intentionality.

Intentional action would be realized in terms of a generation of wormhole magnetic fields (used to explain so called Comorosan effect [14, C1]) which involve two parallel space-time sheets carrying opposite magnetic fluxes and having opposite time orientations so that net energy would be zero. The positive energy flux quantum would carry ions. The generation or disappearence of this kind of magnetic flux tubes means that new narrow bands appear to or disappears from EEG. The frequencies are predicted to be superpositions of p-adic resonance frequencies.

d) One could try to build concrete models for what happens at the level of magnetic body of brain in transitions to altered states of consciousness or in the changes of moods. This would require detailed knowledge about changes of cross features of EEG in this kind of situations.

e) The presence of the locally stripe like magnetic structures could be directly seen in the distribution of the neural activities or in the structure of cortex. Ocular dominance columns in cortex indeed demonstrate stripe like structures

with stripes having width between 200-500 micrometers [15]. This structure is predicted to be fractal containing structures within structures. Also cell membranes and endoplasma membranes can be seen as one hierarchy level in this structure (p-adic length scale $k = 151$ corresponding to the cell membrane thickness).

3.2 Time mirror mechanism

The basic idea of time mirror [J3] is that negative energy ME propagating to the direction of the geometric past is reflected towards future as a positive energy ME. This mechanism is fundamental for all aspects of intentional behaviour, with negative energy MEs representing intention transformed to desire.

The basic system receiving negative energy MEs would be a population inverted laser. Besides ordinary lasers many-sheeted lasers with universal frequencies determined by p-adic length scale hypothesis are possible. When this kind of system receives a negative energy MEs from future, it drops down to lower energy state. The dropped ions can also induce a phase transition if their number becomes large enough since the rate of the transition is proportional to the number of particles already dropped to the ground state.

Time mirror mechanism of long term memory could allow a realization as a technology for communications with geometric past and future.

a) Manysheeted spacetime is populated by many-sheeted lasers and therefore generation of phase conjugate laser beams propagating into geometric past could be absorbed by this kind of system. If population inversion is involved, a reply would be generated as ordinary laser beam received by the sender. There are claims (de-la Warr camera [16]) about the possibility to take hologrammic photographs from the geometric past and time mirror mechanism could make this possible.

b) Also the communication with future can be imagined. Falling for a moment into a really science fictive mood, one could imagine sending signals at p-adic frequencies $f(n, k)$ consisting of k bits and a duration defined by the p-adic time scale to the geometric future to tell that human kind has finally invented the p-adic hierarchy of cognitive codes. The civilizations in future would in turn start sending negative energy MEs with corresponding frequencies to us and we would be receive them using population inverted lasers.

c) Critical systems are optimal for acting as both receivers and senders: water near freezing point, capacitor near electric discharge, cell membrane, and living systems in general, etc.... As a matter fact, entire TGD universe is quantum critical system.

3.3 Remote metabolism

Remote metabolism relies on exactly the same mechanism as time mirror mechanism. Since the negative energy MEs can generate phase transition generating positive energy MEs inducing classical feed of energy to the system which generated negative energy ME, negative energy MEs could serve only a control purpose. For instance, negative energy MEs generated by DNA could generate emission of coherent light from mitochondria. Negative energy MEs with very low intensities associated with biophotons would be enough.

The optimal system acting as a sender is system which desperately needs energy. Some areas of left cortex of synesthetes utilized anomalously low amount of metabolic energy (this should be in fact lethal) during synesthesia and this could explain the memory feats as a byproduct. Dogs are able to precognize when

their masters decide to return home: it would be interesting to test whether this is easier when master is tired or even sick. Insects find more easily the plants suffering denutrition [17]: infrared light at negative energies is probably involved as also in case of dogs. Also this could be tested systematically insects could be cheated using phase conjugate laser beams at corresponding frequencies. Note that also virtual olfactory experiences might be induced using laser light at proper frequencies.

The hypothesis could be tested by looking whether (say) bacteria suffering from denutrition could induce generation of photons from mitochondria of a healthy population of bacteria. Besides the light generated by mitochondria as a by-product of metabolism, Buehler has observed in live mammalian mitochondria what he calls reversible excitation light-induced enhancement of fluorescence [18]. This suggests that mitochondria could effectively act as population inverted many-sheeted lasers. Population inverted laser with properly chosen frequency could replace the mitochondria in the experiment.

In case of human subjects it might be also possible to test the "causal anomaly" analogous to that involved with Libet's experiments about active aspects of conscious experience if it were possible to determine the moment of time when the system sends the negative energy MEs. The system would receive positive energy photons at same time without any time lapse. If human agents are in question the value of this time might be possible to determine.

