The anomalies in rotating magnetic systems as a key to the understanding of morphogenesis?

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Abstract

During almost two decades I have returned repeatedly to the fascinating but unfortunately un-recognized work of Roschin and Godin about rotating magnetic systems. With the recent advances in TGD it has become clear that the reported strange effects such as the change of weight proportional to the rotation velocity of rollers taking place above 3.3 Hz rotation frequency and rapid acceleration above 9.2 Hz up to frequency 10 Hz could provide clues for developing a general vision about morphogenesis of magnetic body, whose flux quanta can carry Bose-Einstein condensates of dark charged ions with given mass and charge if the hypothesis $h_{eff} = n \times h = h_{gr}$ identifying dark matter as phases with non-standard value of Planck constant holds true.

The generalization of Chladni mechanism would provide a general model for how magnetic flux tubes carrying charged particles with given mass at given flux tube drift to the nodal surfaces giving rise to magnetic walls in the field of standing or even propagating waves assignable to "topological light rays" (MEs). Ordinary matter would in turn condense around these dark magnetic structures so that Chladni mechanism would serve as a general mechanism of morphogenesis. This mechanism could be universal and work even in astrophysical systems (formation of planets).

The change of weight correlating with the direction of rotation (parity breaking) and rapid acceleration could be understood in terms of momentum and angular momentum transfer by dark photons liberated in the quantum phase transition of many-particle states of dark charged particles to from cyclotron Bose-Einstein condensates giving rise to analogs of superconductivity and spontaneous magnetization.

There is also evidence that the presence of light source below massive object affects its weight by about .1 per cent. This effect could be explained along the same lines. Zero Energy Ontology and the proposed mechanism remote metabolism at the level of dark matter is however needed and this would force to modify dramatically the views about basic interactions at the level of dark matter.

An increase of weight $\Delta g/g \simeq 2 \times 10^{-4}$ is observed for electrets: this number has appeared in TGD already earlier and in TGD framework could have interpretatation in terms of dark matter layer with mass $M^D \simeq 2 \times 10^{-4} M_E$ at distance of Moon. More generally, any living system could be accompanied by a magnetic body with this mass fraction and lose it in biological death. Amusingly, this change of weight happens to consistent with the "weight of soul" claimed to be 21 g.

1 Introduction

During almost two decades I have returned repeatedly to the fascinating but unfortunately un-recognized work of Roschin and Godin about rotating magnetic systems [H5]. The motivation has been that the strange effects such as change of weight proportional to the rotation velocity of rollers taking place above 3.3 Hz rotation frequency and rapid acceleration above 9.2 Hz up to frequency 10 Hz could provide the clues for developing a general vision about morphogenesis of magnetic body, whose flux quanta carry Bose-Einstein condensates of dark charged ions with given mass and charge if the hypothesis $h_{eff} = h_{gr}$ holds true.

At this time my friend Samuli Pentikäinen re-stimulated my interest by sending some links to the files describing the patent of Godin and Roschin. We had a nice brain storming about the system, which eventually inspired the preparation of this article to clarify my recent views about the system. One can find from web a brief description of the rotating magnetic system (see `http://tinyurl.com/jceswe4`) and the english translation of the patent (see `http://tinyurl.com/hb6bfla`). I am grateful for Samuli for these links and interesting discussions. In the sequel I summarize the most recent views. It is earlier view but with some important new ideas added.

The best way to proceed is to identify the crucial questions. In the following I list these questions. I have proposed several alternative answers to these questions and the goal in the following is to fix the answers as uniquely as possible.

Consider first questions related to the formation of magnetic walls.

1. How could the observed magnetic walls be formed? So called Chladni mechanism making visible the nodal lines of oscillations of a vibrating square plate by putting thin powder on the plate so that the powder ends up to the nodal lines is neatly described in the article of Geesink [I2] (see `http://tinyurl.com/j9rsyqd`).

Could a generalization of Chladni mechanism [L10] explain the formation of magnetic walls as an analog of morphogenesis at the level of dark matter?

Neither standing waves nor circularly polarized waves are possible as single sheeted structures. Propagating circularly polarized waves with net spin assignable to pairs of "topological light rays" ("massless extremals", MEs) and standing waves assignable to the pairs of these pairs would have cylindrical nodal surfaces, which in the simplest situation would be stationary.

Charged flux tubes would drift to these stationary 2-D magnetic walls where electric field vanishes. Ordinary matter would in turn condense around magnetic body as assumed in TGD inspired quantum biology so that dark morphogenesis would induced ordinary morphogenesis.

2. Could the generation of magnetic walls be a quantum phase transition taking place at quantum criticality? Could generalized Chladni effect lead to the drift of the charged flux tubes to the nodal surfaces defining the magnetic walls? What could serve as the seed of this phase transition? Since the signs of the momentum gain and acceleration at the roller correlate with the rotation direction, the rotation of roller and its magnetic body could serve as the seed.

What can one say about magnetic flux tubes and walls?

1. Could the flux tubes from rollers go through wormhole contacts to a larger space-time sheet containing return flux tubes from rollers drifting to the magnetic walls?

2. The magnetic walls have magnetic field in the same direction as the magnetic field of rollers in the same region so that the interpretation as return flux makes sense. The patent does not tell whether the magnetizations are parallel or not. If the magnetizations are opposite as stability considerations would suggest, the return flux for the magnetic flux from stator would not form magnetic walls. If so, the rotation of the rollers should be essential for the formation of the magnetic walls and would serve as a seed of this phase transition.

Where does the dark matter at magnetic walls come from?

1. The charge density $n = \omega B/e$ ($c = 1$) at roller changing sign with the direction of rotation would be naturally due to the transfer of electrons between rollers and magnetic body and one can interpreted the distance between magnetic walls as cyclotron frequency associated with electrons in the magnetic field $B = .3$ Tesla. The density of electrons (holes) is extremely small and cannot explain weight change and spontaneous acceleration. Neither can the electrons from rollers correspond to the dark matter at the flux tubes and magnetic walls.

2. Could the charged particles already exist at the flux tubes leaving the roller and at the return flux tubes and drift to the flux walls? Does $h_{gr} = h_{eff} = n \times h$ hypothesis [L6] [K3, ?] guaranteeing that given flux quantum contains only charged particles of given mass hold true? This allows in principle many kinds of charged particles. In TGD inspired quantum biology many ions indeed appear and dark phases.

Note: The notion of gravitational Planck constant h_{gr} introduced originally by Nottale deserves a comment. It is defined as $\hbar_{gr} = GMm/v_0$, where M could in the recent case be $M_D \sim 10^{-4} M_E$ for flux tubes of $B_{end} = 2B_E/5$ and Earth's mass M_E for the flux tubes of galactic magnetic field $B_{gal} \sim 1$ nT mediating the gravitational interaction of Earth. By assuming that the parameter $r = v_0/v_{rot,M}$ for Earth has the same value as for Sun. The value of r is fixed by $v_0 \simeq 2^{-11}$ for Sun from the Bohr orbit model for the orbits of inner planets originally proposed by Nottale [E1] [K4] and v_{rot} is the rotational velocity of Sun.

3. Is there a connection with biology? The spontaneous acceleration occurs in the range 9.2-10 Hz. This range corresponds to alpha band in EEG. In TGD inspired biology the endogenous magnetic field $B_{end} = .2$ Gauss (maybe Earth's magnetic field inside organism or at some distance from the surface of Earth) and magnetic field with strength range around the average value $B_{gal} \simeq 1$ nT of galactic magnetic field are important.

Are these magnetic fields involved and could they serve as sources of dark charged particles? The flux tubes mediating the gravitational interaction of Earth could be at the flux tubes

which are originally those of galactic magnetic field and would satisfy the condition $h_{eff} = h_{gr}$ guaranteeing that dark cyclotron photons have the energy spectrum of bio-photons as a universal energy spectrum in visible-UV range in which also the transition energies of bio-molecules are.

Could the rotation of the rollers inducing the rotation of flux tubes increase the probability of reconnections with the flux tubes of $B_{end} = .2$ Gauss and $G_{gal} \sim 1$ nT mediating Earth's gravitational interaction? Could the charged particle condensates from these flux tubes flow to the flux tubes of rollers or to the magnetic walls? The values of critical frequencies indeed suggests that $B_{end} = .2$ Gauss and $G_{gal} \sim 1$ nT could have an important role.

A further group of questions relates to the mechanism of effective weight change and spontaneous acceleration.

1. Where do the momentum and angular momentum causing effective weight change and spontaneous acceleration come from? At the magnetic walls Bose-Einstein condensates could be generated and give rise to either super-conductivity or cyclotron Bose-Einstein condensates as generalized spontaneous magnetization or both. This demands that the charged particles at the flux quanta form Bose-Einstein condensates so that they have parallel longitudinal momenta p_L and/or spin and cyclotron quantum numbers n, m. This requires that the spins or momenta of charged particle have same value. Conservation laws require that the increments of quantum numbers in the phase transition go to the roller and would cause weight change in the case of super-conductivity and spontaneous acceleration in the case of cyclotron Bose-Einstein condensate associated with angular momentum.

2. How can one understand the correlation between the sign of the weight change and direction of rotation? Could parity breaking - perhaps made possible by large h_{eff} variants of weak gauge bosons - make this possible? What comes in mind is the winding of DNA and twisting of magnetic flux tubes in Sun. Are the flux tubes leaving from rollers transferred to space-time sheets carrying magnetic walls at fixed positions of wormhole contacts? If so the flux tubes emanating from rotating rollers would twist so that they would become chiral. Could this chirality force the dark photons to propagate with higher probability to another direction of the flux tube and induce the apparent weight change by momentum feed due to the transformation of dark photons to ordinary ones followed by absorpion?

   The observation of visible and yellow light could be interpreted as a transformation of dark photons to ordinary photons with energies in visible and UV range.

3. Where comes the rotational energy of the roller during spontaneous acceleration and the energy associated with the dark photons inducing weight change?

   The simplest explanation is that the formation of magnetic walls liberates energy and this energy goes to the magnetic system in the way described.

   Charged particles could also form kind of dark nuclei at the flux tubes and the dark nuclear energy which is assumed to scale down by $1/n$ in TGD based model of cold fusion, liberates energy. These dark nuclei could transform to ordinary nuclei when interacting with charged systems and would liberate practically all ordinary nuclear binding energy. Could the observed corrosion of copper foils around the rotor and stator could be due to this transformation?

   An further possibility could be remote metabolism in which system sends negative energy signal to a system able to receive it. This mechanism might be central mechanism in quantum biology based on ZEO associated with metabolism, motor actions involving signals to geometric past (explaining Libet's classical finding that neural activity precedes conscious decision), and with memory as communications with geometric past.

What is the proper quantum description for the change of weight and acceleration?

1. Could the most elegant option rely on a discrete state function reduction sequence for macroscopic quantum states of the tensor product system formed by rollers and the flux tubes leaving them and the return flux tubes at magnetic walls (possibly fused to form magnetic

walls)? The states of this system would be entangled pair with vanishing total angular momentum and momentum and thee quantum numbers would be opposite for every state in the superposition. Could these reductions could be regarded as quantum phase transitions? The quantum numbers increments would go to the dark photon many-particle states and dark photons would be absorbed by the rotor and give rise to apparent weight change or spontaneous acceleration. Rollers could be treated as quantal rigid bodies with cylindrical symmetry in the simplest model.

2. Could one treat the entire flux tubes coming from the rollers going to larger space-time sheets containing the magnetic walls via wormhole contacts as particle like quantum system and treat the transitions as phase transition between the states of these systems rather than at single particle level?

There is also evidence that the presence of light source below massive object affects its weight by about .1 per cent. This effect could be explained along the same lines. Zero Energy Ontology and the proposed mechanism remote metabolism at the level of dark matter is however needed and this would force to modify dramatically the views about basic interactions at the level of dark matter.

An increase of weight $\Delta g/g \simeq 2 \times 10^{-4}$ is observed for electrets [E3]: this number has appeared in TGD already earlier [?, K3] and in TGD framework could have interpretatation in terms of dark matter layer with mass $M^D \simeq 2 \times 10^{-4} M_E$ at distance of Moon. Amusingly, this change of weight happens to consistent with the "weight of soul" claimed to be 21 g.

2   The construction of the magnetic system and findings

The rotating magnetic system is a modification of the homopolar generator (see `http://tinyurl.com/cn94kbk`) invented by Faraday. Homopolar generator is a metal disk rotating in magnetic field orthogonal to it. A radial electric field $E = -v \times B$ is generated in equilibrium and implies that current follows in the wire, whose end is attached to the boundary of rotating disk. The current can run through a load and the system provides electric power. One must of course feed power to the system to keep disk in rotation.

The system replaces the rotating disk with rollers, which are cylinders rolling along the surface of stator without slipping so that the rotation is transformed to rolling motion: car is familiar example of this. The slipping is prevented by a magnetic cog wheel obtained by inserting orthogonal linear magnets to the stator and rollers.

The patent application represents the role as electric generator as basic function of the system but the reported effects suggest that it can indeed transform to a generator in the sense that the system begins to accelerate at rotation frequency near 10 Hz and produces power. Also a change of weight is observed. These effects make the system a possible example of new physics effects.

2.1   Construction

The rotating part consists of rollers, which are cylinders rotating along the stator ring. The radius of the whole system called converter was about .5 m. Stator and rollers were made of the same magnetic material consisting of rare earth metals. The value of the residual induction was $B = .85$ Tesla with coercive force $H_c \sim 600$ kA/m and with density of magnetic energy $W \sim 150$ kJ/m^3. Magnets were constructed using electric induction. Inserts with radial magnetization were added to both stators and rollers (see Fig. 1 at `http://tinyurl.com/hb6bfla`) in order to build magnetic cog wheel. Inserts had $B = 1.2$ Tesla, $H_c \sim 1000$ kA/m, and $W \sim 360$ kJ/m^3).

Stator and rollers were wrapped with copper foild of thickness .8 mm having direct contact eith magnets at stator and rollers. Between the surfaces of the stator and roller there was an air gap of thickness $\delta \sim 1$ mm.

The magnetizations of both stator and rollers were along the axis of the cylinder but it remained unclear to me whether they were parallel or antiparallel. Antiparallel magnetization would be favoured by the minimization of magnetic interaction energy $E = -\mu \cdot B$ in dipole magnetic field with return flux in direction opposite to magnetization.

The diameter of the stator 1 and the rotor 2 (see Fig. 2 at `http://tinyurl.com/hb6bfla`) was selected so that the ratio of the stator diameter D and the roller diameter d was integer multiple of 4: $D/d = 4 \times n$. This is reported to be a condition for spatial quantization and achieve resonant mode between the working elements of the device body. If no slippage occurs in the rotation, the velocity v of the roller rotation at its surface is same as the rotation velocity V of roller along stator surface: $v = V$ implies $\omega d = \Omega D$ giving $\omega/\Omega = D/d$. The condition $D/d = m$ guarantees that single full rotation along stator corresponds to m full rotations for roller and this is very natural condition if one considers em waves possibly associated with the motion. Why one must have $m = 4 \times n$ fullrotations per one full rotation along stator is not quite clear. For $n = 1$ this would mean that a rotation of $\pi/2$ along stator means 2π rotation for roller.

The total weight of the system was about 350 kg.

Ring electrode was attached to the periphery of the device (along the ring just outside the roles) connected to high voltage source with stator as positive pole and the outer boundary of roller ring as negative pole. The voltage had typically a limiting value of 20 kV. The use of the radial electric field was reported to stabilize the mode in which the system produces energy.

2.2 Observations

Several strange findings are reported. The system was set in motion by using an electric motor and the rotation frequency was gradually increased by increasing the power feed to the system.

The sign of the weight change depends on the direction of rotation. The following describes the situation for which weight change occurs.

1. At rotation frequency of 3.3 Hz the weight of the system started to change with the sign of the change depending on the direction of rotation. Fig. 4 at `http://tinyurl.com/hb6bfla` shows the relationship between rotation frequency f (rpm as unit) and the weight loss $|\Delta G|$ in per cents.

2. At rotation frequency 9.2 Hz and the system started to spontaneously accelerate. At this moment the system was coupled to a fist load of 1 kW. At the same time weight loss slowed down to and increased from 30 per cent to 35 per cent during in the range 9.2 Hz-10 Hz. An unpleasant whistling sound was heard. Fig. 5 at `http://tinyurl.com/hb6bfla` shows also the time development during the period $9.2 - 10$ Hz

3. At $f = 10$ Hz frequency the total load was $P = 7$ kW. I am not sure whether it was kept in that value during the next period when the rotating frequency was reduced or whether it was reduced gradually. At these values of f and P a high voltage of 20 kV was applied with positive pole at stator. The rotation frequency dropped to 3.3 Hz without any change in weight change ΔG. After than also weight change went to zero. The load of 7 kW caused the fall down of the system. Did the magnetic cogwheel start to slip or what happened?

The behavior of weight change suggests that there was a feed of both momentum (and energy) to the system in the interval 3.3 Hz-9.2 Hz during which $|\Delta G|$ increased. In the interval 9.2 Hz-10 Hz there was energy feed but no momentum feed. For the load of 7 kW the feed of energy was reduced and the rotation frequency started to reduce but $|\Delta G|$ remained the same. At $f = 3.3$ Hz the momentum feed began to reduce and weight change reduced gradually to zero.

This suggests that three critical frequencies were present. 3.3 Hz, 9.2 Hz and 10 Hz. Above 3.3 Hz the presence of momentum feed is suggestive. Perhaps by a beam of massless particles with downwards direction to cause weight change. In 9.2 Hz-10 Hz range also the presence of beams of massless particles in both directions parallel to rotors was present causing energy feed but no momentum feed. Above 10 Hz and with load of 7 kW the standing wave energy feed stopped and only the momentum feed remained. It did not go to zero at 3.3 Hz but went to zero smoothly so that the effect was not reversible. This might be due to the presence of load.

Also other effects were observed.

1. In dark room a coronal discharge was observed around the convertor in form of blue-pink glow and characteristic smell of ozone. Cloud ionization region covering stator and rotor respectively and a toroidal shape. Visible wave pattern - increased luminescence intensity

zones of white and yellow light located along the height of the roller was observed. The sound characterizing corona arc was not audible.

2. There was also a visible erosion damage to the copper surfaces of the stator and rollers.

3. Also vertical magnetic walls with field strength of .05 Tesla and with layer thickness of 5-8 cm and distance of .5-0.6 m were observed around the unit. If I understood the english translation correctly, the direction of magnetic field co-incided with that for the magnetic field created by rollers so that the flux can be interpreted as a return flux from rollers. The pattern was observed also outside the laboratory.

Magnetic walls begin to appear at rotation frequency 3.3 Hz with the intensity of the magnetic field and temperature drop increasing linearly with the rotation frequency. Maximal temperature drop from 22 °C to 6-8 °C inside the magnetic walls is reported.

3 Quantum model

The classical model summarized in Appendix does not work. Dark matter realized as a hierarchy of $h_{eff}/h = n$ phases assignable to magnetic body of the system at quantum criticality is the basic idea. The general explanation for the spontaneous acceleration and weight change is transfer of momentum and energy between the magnetic system and its magnetic body.

3.1 Some guidelines

3.1.1 What can one learn from homopolar generator?

The patent talks about a modification of homopolar generator (see `http://tinyurl.com/cn94kbk`), which is basically a rotating metal disk in magnetic field orthogonal to the disk. The modification is that the rotating metal disk is replaced by magnetic cylinders rolling along the boundary of the stator ring.