3.4 Sensory organs as seats of sensory qualia

The assumption about sensory organs as seats of sensory qualia [J2] represents one of the main differences between TGD and standard neuroscience approach. The approach avoids elegantly the problem why different sensory pathways would give rise to different sensory qualia and explains the difference between imagined sensory experience and motor action. Phenomena like dreams, hallucinations, synesthesia, phantom limb, the experiences generated by stimulating neurons of sensory pathways and projected pain, and quite generally, the active role of experiencer in building sensory percepts are obvious counter arguments against the idea that sensory organs are primary sensory experiencers (or form parts of them). Back projection hypothesis and the identification of the long term memories as multitime experiences allows in principle to overcome these objections.

A second interesting hypothesis motivated by what happens during the embryonic development is the notion of skin sense and brain senses [J2]. Skin senses would include hearing and the hypothesis is that the corresponding sensory receptors can entangle with environment whereas the brain senses would entangle with brain or possibly magnetic body to make possible back projection. This would explain why skin seems to be in special role as far as remote mental interactions are considered (GSR).

I have proposed tests for these hypothesis in [J2] and will not repeat the tests here. Suffice it to say that hypnotically induced sensory experiences privide an especially elegant manner to test the back projection hypothesis.

4 The new physics associated with many-sheeted spacetime

4.1 Topological light rays (MEs)

Topological light rays (MEs, massless extremals) are perhaps the most central element in TGD inspired theory of consciousness. They come in several varieties. Positive energy MEs and negative energy MEs (laser beams and their phase conjugates in em case). Positive energy MEs are correlates for classical signals to future and negative energy MEs correlates for entanglement with past and represent intentions transformed to desires.

There are also interior and boundary MEs. Positive energy boundary MEs propagate with effective phase velocity $v << c$ and could correspond to EEG waves.

1. Tests for MEs in general

1. MEs can carry lightlike vacuum 4-current which generates coherent photons. Since current is lightlike it creates a radiation pattern not possible to produce by the currents of ordinary charged particles which move always with subliminal light velocity and produce also other kinds of radiation as a consequences. Bose-Einstein condensed photons are also present and would represent a laser beam.

2. ME would represent classical radiation field which propagates in precisely targeted manner without weakening and without dispersion. This could be tested.

3. Biophotons [19] might provide the experimental proof for the notion of ME. Biophoton intensities are extremely weak which suggests that the physics of MEs is not easy for experimentalist. In TGD based model of biophotons pairs of positive and negative energy MEs moving along DNA strands are used to explain biophoton generation. These ME pairs of vanishing total energy could represent the realization of an intentional action of DNA. MEs carrying nonvanishing lightlike currents indeed generate coherent light. Negative energy MEs entangle DNA with mitochondria and in this manner draw metabolic energy or induce generation of positive energy MEs by the proposed seed mechanism. As already noticed, mitochondria are known to generate visible light.

2. Tests for boundary MEs

1. Boundary MEs induce a leakage of ions and particles between various space-time sheets. Matter appears to places where it should not be [11, 12]

2. Modanese and Podkletnov [20] found that a capacitor near criticality to dielectric breakdown in low temperature and second plate in superconducting state, generates radiation of unknown type. The radiation induces a motion of test penduli. There is however no energy absorption since the radiation intensity is not weakened.

The explanation is that the positive energy MEs generated attach along their boundaries to the test penduli for some time and induce the leakage of atoms/ions between space-time sheets. This induces a recoil effect at atomic spacetime sheet and the pendulum moves. Boundary ME would play essentially a role of controller rather than energy provider.

This phenomenon could be studied in more detail in also other systems near criticality. Note that the Russian psychokinesist Vinogradova acted on electrostatic system near criticality to dielectric breakdown [21].

3. Tests for negative energy MEs

1. Population inverted laser at mirror frequency near living system perhaps suffering from denutrition might make possible remote metabolism. The system would return to ground state effectively without emitting radiation. .5 Hz and .125 frequencies in infrared are especially interesting. Phase conjugate laser waves could induce spontaneous laser radiation in population inverted system by serving as a seed of phase transition like process leading to the ground state.

2. If negative energy MEs appear as boundary MEs they could drift to the direction of the geometric past and this would give a superluminal effective phase velocity for then. Mozart's 40 communicated with superluminal velocity might be based on this phenomenon.

3. Negative energy em MEs with fundamental frequencies which correspond to energies above thermal energy (at least, probably also more generally) and corresponding photons should propagate through matter effectively without interacting. Only population inverted laser with the frequency of ME would absorb them. Feinberg's "transparent chicken" experiments [22] support this interpretation. Negative energy em MEs are excellent candidates for the TGD counterpart of "Psi field".