1. As already Faraday observed, a direct current is generated to the wire attached to the boundary of the disk. This suggests that a radial electric field is generated to the disk and in equilibrium the force to rotating charge vanishes so that one has $F = q(E + v \times B) = 0$: this gives $E = -v \times B$. This effect does *not* follow from Faradays law stating that a system moving linearly in magnetic field observes also electric field $E = v \times B$.

2. What is strange that the electric field has source: a constant charge density whose sign depends on the direction of rotation. Charge separation would occur: depending on the direction of rotation some amount of positive or negative charge leaves the system and goes somewhere. Also charge of opposite sign could enter from outside.

What is important to notice is that parity breaking in macroscopic length scale takes place. Standard model predicts large parity breaking effects only in intermediate boson length scales. Could large $h_{eff}/h = n$ phases for which weak bosons have Compton length scaled up by n proposed in the model of cold fusion [L2] be involved. The situation would be same as in biology, where chirality selection having no generally accepted explanation in standard model framework takes place.

3. An analogous charge separation occurs in the Pollack effect [L1] occurring when water bounded by gel phase is irradiated with IR light [L1]. Charge separation occurs and so called exclusion zone of thickness up to 100 micrometers becomes negatively charged: the negatively charged region has strange properties and Pollack calls it exclusion zone. The effective stoichiometry of water changes 0 to $H_{1.5}O$ as one proton per probably hydrogen bonded pair of water molecule goes somewhere. In the case of Pollack effect TGD explanation is that positively charged protons go to magnetic flux tubes as dark protons making possible macroscopic quantum effects crucial for life.

Charge separation is central in biology. Cell is negatively charged and also DNA has negative charge of one unit per nucleotide and the proposal is that dark protons are located along

flux tube parallel to DNA and provide a realization of genetic code. The chemical realization would be only a shadow of this realization at the level of dark nuclear physics: dark protons would indeed form analogs of nuclei and dark weak interactions would transform part of dark protons to dark neutrons [L4] (http://tinyurl.com/jgfjlbe).

4. What is interesting is that the so called Tewari generator, which is essentially homopolar generator is claimed to produce also over unity effects and in India there is a large scale trial using Tewari space-energy generators as new power source. I have discussed already earlier a model for Tewari generator [L3] (see http://tinyurl.com/z5zm8aa).

3.1.2 A possible connection with biology

The range $9.2 - 10$ Hz for the rotation frequency f_0 corresponds to alpha band in EEG and to the fundamental bio-rhythm. 10 Hz frequency corresponds also to the secondary p-adic time scale assignable to electron.

The condition $f = 4n \times f_0$ for the rotation frequency of roller implied by $D/d = 4 \times n$ found to give rise to a resonance corresponds to harmonics of this frequency. For $n = 1$ (only 4 rollers) one has frequencies $40, 80, ..$ Hz. 40 Hz is the thalamocortical resonance frequency believe to be crucial correlate of conscious experience. 80 Hz corresponds to a resonance frequency in REG, the EEG counterpart for retina. Fig 1. at http://tinyurl.com/hb6bfla would suggest $D/d = 8$ or $D/d = 12$ so that the roller frequency would be 80 Hz or 120 Hz for $f_0 = 10$ Hz.

Maybe also the frequency 3.3 Hz at which the weight change begins could be also seen as an analog of EEG frequency. EEG indeed has a resonance frequency around 3 Hz.

In TGD inspired model of quantum biology the cyclotron frequencies of various biologically important ion in an endogenous magnetic field field $B_{end} = .2$ Gauss (2/5 of the Earth's magnetic field (possibly identifiable as the value of Earth's magnetic field inside organism or farther away from the surface of Earth) are in EEG range and crucial in explaining the effects of ELF em fields on vertebrate brain [J1] [K2] are crucial. Interestingly, for iron ion the cyclotron frequency is near 10 Hz (as also for phosphate ion which might have fundamental implications in living matter [L5]). Could it be that iron ions Fe^{-2}, which are bosons, end up to the magnetic body of the system and form a Bose-Einstein condensate?

This supports the idea about primitive plasmoid like living system having magnetic body and the analog of EEG realized in terms of dark photons. Magnetic body would used "biological body" as sensory receptor and motor instrument and the generation of rotation might be interpreted as a kind of motor action.

3.1.3 What could quantum criticality correspond to?

Quantum criticality is the prerequisite for generation of dark $h_{eff} = n \times h$ phases possibly satisfying also the condition $h_{eff} = h_{gr}$. Quantum criticality corresponds to some kind of instability. The motivation for the hypothesis is that at quantum criticality long range correlations and fluctuations are present and large h_{eff} would give rise to them. How could quantum criticality be realized in the system considered?

Quantum criticality certainly corresponds to the frequency intervals beginning at values 3.3 Hz and 9.2 Hz and continuing to about 10 Hz. At 3.3 Hz the formation of magnetic walls would begin and magnetic field would increase linearly as the function of frequency also the effective weigh change would start to develop. The interpretation would be that B-E condensates analogous of super-conducting phases start to form at flux tubes drifting to the magnetic walls and the momentum liberated in the process goes to the magnetic flux tubes as dark photons transformed to ordinary photons. Actually one would have sequence of quantum phase transitions feeding momentum at discrete steps to the magnetic body and inducing effective change of weight. At 9.2 Hz also Bose-Einstein condensation in angular momentum degrees would occur and also a feed of angular momentum would start to occur in the same manner and lead to acceleration.

3.1.4 Formation of magnetic walls as a quantum phase transition

How the observed magnetic walls could be formed? Could a generalization of Chladni mechanism explain this as an analog of morphogenesis at the level of dark matter?

1. Propagating circularly polarized waves with net spin assignable to pairs of MEs and standing waves assignable pairs of these pairs would have cylindrical nodal surfaces, which in the simplest situation would be stationary. Charged flux tubes would drift to these stationary 2-D magnetic walls.

2. At the magnetic walls Bose-Einstein condensates would be generated and give rise to either super-conductivity or cyclotron Bose-Einstein condensates as generalized spontaneous magnetization or both. This requires that the charged particles at flux tubes are organized so that they have parallel longitudinal momenta and/or spin and cyclotron quantum numbers n, m. This require that the spins or momenta of charged particle turn to the same direction. Conservation laws require that the increments of quantum numbers go to the roller and could cause weight change in the case of super-conductivity and spontaneous acceleration in the case of cyclotron Bose-Einstein condensate associated with angular momentum.

3. Ordinary matter would in turn condense around magnetic body as assumed in TGD inspired quantum biology so that dark morphogenesis would induced ordinary morphogenesis.

4. The mechanism would be universal. Even exo-planetary systems are found to be preceded by the formation of concentric rings, which suggests that Chladni mechanism is at work also here and drives dark matter to the rings after which ordinary matter condensed around dark matter.

3.2   Standing waves, magnetic walls and Chladni mechanism

In TGD inspired quantum biology morphogenesis could rely on a generalization of Chladni mechanism (for explanation (see `http://tinyurl.com/j9rsyqd`) [L10]. Chladni mechanism in its original form was a clever trick to make the nodal curves associated with standing waves visible: in the original situation one has vibrating square shaped oscillating membrane and the added particles end up to the nodal lines of the membrane.

In the generalization of Chladni mechanism charged particles would be driven to stationary nodal surfaces of standing waves where they experience no force. One can consider also a more general mechanism in which the nodal surfaces vary slowly in the time scale of the dynamics of charged particles.

One can generalize further: also the magnetic walls carrying dark charged matter could be associated with the nodal surfaces of TGD counterparts of standing waves where charged particles experience no force orthogonal to the flux tube. What is so remarkable that for $h_{eff} = h_{gr}$ given value of h_{eff} would correspond to a given value of particle mass so that various kinds of charged particles would at flux tubes like books in shelves corresponding to particular topics. Living matter would be extremely organized at the level of magnetic body and ordinary matter would organize around magnetic body.

The charged particles at magnetic walls could be bosonic ions or Cooper pairs of fermionic charged particles and form cyclotron Bose-Einstein condensate with all particles in same cyclotron state and with the same spin. The large distance from rotating system would suggest large quantized angular momenta proportional to the distance which is approximately a multiple of the wavelength $\lambda \sim .5m$.

What is interesting that the distance between magnetic walls is about .5 meters asymptotically whereas the cyclotron wavelength of electron in magnetic field of $B_r = .05$ Tesla is $\lambda = .2$ meters. The field giving rise to $\lambda = .5$ meters is by a factor $2/5$ times smaller than B_r. Also the endogenous magnetic field $B_{end} = .2$ Gauss relates by the same factor $2/5$ to the nominal value of the Earth's magnetic field $B_E = .5$ Gauss. Could it be that the "endogenous" variant of B_r - perhaps the dark magnetic field accompanying $B_r = .05$ Tesla - is also now by a factor $2/5$ smaller? Or is the value of the field this in the region where the radiation is generated.

If the angular momentum has $\hbar_{eff} = h_{gr}$ as unit, the angular momentum would be scaled up from ordinary. It is not however clear whether this true. Since dark space-time sheets are n-fold coverings it could happen that single sheet has fractional angular momentum unit $\hbar/n$ so that n-sheeted structure would have $\hbar$ as unit of angular momentum. Nodal surfaces can be associated also with propagating waves and they would be in the recent case same as those associated with the standing waves.

Chladni mechanism could transcend to a basic mechanism of morphogenesis.

1. Charged magnetic flux quanta and therefore also biomolecules would end up to the nodal surfaces of say electric field since the force on them would vanish at the nodal surfaces. This would give stationary structures. MB could control morphogenesis by using this kind of standing waves forcing the formation of various structures at their nodal surfaces.

2. The induced fields associated with the simplest "topological light rays" ("massless extremals", MEs) are of form $sin(\omega(t-z))\epsilon(\rho)$, $(c = 1)$. $\epsilon(\rho)$ is polarization function and ρ is a coordinate varying in the direction of local polarization and can be chosen rather freely. Now it is taken to be the radial cylindrical coordinate. $\epsilon(\rho)$ can have zeros, which makes possible stationary nodal surfaces also in the case of propagating MEs.

3. The objection is that TGD does not allow single-sheeted realizations of standing waves needed for instance to realize the standing waves assignable to induction coil and wires of electric circuits. This objection is not lethal. In many-sheeted space-time one can realize effective sinusoidal standing waves as 2-sheeted structures from two MEs propagating to opposite spatial directions and carrying plane waves with a fixed frequency. These two-sheeted structures would serve as basic building bricks. The test particle having necessarily wormhole contacts to both MEs would experience the force caused by the sum of the induced gauge fields assigned to the two MEs. The force would be same as that caused by a standing wave with separable temporal and spatial dependence not realizable as preferred extremal: that is a product of trigonometric functions - say product of form $sin(\omega t)sin(\omega z)\epsilon(\rho)$.

   MEs have also always constant direction of polarization. Circularly polarized effective fields could be generated by pairs of MEs for which one has two linear polarizations in orthogonal directions with a phase lag of $\pi/2$.

4. The force would vanish at nodal surfaces, which would thus define naturally the shape of a stationary structure defined by molecules. These surfaces would correspond to the vanishing of $sin(kz)$ factor and to the vanishing of $\epsilon(\rho)$ factor.

5. One can take several primitive MEs and allow them to have different directions but common frequency. One would obtain effective standing wave with common factorized temporal and spatial dependences given by the sum of spatial parts of the sinusoidal waves. The nodal surface for this wave would correspond to the nodal surface for the sum of the spatial waves and one would obtain arbitrarily complex nodal surfaces.

   The nodal surfaces for these waves would naturally associated with the nodes of a tensor network [L8], where the flux tubes of MB indeed meet. Fractal structure with tensor networks with nodes of tensor networks can be assumed in TGD framework. In the recent situation one would have effective 2-dimensionallity and the nodes would be cylinders.

6. There is a connection with holography in which reference wave and the wave of same frequency reflected from the target interfere. Now all waves can be regarded as standing reference waves coming from different directions and generated by magnetic body and propagating along flux tubes of magnetic body. Bio-structures would be formed to the nodal surfaces of this hologram.

Consider now a more detailed description of the recent situation.

1. Magnetic walls would naturally correspond to the nodes of $\epsilon(\rho)$, which would be strictly periodic function or only asymptotically periodic as Bessel function. These nodal surfaces are possible already for single sheeted situation. Cylindrical symmetry would suggest Bessel functions.

   The distances between the magnetic walls are in the range .5 m-0.8 m. This length scale would correspond naturally to the wavelength of approximately periodic radial polarization function $\epsilon(\rho)$. The scale naturally corresponds to the radius of stator or the entire system. The frequency corresponding to $\lambda = .5$ meters would correspond to frequency $f = 6 \times 10^8$ Hz. The cyclotron frequency of electron would be 1.5×10^8 Hz in the field of .05 Tesla. Correct

value would be obtained for $B = .3$ Tesla: this would correspond to the value of the magnetic field at the flux tubes of the magnetic body emanating from rollers.

The hypothesis that the cyclotron energies of dark particles are in the range of bio-photon energies - visible and UV- suggests that the value of $n = h_{eff}/h = h_{gr}/h$ satisfies $n \geq 4 \times 10^3$ for the corresponding dark photons in the case of electrons. Note that the gravitational Compton scales $\Lambda_{gr} = h_{gr}/m$ would not depend on the mass m of the particles. This realizes Equivalence Principle.

2. If the absorbed photons have well-defined helicity and thus spin, they have circularly polarized waves as classical correlates. MEs do not however allow a polarization changing with time. This problem is circumvented by using union of MEs, which have orthogonal linear polarizations but are in different phase so so that the direction of polarization observed by test particle rotates.

   The transfer of spin is expected to be small below 9.2 Hz whereas the momentum is transferred. Hence these pairs could describe propagating waves present below 9.2 Hz. The continual absorption of these ME-doublets would serve as a correlate for the absorption of dark photons and would be a correlate for the weight change

   There would be parity breaking in the sense that the rates for the generation of MEs with opposite momentum directions are not same: this would gives rise to a net momentum gain and weight change. Mechanism would be similar to that in the case of radiation pressure. The extreme situation is that there is strict correlation between the directions of rotation and momentum for MEs and dark photons.

3. Standing waves with both polarizations are obtained by combining two pairs of MEs with net circular polarization and having opposite momentum directions to get a 4-plet of MEs representing standing waves with giving spin. These MEs could emerge above 9.2 Hz besides propagating MEs. The absorption of ME-4-plets would be a correlate for the energy and angular momentum transfer but no momentum transfer.

3.3   Spontaneous acceleration and weight change

Recall that the general features of the spontaneous acceleration and weight change are following.

1. The change of weight increases gradually above $f = 3.3$ Hz. The interpretation would be that there is not momentum from the dark photons absorbed by the rollers. During rapid acceleration beginning at $f = 9.2$ Hz the weight change stays the same and after than slowly increases from 30 per cent to 35 per cent. The interaction is that the rate for the absorbtion of dark photons is constant during rapid acceleration and slowly increases after than as function of ΔG: as a function of time the rate could be slowly increasing all the time. This suggests that the momentum distribution for dark protons is not invariant under reflections so that a correlation between weight change and direction of rotations emerges.

2. At 9.2 Hz an additional contribution to dark radiation for which net momentum gain is small would emerge: now only energy and angular momentum is fed to the system. The dark photons having both momentum directions with the same probability but same spin direction would be involved.

3. Similar effect could be involved with the weight change of a rotating super-conductor observed by Podletnov at Tampere [H4] and later in experiments in which Podletnov and Modanese utilized electric discharges for a capacitor [H3, H1]. The other plate of the capacitor was super-conductor and an unknown radiation was identified as the reasons for the motion of test penduli observed. No exponential reduction of the effect occurred. This suggests that only a very small fraction of the radiation was absorbed or that the effect was a kind of control effect inducing leakage of small amount of ordinary matter to from the test penduli - perhaps as dark matter. A possible explanation is in terms of dark photons such that only small portion of them is absorbed by the test penduli and receives the momentum of the photons. The dark photons could be accompanied by topological light rays.

3.3.1   The loss of electrons cannot explain weight change and acceleration

The transfer of electrons between roller and its magnetic body is very natural explanation for the charging of the roller. Could the loss of electrons with same spin direction to the magnetic body reduce the magnetization of the roller and lead to a loss of spin angular momentum?

1. If the loss of electrons does not affect total angular momentum of the roller, the loss of spin must be compensated by generation of orbital angular momentum so that roller wold experience a torque. Electrons going to the flux tubes of the magnetic body have also momentum. Could the roller receive a recoil momentum from electrons? Could electrons to the magnetic body or from the magnetic body give their spin and angular momentum to the roller.

   The number density of negatively charged particles given by

   $$n = -\nabla \cdot \frac{E}{e} = -\frac{\omega B}{e}$$

   in the units used ($c = 1$) is extremely low: a fraction of order 10^{-23} of the number density of atoms: roughly 1 electron per mole. The maximal possible spin transfer rate predicted to be $\frac{d\omega}{dt} \frac{B}{e} \hbar/2$ by the above formula should be the torque $I d\omega/dt$ required by the spontaneous acceleration. Here $I = n \times MR^2/2$ is the moment of inertia and $R \sim .05$ m a rough estimate for the radius of the roller. This gives $\hbar B/2ce = \rho R^2/2$. The discrepancy is 25 orders of magnitude for B about 1 Tesla.

3.3.2   Momentum and angular momentum transfer by dark photons

A more plausible explanation is in terms of a momentum and/or angular momentum transfer from the magnetic walls or flux tubes condensing around them.

1. The magnetic field of the roller has the same direction as the return flux of rollers so that the natural interpretation is that the phase transition increasing Planck constant fuses the return flux tubes to magnetic walls carrying the dark matter. They could also fuse to single flux sheet. Quantum coherence scale would increase from flux tube radius to the circumference flux tube and the flux wall radius could be proportional to $n = h_{eff}/h$.

2. Bose-Einstein condensates of charged particles wih $h_{eff} = n \times h = h_{gr}$ would be formed at the topologically condensed flux tubes at walls or at the wall possible form by fusion of the flux tubes. The dark photons would be liberated in the phase transition turning either momentum or angular momentum or both so that the have same values. If the phase transition liberates energy, the energy liberated would form a many-photon state of dark photons at the flux tubes associated with rollers and stators and the photons would be transform to ordinary photons and absorbed generating effective weight change and spontaneous acceleration.

3. The direction of the net dark photon momentum would correlate with the direction of rotation meaning parity breaking present also in the unipolar generator for which the direction of electric field and sign of the induced charge density depends on the direction of rotation. A more general assumption is that the difference between the photons with opposite momentum difference is non-vanishing and correlates with the direction of rotation.

3.3.3   What is the source of energy?

Where comes the rotational energy of the roller during spontaneous acceleration and the energy associated with the dark photons inducing weight change?

1. The formation of magnetic walls could liberate energy and this energy could end up to the rotating magnetic system in the manner already described.

2. Charged particles could form kind of dark nuclei at the flux tubes and the dark nuclear energy assumed to scale down by $1/n$ in TGD based model of cold fusion, would liberates

energy. These dark nuclei could transform to ordinary nuclei when interacting with charged systems and would liberate practically all nuclear energy. There are indications for the occurrence of this both in cold fusion and in the interaction of so called Brown's gas (see `http://tinyurl.com/5tyl92`) with metals [H2]. The corrosion of the copper folios around the stator and rotor could be interpreted in terms of transformation of dark nuclei to ordinary nuclei liberating nuclear binding energy.