4.2 Induced gauge field concept

1. Classical Z^0 force

TGD predicts classical Z^0 fields, in particular MEs which are however not accompanied by counterparts of photons and thus differ from em MEs. Z^0 boundary MEs are in key role in TGD based model of nerve pulse generation and kHz neural synchrony [J1].

a) Quite generally, classical Z^0 forces created by nuclei which are completely ionized Z^0 ions (electron and proton have very small Z^0 charges unlike neutrino and neutron) are screened by BE condensate of neutrino Cooper pairs. This predicts that neutrinos are absolutely essential for condensed matter stability and can thus control it. The classical van der Waals state equation indeed assumes short range repulsion in atomic length scale and classical Z^0 force could provide it.

b) Also chemical stability for molecules containing more than one atom heavier than hydrogen atom are unstable against Z^0 force unless it is screened by neutrinos. Presumably this kind of molecules do not exist in vacuum. This leads to a view about prebiotic evolution conforming with basic experimental findings [D2] (such as the appearence of molecules like CH_2, NH_3, H_2O first and the importance of the mineral interfaces). The potential presence of large parity breaking effects (chiral selection in living matter) would give extremely tight constraints on model building. Enzyme action is chirally selective and could thus rely on the control of neutrino Cooper pair density and thus of molecular stability. Strong isotope effects are expected. In particular, D_2O could differ dramatically from H_2O as far as biology is considered since D_2O D has much larger Z^0 charge than H.

The basic question question is how to control artificially the density of neutrino Cooper pair condensate responsible for Z^0 screening to demonstrate that the classical Z^0 force is there. Here the study of enzyme action might provide clues.

c) Classical Z^0 force can be present also in astrophysical length scales and the acceleration anomaly for spacecrafts observed by NASA could be understood in terms of classical Z^0 force. The findings of Shnoll [23] about variations of

electroweak and chemical rates in astrophysical time scales are consistent with the hypothesis that time varying astrophysical Z^0 fields are involved, and with the prediction that clasical Z^0 force is fundamental for biochemistry.

d) Rotating systems generate Z^0 magnetic fields and there is evidence that this kind of force is present in rotating magnetic systems. Different directions of rotations should give rise to different Z^0 magnetic fields [B1].

2. Classical W fields

Also classical long ranged $W^{\pm}$ fields, which are charged, are in principle possible and could induce electroweak decays with anomalously high rates by say $p+n \to n+p$ mediated by classical W field for p and N in different atomic nuclei. Also exotic ionization by $e+p \to \nu+p$ of an electron of first atom induced by classical W field generated by environment would be possible. Long range entanglement for which two atoms are not in charge eigenstates can be imagined and the detection of this kind of entanglement might be attempted by measuring the em charge of second atom and looking whether the result is not always the same (the outcome would represent atom A,Z in some cases and the isotope A,Z-1 in some cases [D1].

3. Classical color force

Classical color force is also predicted and almost unavoidably accompanies classical em fields. Spacetime sheets have color rotational degrees of freedom analogous to rigid body degrees of freedom. These degrees of freedom are crucial in the TGD based model of color vision. TGD allows in principle a hierarchy of non-asymtotically free QCD:s and color confinement in various length scales. One cannot exclude the possibility that color confinement effects might be involved also with biologically interesting length scale. In fact, understanding of color confinement reduces to the same mechanism as understanding of macrotemporal quantum coherence. The challenge is to invent clear cut test for the presence of classical color forces (visual colors are of course direct sensory proof for them!).

4. The possibility of purely geometrical vacuum charge densities

TGD predicts the possibility of purely geometrical vacuum charge densities. In fact, there is evidence for this kind of densities already from the times of Faraday. Rotating magnet was found to generate an electric field $E = v \times B$. This field coresponds to a nonvanishing charge density whose sign depends on the direction of rotation. This would mean enormous parity breaking effect since the character of charges responsible for the charge density would depend on the direction of rotation. TGD explains the effect as vacuum charge density not possible in Maxwell's theory.

In particular, any rotating system generates Z^0 electric field in this manner and this field can give rise to effective antigravity effects. The behaviour of rotating magnetic systems seems to exhibit this kind of effects [B1].

5. Gravitational effects

A given system feeds its gravitational flux to several spacetime sheets and the fraction of flux fed to given spacetime sheet experiences the gravitational field prevailing at that spacetime sheet. Irradiation inducing bridges between space-time sheets could alter the distribution of gravitational fluxes and thus induce anomalous gravitational behaviour.

TGD predicts that classical fields couple to gravitation with a coupling constant with is almost 10^8 stronger than the Newtonian gravitational constant

characterizing the coupling to matter. The gravitational field energy of classical fields could be of same order of magnitude as the gravitational interaction energy of matter in condensed matter.

Classical gravitational fields distinguish between different spin glass degenerate configurations. Spin glass degeneracy makes possible macrotemporal quantum coherence. In this sense gravitation is fundamental for consciousness also in TGD framework. The model of long term memory involves transitions for which the gravitational interaction energy for classical fields changes and generates ultralow frequency (ULF) MEs with frequencies corresponding to time span of the long term memory. The length scales involved with the effects are predicted to be between cell membrane thickness and cell size for 3-D structures and between cell membrane thickness and 100 μm for linear structures such as microtubuli [J3].

The challenge is to develop tests for the predicted new effects.

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