3. A further possibility could be remote metabolism in which system sends negative energy signal to a system able to receive it. Quantum credit card mechanism serving as a general mechanism in remote metabolic energy transfer, motor actions as processes involving signals into geometric past (Libet's findings), and mechanism of memory as communications with geometric past, is a natural proposal in Zero Energy Ontology (ZEO).

   The dark matter at flux tubes could gain positive energy by emitting negative energy dark photons, which would be transformed to ordinary ones and be absorbed by the matter at magnetic flux tubes which indeed are cooled. This process could occur in time scale which is fraction of second or even time scale corresponding to the cyclotron time of dark photons. This process should generation of a pair of cyclotron photons at the flux tube of roller and at the flux wall. It is not necessary that the photons have same energy and momentum since the negative energy photon.

   Here one cannot avoid few words about TGD inspired theory of consciousness. Large state function reduction meaning the "death" of conscious entity assignable to CD would occur at opposite boundary of CD and the resulting state would be time reversal of the original so that second law would hold in non-standard direction of geometric time and lead to effects apparently inconsistent with second law. The reported cooling of the magnetic flux walls suggests that also this mechanism could be involved. Also the idea about magnetic systems with charge separation as primitive life forms suggests this.

4. One cannot completely exclude even more radical mechanism allowed by ZEO and not breaking conservation laws since the conservation laws hold true only in given scale characterizing CD. The reason is that the states have vanishing total values of conserved charges. The usual conserved charges can be assigned with either boundary of CD and are of opposite sign at the opposite boundaries. In the first state function reduction to the opposite boundary the average values of charges of states analogous to square roots of thermal partition functions can change. This could lead to the increase of the average energy associated with given CD which also increases in size. One could imagine even the possibility that CD increases so that it gives rise to sub-cosmology.

   One could imagine that the changes of the arrow of geometric time taking place in the "death" of self with standard arrow of tiem has interpretation as signal sent to geometric past and increasing the energy at "dead" end as also the magnitude of the negative energy at the opposite end of CD. In this manner the energy of CD would gradually increase.

3.4 How the system could be scaled?

The system has rather large weight and it would be desirable to study smaller system. Therefore it is of considerable interest to see how the system might behave in the scaling.

1. If the quantum critical frequencies 10 Hz an 3.3 Hz correspond to resonance frequencies of EEG and biorhythms, one can hope that they are independent of the scaling of the system.

2. The frequency corresponding to the distance between the magnetic walls could be interpreted as cyclotron frequency for the magnetic flux tubes assignable to the electrons at magnetic field of .3 Tesla. This field value could be assigned with the rotor. Scaling of this frequency would scale the distance between magnetic walls.

3. The values of the dimensionless parameters, in particular the ratio of the radius of the roller to that of stator should be kept unaffected.

If this view is correct, there should be no obvious problem in scaling down of the system.

4 Other examples about weight loss

There are also other experiments involving poorly understood weight change. In the following two examples are considered.

4.1 Could photons affect gravitational force?

I participated an intense Facebook discussion on rotating magnetic systems and some-one gave a link to a very interesting experiment in which light arrives horizontally in a box and is reflected there in forth and back in a 6-layered structure [E2] (see `http://tinyurl.com/zs9wley`). It is reported that the presence of light-box reduces the gravitational force on an object above the box and increases it for an object below the light-box.

Could TGD explanation be similar to that as for the reduction of weight of rotating system in Godin&Roschin experiment [H5]? This might be the case although the reduction of weight is fraction of order .1 per cent and much smaller than the maximal reduction of 35 per cent in G&R experiment. This could be understood if dark photons with energies scale up by a factor $h_{eff}/h = n = h_{gr}/h$ result as a small leakage from ordinary photons or vice versa. In G&R experiments the beam of photons arriving the system is dark.

After brainstorming the first serious trial to explain the effect led to a strange conclusion: the momentum direction for the dark photons exchanged between the light-box and test mass must be opposite to the momentum. This violates **Quantum Classical Correspondence** (QCC), which is basic principle of TGD. In the light-hearted brainstorming mood I was ready to accept this but soon realized that this won't go. After that it was easy to see that Zero Energy Ontology (ZEO) solves this problem. This however leads to a dramatically new manner to interpret gravitation and also other interactions. This interpretation is however not in conflict with existing physics although it would conform with the vision of Sheldrake.

Consider first how gravitational force by dark gravitons giving rise to momentum exchange along the flux tubes connecting the test mass to Earth could work.

1. The weight gets momentum increments Δp assignable to gravitons with some rate and this gives rise to net momentum transfer rate dp/dt defining gravitational force. Reaction law holds in the sense that mass gets a momentum increment Δp when a momentum $-\Delta p$ travels along flux tube to Earth getting opposite momentum increment. Note that the direction of Δp is **opposite** to the direction of travel of graviton in positive energy ontology! Also the energy of the graviton is negative.

2. This does not conform with the classical expectation about (virtual) gravitons as a localized wave packets. Momentum increment $-\Delta p$ can be said to travel in direction of Δp rather that in its own direction as one might expect!

How could one cure this problem?

1. Should one give up QCC although it is basic principle of TGD? Could one argue that gravitation is quantum macroscopic interaction - something totally different from say entropic gravity - and one must speak of non-localized waves of momentum Δp in the scale of the entire system even in astrophysical situations so that classical intuition could fail. This is what TGD indeed predicts via $h_{eff}/h = n = h_{gr}/h$ hypothesis.

2. Or should one replace positive energy ontology with ZEO and interpret the momentum exchange as taking place in reverse time direction. ZEO could allow to achieve this correspondence in terms of remote metabolism in which test mass sends negative energy dark gravitons travelling in reversed direction of geometric time to a system able to absorb them and gains positive energy as a recoil.

   Test mass would send to the geometric negative energy dark gravitons with momentum $-\Delta p$ (this momentum is directed upwards to the light box getting positive energy gain and downwards direct Δp p as a recoil. The QCC would not be lost because of time reversal. Since the virtual graviton propagates backwards in time, QCC is true: situation is PT reversal of a positive energy dark graviton with momentum Δp propagating in its own direction.

3. Are planets then primitive conscious entities soaking up gravitational energy from Sun?! Or does this happen in dark sectors whereas at classical level gravitation would be described much as in GRT. From this there is not a long way to the idea that living organisms on Earth soak up energy from Sun also a dark photons. All physical systems would be trying to steal energy from each other! One can safely give up the belief that Nature is somehow innocent. This sounds a pre-Keplerian idea but in ZEO it need not be inconsistent with basic laws of physics. This picture conforms with the views of Sheldrake about learning and morphogenesis.

Consider now the experiment in this picture. What would happen as one adds light-box below the test mass?

1. This picture about gravitational force as remote metabolism generalizes to the recent case by replacing negative energy dark gravitons with negative energy dark photons. Test mass would be a primitive living system and would gradually learn to utilize light-box as an energy source using remote metabolism. This would conform with the observation that it takes time for the effect to emerge.

2. Test mass would send negative energy dark photons along gravitational flux tubes and some fraction of them would be absorbed by the light-box as they transform to negative energy bio-photons with some rate - at least if quantum criticality in some sense is realized: in what sense remains an open question. Does quantum criticality develop during the time needed for the effect to emerge. Certainly the fact that the photons in the light-box have energies in the range covered by bio-photon energies matters.

3. If negative energy dark photons have Δp parallel to the direction of motion with reversed arrow of time, Δp is directed downwards and the effective weight increases if the box is below the test mass. If the box is above the test mass the effective weight is reduced. This is what has been reported in the article. From the size of the reduction of mass about 1 per cent one in principle could get idea about the rate for the transformation of dark photons to ordinary visible photons.

4. A related TGD inspired suggestion is that topological light rays (MEs) parallel to the magnetic flux tubes mediating the gravitational interaction are generated and dark photons can be assigned to them. The fundamental property of MEs is that pulses can propagate only in single direction and this could relate closely to the sign of the force. Dark photon Bose-Einstein condensate propagating in single direction is generated as photons from the light-box transform to dark bosons. For given ME all dark photons must be collinear just like the classical pulses inside ME propagate only in single direction. The direction would be towards the test mass and opposite to the direction of momentum exchange involved to make the interaction attractive. Also now the TGD analogs of standing waves might be involved and would correspond to pairs of "plane wave" MEs such that the sums of their em fields are standing waves.

5. What is interesting that this model could also explain the well-known fluctuations in the value of gravitational constant measurements (see `http://tinyurl.com/kvczx7g` and `http://tinyurl.com/jnb8mv9l`). Also Sheldrake notices the reports about the variation of G (see `http://tinyurl.com/zq7ee57`). The largest variation is about one percent from the average value, and there is evidence that the measured value varies periodically with a period of one sidereal day (galaxy as rest system).

   This suggests that the test mass soaks energy from the flux tubes of galactic magnetic field: I have indeed proposed that they mediate the gravitational interaction of Earth (the local geometric entanglement of galactic flux tubes could be essential for the formation of various biological or even more general material structures). The effectiveness of soaking could depend on the angle characterizing the orientation of the gravitational flux tubes with respect to the line connecting Earth to Galactic center varying in the range $[0, \pi]$. The effectiveness could also depend on the position of Earth at its orbit around Sun giving annual variation: could the local density of the galactic flux tubes have periodic variation? There are also other interesting appearances of sidereal day and year in living matter [L7].

The long measurement times should tend to affect the measured value of the gravitational constant G. One should arrange the instruments so that the are not below or above the test mass.

One can criticize the idea.

1. Skeptic of course argues that the assumption about all matter having some aspects assigned to living systems is worst kind of pseudo-science that they have ever met and that now these quantum crackpots try to bring physics back to pre-Keplerian times. ZEO is however completely consistent with basic laws of classical physics and quantum physics. The fact is that TGD predicts that dark matter as a key aspect of what it is to be living. Adelization of physics means that cognition is present in all scales - already in elementary particle length scales as the success of p-adic mass calculations suggests. TGD also predicts hierarchy of conscious entities. Also skeptics explain all our activities in terms of conscious choices. Maybe also skeptics should finally accept free will as a fact and try to explain it scientifically. The consolating news for skeptics is that in ZEO one can indeed assign to consciousness causal powers without ending up with conflict with the laws of physics.

2. Physicalist would argue that one can just assume that light-box has additional **attractive** interaction with test mass analogous to gravitational interaction. This interaction should be electromagnetic, certainly not the extremely weak gravitational interaction. Coulomb attraction is probably not in question. The interaction energy for this interaction should increase as the distance between test mass and light-box decreases to give attractive force as gradient of interaction energy - just as in the case of gravitation. If this picture is correct, one should be able to express this interaction in more familiar terms.

4.2   Weight change for electrets and "weight of soul"

Also the weight of electrets have been found to change as the Research Gate conference article or Schreiber and Tajmar reports [E3] (see `http://tinyurl.com/hh88frv`). They refer also to other works reporting anomalous looking weight changes. Recall that electrets are systems possessing spontaneous electric polarization and therefore analogous to magnets. Electret property allows to transform electric signals to mechanical and vice versa. Living systems are full of electrets.

Electrets were produced from organic materials (organic origin might be relevant) by a procedure described in the article beginning with melting at temperature 120 °C to a molten state followed by an application of an external high voltage (10 kV) electrostatic field forcing the microscopic electric dipoles to orient in parallel leading to complete solidification until room temperature was reached.

Fig. 3 describes the schematic model for the resulting electret containing parallel electric dipoles and free positive and negative charges. The polarization of the electret its not completely stable and can change or disappear. There are two kinds of free charges near the ends of the electret: the region near negative pole contains more positive than negative charges and the region near positive pole more negative than positive charges. There are two kinds of charges known as heterocharges and homocharges and these charges have different relaxation times. Therefore the relaxation can lead to change of the polarization voltage and even of its direction.

Two kinds of measurement were performed. Both the resulting polarization of electret and its weight were measured in the first experiment (see Fig. 7 of `http://tinyurl.com/hh88frv`). The voltage for these electrets changed after half an hour: the voltage dropped first from 3 kV to about 2.82 kV and then suddenly jumped to 3.425 kV. The weight showed after an initial fluctuation period a sharp increase to a saturation value taking place after 5.5 hour so that there was 5 hour lag. For an unpolarized electret the weight was found to increase steadily (see Figure 9 of `http://tinyurl.com/hh88frv`). The overall change of the weight during 20 hours was $\Delta g/g \sim 2 \times 10^{-4}$ in both measurements.

The change of the electric field of the polarized electret was accompanied by an increase of weight followed by a fluctuating period with vanishing average weight increase followed by a sudden increase after 5 hours followed by steady increase. The overall change in both cases was about $\Delta g/g \sim 2 \times 10^{-4}$. Maybe the behavior of polarized electret could be seen as that of a depolarized electret perturbed by the change in the value of polarization. There was 5 hour lag before the

sudden change in $\Delta g/g$: as if the steady weight increase occurring for electret with no polarization had been prevented by the change of the polarization and transformed to a fluctuation lasting for about 5 hours before returning to nearly normal value.

The challenge is to understand the cause of weight increase and why it was affected by the change in polarization. The models for the weight change of a rotating magnetic system and for the weight change induced by the presence of light-box suggests that the continual feed of dark photons transformed to ordinary photons was involved. One can consider two options in this framework: the electret sends negative energy dark photons to some system below the electret able to receive them or the source system located above the electret sends positive energy dark photons to the electret.

1. Since the electret system consists of organic material one might think that it could still be able to regenerate a connection to its magnetic body carrying magnetic field - say the endogenous magnetic field $B_{end} = .2$ Gauss. Perhaps the transformation to electret returned the ability to regenerate this connection by generating an ordered phase of dipoles: could one say that the external field "revived" the organic material.

2. The magnetic body located above the system send dark positive energy photons to the electret in which they are partially transformed to ordinary photons. B_{end} can have flux tubes also below the Earth's surface and the electret could get energy by remote metabolism by sending negative energy dark photons downwards constantly. This would give rise to a increase of the effective weight.

What other models can one imagine?

1. One can also imagine that dark mass of order $\Delta m/m \sim 2 \times 10^{-4}$ flows from magnetic body to the system and transforms to ordinary matter.

2. I have already earlier encountered the number 2×10^{-4} assigned with endogenous magnetic field $B_E = .2$ Gauss [**?**, K3]. The proposed interpretation was that the flux tubes of B_{end} correspond to gravitational flux tubes for dark mass $M_D \sim 2 \times 10^{-4} M_E$. Could one think that the revived system regenerates gravitational flux tube connections to this mass and experiences the gravitational field generated by it?

   The arguments used however strongly suggest that M_D must reside at the distance of Moon at a spherical layer: this conforms with the vision about how the condensation of visible matter around dark matter creates the astrophysical objects. In Newton's theory however the net gravitational force should be very small at the surface of Earth since different contributions to the force would interfere. M_D should reside considerably below the surface of Earth for this model to make sense.

   Flux tube picture distinguish between TGD and Newton's theory could however save the situation: the gravitational flux would arrive along flux tubes through wormhole contacts below the surface of Earth and then spread out radially and give an additional contribution to the Earth's gravitational field and cause the weight increase. This explanation does not apply to rotating magnetic systems nor to the change of weight due to light.

   The objection is that the system cannot just decouple from the flux tubes. Also the conservation of gravitational flux which could correspond basically to the conservation of Kähler magnetic monopole flux prevents this.

   The most attractive solution of the problem emerged from the observation that the "inner inner" core of Earth having radius about 300 km has mass of order $M_D = 10^{-4} M_E$ if the density in this region is the average density of Earth. Probably M_D is somewhat larger meaning that actual estimate is higher, and even $M_D = 2 \times 10^{-4} M_E$ giving 4 times higher cyclotron energy scale - bio-photon energies include visible and UV range so that this might well make sense.

3. The third option is that the mass of electret has also dark contribution coming perhaps from its own personal MB - its "soul"! MB as intentional agent indeed behaves in many respects like "soul". This is just what I have proposed many years ago: as the ageing biological

body gets uninteresting, MB finds more interesting target of attention. In this case death would mean the loss of MB and also loss of weight $\Delta m/m \simeq 2 \times 10^{-4}$ if the ratio M_D/M is universal.

Also Earth could have MB and it could indeed correspond to the dark mass at distance of Moon. Could the flux tubes from Earth carrying monopole flux go at this distance to another space-time sheet through wormhole contacts carrying quantum numbers of dark matter particles at their throats and return near Earth's core, where they would return to the original space-time sheet and turn back to form a loop? Could these loops be just elementary particles with $h_{eff} = h_{gr}$?

An interesting test is to see what happens as organism dies: is it weight changed - reduced - as these experiments would suggest? For a weight of 100 kg the weight reduction would be 20 g if one can extrapolate from the above measurements. Amusingly, the "weight of soul" has been measured and - believe or not - the average result happens to be 21 g (see http://tinyurl.com/k7d8vuy! Of course, one can invent many explanations for the weight change and also challenge its occurrence, and skeptics of course ridicule the idea about detecting the possible weight change because someone has uttered the word "soul" in this context.

5 About the description of rotating magnetic systems in zero energy ontology (ZEO)

I have worked for decades in an attempt to understand the findings of Godin and Roschin [H6, H5] about strange effects in rotating magnetic system [K1]. The possible connections with TGD inspired quantum biology are discussed in [L9]. The developments in zero energy ontology (ZEO) and increased understanding of magnetic fields in TGD framework allow to lookat the situation again. I am not an engineer but more precise model might allow development of simpler systems catching just the essentials and also scaling down of the system of Godin and Roschin perhaps allowing easier testing of the model.

5.1 Summary of the updated picture

5.1.1 Basic new ideas

The basic new ideas brought by TGD are present already in the earlier model [K1] but in less developed form.

1. Dark matter is assigned with the hierarchy of effective Planck constants $h_{eff} = nh_0$, $h = 6h_0$ [?, K3]. The strengthening of hypothesis introduces gravitational Planck constant $\hbar_{eff} = \hbar_{gr} = GMm/v_0$ introduced originally by Nottale [E1] and assigned with flux tubes mediating gravitational interactions. h_{gr} can have so large values that $E = h_{gr}f$ for cyclotron frequencies in ELF range (say 10 Hz) are in the range of bio-photon energies in visible and UV energies. One can assign the analog of gravitational Planck constant also to flux tubes mediating electromagnetic and other interactions: for instance $h_{eff} = h_{eff} = nh_0$ would be natural in the case of of the observed flux walls.

2. Dark matter can perform macroscopic quantum jumps since various quantum scales scale up like h_{eff} (Compton lengths) or even h_{eff}^2 (atomic orbitals).

3. Magnetic body (MB) is key notion. It has as building bricks magnetic flux quanta. Typically flux tubes and flux sheeets. It consists of two kinds of flux quanta. Flux can be vanishing, which corresponds to Maxwellian case. The flux can be also non-vanishing and quantized and corresponds to monopole flux. In this case magnetic field requires no current to create it. This option is not possible in Maxwellian world. These flux tubes play a key role in TGD Universe in all scales.

Also Earth's magnetic field with nominal value $B_E = .5$ Gauss has these two parts. Monopole part corresponds to $B_{end} = .2$ Gauss explaining strange effects of ELF em radiation to the physiology and behavior of vertebrates. The presence of this part identifiable as monopole

flux explains why Earth has magnetic field: this field should have decayed long time ago in Maxwellian world since it requires currents to generate it and they disappear. Magnetic fields of permanent magnets could have a monopole part consisting of flux quanta. Electromagnets do not have it. For flux walls the magnetic field is of order $B = .05$ Tesla and much stronger than B_{end}, whose cyclotron frequencies are involved also with the rotating magnetic system so that different magnetic fields are in question.

MB would carry dark matter as $h_{eff} = n \times h_0$ phases and act as a "boss" controlling ordinary matter [L11]. Communication to and control of biological body (ordinary matter) would be based on dark photons, which can transform to ordinary photons and vice versa. Molecular transitions would be one form of control.

4. ZEO predicts that the arrow of time changes in "big" state function reductions (BSFRs - ordinary state function reductions as opposed to the counterparts of weak measurements or "small" SFRs). This would happen at magnetic has dramatic implications. Time reverse dissipation looks like energy feed from the environment to system. Self-organization involves always energy feed and generation of structures rather than their disappearance in apparent conflict with second law. Self-organization would correspond to dissipation in reversed time direction implied by generalized second law. No specific mechanisms would be required and only metabolic energy storages- systems able to receive the energy dissipated in reversed time direction - are enough. Obviously this provides a totally new vision about energy technology.

5.1.2   Basic picture about rotating magnetic systems

What is observed in rotating magnetic systems is following.

1. As the rotation velocity for the roller system around stator magnet approaches to 10 Hz frequency, which is basic biorhythm, the system starts to accelerate spontaneously around 9 Hz: the critical frequency is quite not the same for opposite rotation velocities. The rotating system must extract energy and angular momentum from some source. A good candidate for the apparent source of energy is the MB of the system. There should be an exchange of energy and angular momentum to system (call it "biological body" BB in the sequel) and MB.

   Depending on the rotation direction the weight of the rotating system increases or decreases. The interpretation is as additional force due to the exchange of momentum between MB and BB. The exchanged momentum would have direction depending on the rotation direction.

2. Cylindrical magnetic walls with magnetic field strength about $B = .05$ Tesla are observed and the temperature at their position is lowered. This behavior is in conflict with standard thermodynamics but would conform with time reversed thermodynamics. This would conform with time reversed dissipation from a system identifiable as MB of the rotating system. This mechanism would be completely general mechanism of metabolism in TGD being present in all self-organizing system. This would look like cooling of the air for the observer with standard time direction. One could interpret the situation as extraction of thermal energy from environment by walls of MB and its transfer to the BB leading to cooling. Also angular momentum and momentum would be transferred.

   In ZEO this would conform with the occurrence of macroscopic BSFR - a phase transition changing the arrow of time at MB. The phase transition taking place instantaneously with respect to *subjective time* identifiable as sequence of SSFRs must be distinguished from what happens after it with reversed arrow of *geometric time*. The quantum jump would be instantaneous and completely analogous to what has been observed by Minev *et al* in atomic systems.

3. The air in around rotating magnetic system emits visible - maybe also UV - light which can be assigned with molecular and atomic transitions. This suggests that transformation of dark cyclotron photons in B_{end} with ELF frequencies and very large $h_{eff} = h_{gr}$ to photons identified in bio-systems as time reversed bio-photons inducing transitions of molecules to higher energy states takes place. Observer would see emission of ordinary photons generated

as molecules return to the ground state. Also direct transformation to bio-photons could take place and produce diffuse background. The cyclotron photons would have energies, which do not depend on the mass of charged particle since cyclotron energies are proportional to $\hbar_{gr}/m$ and one has $\hbar_{gr} \propto m$. For 10 Hz frequency would in the range bio-photon energies (visible and UV).

4. The rotation of rollers occurs without slippage with velocity v. The rotation frequency around the central cylinder is $\Omega = 2\pi F = v/R$. The spin velocity of the rollers with of radius r around their axis $\omega = v/r$ and by a factor R/r higher than Ω. During acceleration Ω is in the range 9-10 Hz. This frequency defines fundamental biorhythm - alpha rhythm- so that the analogy with TGD inspired quantum biology suggests itself strongly. 10 Hz frequency could be critical rotation frequency for the rollers around central cylinder.

   The energy transfer between MB and BB could take place resonantly at this frequency. Other important resonance frequencies could correspond to those assignable to EEG. The cyclotron frequencies of those biologically important ions that can occur as mechanical resonance frequencies in the system are especially interesting and would represent coupling between MB and BB. In particular, proton has cyclotron frequency 300 Hz in B_{end}. The spinning frequencies of the rollers bring in additional frequencies above 10 Hz determined by their rotating velocities with respect to the central cylinder.

   The analogy with biology forces to ask whether the phase transitions generation of flux walls is central also in quantum biology: consider flux walls possibly assignable to axonal membranes.

5. The biologically important cyclotron frequencies in magnetic field $B_{end} = .2$ Gauss should correspond to rotation frequencies of the rotating magnetic system. The scaling down of the system should not be problematic. $\Omega = v/R$ means that keeping Ω constant and reducing R, reduces also v in same proportion. Note that centripetal acceleration v^2/R produces problems for too large value of R. Rotation frequencies should not change in the scaling. Since one has $\omega = v/R$ this allows reduction of the size of the system if rotation velocities are scaled in the same matter. The scaling of magnetic and electric fields need not be so simple thing.

5.2 Updated model for rotating magnetic systems

The observed anomalies suggest change for the arrow of time and this makes the interpretation as macroscopic BSFR at MB of the system plausible interpretation. The value of h_{eff} should increase to generate the observed effects analogous to self-organization in long scales. Quantum coherence length would increase.

5.2.1 What could happen at MB before the transition

What could happen at MB in the phase transitions? Consider first the MBs before the transition.

1. Before phase transition monopole flux tubes form MB carrying dark matter. Monopole flux tubes would be in question and this requires permanent magnet for which the monopole part of magnetic field would not require currents as sources. The magnets created by electromagnetic currents do not satisfy this condition.

2. One can of course ask whether the magnetic flux tubes of the stator magnet are really at rest. Could the interaction with the flux tubes of the rotating rollers force also them to rotate so that the two magnetic fields would form single coherent rotating structure?

3. Before the transition the flux tubes of the MBs of the rollers would rotate as a whole around the central cylinder. The flux tubes would also rotate around the axis of the roller with the rotation velocity of the rollers. Also the dark matter at the flux tubes of rollers would rotate.

5.2.2 What could happen at MB in transition

What would happen in the transition.

1. What suggests itself is that the magnetic flux tubes of the stator magnet increase in thickness and fuse to the observed magnetic walls having thickness about 5 cm and distance about .5 meters. The field strength is of order .05 Tesla. The cylinders would be closed surfaces carrying monopole flux so that torus-like configurations obtained by taking flux tube which is closed solid torus highly stretched in vertical direction rotating it around vertical axis outside it and near to the second side. This gives torus topology with flux flowing through the section with constant height. Various walls would correspond to this kind of structures inside other looking like cylinders.

2. What would happen to the flux tubes of the rotating rollers? Could also these fuse to form magnetic walls in shorter scale? What about these structures: could also these fused to larger cylindrical structures accompanying magnetic walls. There are no reports about their possible occurrence.

3. Does it make sense to speak about rotating flux walls? In Maxwellian electrodynamics this is not possible without breaking of the rotational symmetry. In TGD framework this is possible since Kähler gauge potential would be different for rotating Kähler magnetic field and correspond to different space-time surface having different induced metric. Rotating Faraday disk develops a voltage between its boundary and center giving rise to electric field $E = v \times B$. This observation is problematic from the point of view of Maxwellian theory since strong parity breaking is involved.

   On the other hand, this observation suggest that the assumption about rotation of the magnetic flux tubes of the stator magnet would not mean too strong deviation from Maxwellian view in TGD. h_{eff} hierarchy in TGD allows strong parity breaking effects, which are indeed present in living matter. Also the earlier model of the system involves parity breaking assigned with the dependence of the effect on the direction of rotation.

   As a matter of fact, the exact cylindrical symmetry is broken by the magnetic cogwheel structure of rollers (12-fold cyclic symmetry) and stator magnetic ($12 \times 12 = 144$-fold cyclic symmetry) preventing the slipping of the rollers.

The following remarks about magnetic fields and corresponding cyclotron frequencies suggest that dark electrons play an important role.

1. The magnetic field strength for stator and rotor magnets was $B_M \sim 1$ Tesla. For electron this corresponds to cyclotron wavelength $\lambda = c/f = 1$ cm. The thickness of the magnetic walls was 5-6 cm. If the monopole flux part of the magnetic field is roughly $r = 2/5$ of the measured field as in the case of B_E, the cyclotron wavelength increases by a factor $5/2$ to 2.5 cm, which is roughly one half of the thickness of magnetic walls. There could be thus be a connection.

2. The magnetic field $B \sim .05$ Tesla of magnetic walls corresponds to electron's cyclotron wavelength $\lambda_c = .2$ meters. The distance between magnetic walls was $d = .5 - .6$ meters. If the value of the monopole part of the flux is $2/5$ of the entire flux as for B_E, λ_c increses to $\lambda_c = .5$ meters.

5.2.3 Also endogenous magnetic field B_{end} is involved

The appearance of biologically important frequencies suggests that besides the magnetic fields associated with the magnetic walls also the endogenous magnetic field B_{end} plays an important role.

1. Also $B_{end} = .2$ Gauss could play a central role defining the monopole part of Earth's magnetic field could play a role. The transition correspond to frequencies around 10 Hz frequency of rotation around stator magnet and the transition begins around 9 Hz frequency. Around 10 Hz rotation frequency one might expect a resonance coupling of the rotating motion of the

rollers to cyclotron transitions in $B_{end} = .2$ Gauss at this frequency. Iron ions have cyclotron frequency around 11 Hz in B_{end} to be distinguished from the magnetic fields of the stator magnet and rollers.

The metal ions possible in the system would have cyclotron frequencies and these should be realizable as rotation frequencies using suitable radii for rollers. Resonance would require correlation between the radii and atomic numbers of the metals involved. A strong analogy with biologically important ions would emerge.

2. B_{end} is by factor 4×10^{-4} weaker than the magnetic field $B \sim .05$ Tesla at magnetic walls. The frequencies associated with the system cannot correspond to B. The value of $n = h_{gr}/h_0$ required by the assumption that ELF frequencies correspond to bio-photon energies is very large - the order of magnitude is of order $n \sim 10^{13}$ for 10 Hz frequency. For h_{gr} must be assigned to gravitational flux tubes carrying no monopole flux with single sheet carrying B_{end}.

3. One can of course consider the interpretation of the measured magnetic field B in many-sheeted space-time. Does the measured B correspond to the sum of identical magnetic fields B_{end} over the $n = h_{eff}/h_0$ sheets of many-sheeted space-time? Cyclotron frequencies as purely local quantities would correspond to the field B_{end} at single sheet. If the measured magnetic field is $B_{meas} = n \times B_{end}$, one would obtain the estimate $n \sim 2.5 \times 10^3$. This could be interpreted in terms of the proposed electromagnetic variant $h_{em} = nh_0$ of h_{gr} having much smaller value.

Could the important mechanical frequencies of the system are equal to cyclotron frequencies in B_{end}?

1. $F = 10$ Hz, which corresponds roughly to the cyclotron frequency f_c of Fe^{++} ion in B_{end}.

2. Proton's cyclotron frequency in endogenous magnetic field $B_{end} = .2$ Gauss is $f_c = 300$ Hz. Can one get this frequency as a mechanical frequency? There were $N_r = 23$ rollers.

   (a) The ratio r/R was integer $N \geq 12$. The frequency associated with the rotation of roller is $f_r = v/r = NF \geq 12F = 120$ Hz. $N = 30$ ($r = 5/3$ cm) would give $f_r = 300$ Hz but $N = 30$ looks too large.

   (b) The periodicity of the roller configuration implies frequency $f = N_r F = 23F = 230$ Hz for $F = 10$ Hz but allowing no identification of f as cyclotron frequency.

   (c) The realization of magnetic cogwheel involves 12-fold periodicity of the roller giving frequency $12 \times 23F = 2.760$ Hz frequency. At stator one obtains $N \times 12$ fold periodicity of stator surface and $12N \times 10 \geq 1,440$ Hz frequency.

5.2.4 About the energetics of the dark matter after the transition

What happens to the dark matter at flux tubes in the phase transition? Especially interesting is the energetics of the transition. One can use observations about cooling associated with magnetic walls and molecular emission lines near rollers. The dissipation of energy by dark matter at magnetic walls and at MBs of the roller possibly fused together could could explain these observations.

1. A transfer of energy, angular momentum, and momentum must take place between the system formed by rotating rollers and MB carrying dark matter. This would happen in the phase transition/quantum jump. Dark matter at flux quanta must lose angular momentum, energy and momentum to the BB of the roller system. Most naturally the MBs of rollers are in question. This requires that roller flux tubes fuse to flux walls. About whether this occurs there is no direct experimental information.

   If also the flux tubes of stator magnet rotate they can fuse to single magnetic wall and if the dark matter comes the transfer of conserved quantities to roller system would take place. The fusion of flux tubes to flux walls would force the acceleration.

2. After the transition occurs dissipation in reversed time direction making itself visible as cooling at magnetic walls assignable to the stator magnet. In standard time direction the rotating system accelerates but in reversed time direction it loses energy and angular momentum and possibly also momentum. This would be induced by time reversal at MB. Does the time reversed dissipation occur via MB of stator magnet or directly?

   Does the cooling of environment correspond to

   (a) dissipation of the energy of the MB of stator magnet or

   (b) dissipation of the energy of rotating system via the MB of stator magnet?

   For the latter option one could say that the MB of stator magnet extracts thermal energy from environment and provides it to the rotating system. For the first option also rotating system would do this and this does not look plausible since the time scales for time reversals are much shorter for ordinary matter. For second option the time reversed classical time evolution would provide a correlate for the quantum jump in accordances with quantum classical correspondence.

3. The emission lines from molecular transitions should take place after the transition as time reversed emission of dark photons from MB transforming to counterparts of bio-photons absorbed by the molecules of air and looking like molecular emission lines in standard time direction. Since dark photons transform first to ordinary photons standard observer would see emission of ordinary photons at bio-photon energies.

   The density of excited molecules would grow as time increases in non-standard direction. For the standard observer this would look reductio of the density of excited states. If the dark photons would have energies in visible and UV range, ionization would be gradually reduced in standard time direction and seen as emissio of photos with bio-photon energies.

   Since roller MBs are nearest to rollers, the MBs of the rollers would naturally provide energy, angular momentum, and momentum to the roller system in the transition. This could occur if the flux tubes of rollers fuse to flux walls so that the dark matter at them can come to rest after fusion. Time reversed absorption of dark photons from the rollers could cause the molecular emissions.

5.2.5 The transfer of conserved quantities after the transition

The first question whether there is any classical description for the transition itself or is the only description in terms of what happens after it. If the quantum jump occurs discontinuously, this seems to be the case. Quantum classical correspondence suggests that the classical description based on what happens after the transition is the only possibility. The observer would talk about extraction of energy from environment. Time reversed dissipation would be the description of the system itself.

   Suppose that both roller flux tubes and and those of stator magnet fuse to magnetic walls and contain after transition dark ions rotating around the walls and that there is also momentum in longitudinal direction with opposite momentum in the magnetic system causing the observed change of the weight. Suppose also that dark matter rotates and there is compensating angular momentum contributing to the of the roller system.

   The natural identification for the transfer of conserved quantities would be in terms of energy, momentum, and spin, and angular momentum of dark photons.

1. In the transition energy and angular momentum are transferred to the roller system instantaneously. Energy and rotational angular momentum are dissipated in reversed time direction and for the external observer the roller system seems to accelerate and gain energy.

2. Photons have also momentum. The roller system would receive momentum in the quantum jump. The dissipation of this momentum would be seen as a force meaning gradual change of weight by external observer. The simplest option is that the momenta at BB and MB of the system are opposite in the final state after which dissipation starts.

Why the sign of weight change depends on the direction of rotations. This would suggest that large parity breaking effects characterizing also living matter are involved. Dark photons (expected to have ELF frequencies) transfer both momentum and spin and rotational angular momentum.

The states corresponding to different directions of rotation are mirror images from the behavior of magnetic field in reflection. How good approximation reflection symmetry P is?

1. If parity is not violated the behavior $p \rightarrow -p$ and $J \rightarrow J$ in reflection P implies increase or loss of weight depending on the direction of rotation as indeed observed. Acceleration of rotation would take place in *both cases* as observed. The critical rotation frequency is different so that parity violation takes place. In standard model framework parity violation is large.

   In this case the helicity of photons proportional to the inner product $p \cdot s$ and $p \cdot J$ of photon momenta would be different for the two cases. The helicities $p \cdot s$ of dark photons would be different in the two case cases and correlated with the direction of rotation.

2. Note that the generation of $E = v \times B$ for Faraday disk involves also parity violation and could take place also now for the rotating magnets. This electric field has non-vanishing divergence and the divergence giving charge density is opposite for the two rotation directions. This should give rise to the charge density of the system a contribution depending on the direction of rotation.

5.3   Is the cooling of the environment enough to explain the acceleration

The classical description of the energy transfer after the transition by standard observed would suggest that the MB of stator magnet extracts energy from the thermal energy of air leading to the lowering of the temperature by about 6 degrees. The MB of roller system fused to a single magnetic wall would extract energy from the transitions of the air molecules visible as emissions of ordinary as dark photons transform to ordinary photons and also from the air near the rollers. The energy from MBs would be transferred to the roller system.

One can make a rough estimate for the contribution of thermal energy to see whether it is significant.

1. The mass density of O_2 molecules $\rho = 1.225$ kg m^{-3} giving for the number density of O_2 molecules $n = 3.4 \times 10^{25}$ m^{-3}.

2. Temperature is $T = 290$ K and is lowered by about 6 K. Thermal energy of molecule associated with translational motion is $e_T = 3kT/2 \simeq 4.4 \times 10^{-2}$ eV at room temperature.

   The density of thermal energy $\rho_T = n e_T = 1.5 \times 10^{23}$ eV/m^3 . Energy of 1 eV corresponds to $eV = 1.6 \times 10^{-19}$ J so that one has $\rho_T = 2.4 \times 10^4$ Jm^{-3}.

   The change of thermal energy is for the reduction of temperature by 6 K equal to 6×10^{-4} eV fraction $\epsilon = 1.8 \times 10^{-2}$ of thermal energy. The energy gain per volume equals to

   $$\rho_g = \epsilon \rho_T = 4.2 \times 10^2 \text{Jm}^{-3} \quad .$$

3. Assume that magnetic wall associated with the stator magnet has thickness $\Delta R = .05$ meters and radius of $R_{min} = .5$ meters. Walls are reported to appear at radii $R_n \sim n R_{min}$, $n = 1, 2, ...$ No upper bound for their heights h is given. They could correspond to the return flux for the magnetic system or stator magnet.

   For a wall of height h_n (the real height is larger) the volume of the wall with radius R_n is

   $$V_n(h_n) = n \times 2\pi R_{min} \times \frac{h_n}{m} = .16n \times \frac{h_n}{m} \text{m}^3 \quad .$$

   This gives energy gain

$$E_n(h_n) = nE_1 \times \frac{h_n}{m} \quad , \qquad E_1 = \rho_T V_1(h/m = 1) = .7 \times 10^2 \ \text{J} \ .$$

The total energy transferred would be

$$E_{tot} = \sum_{n<n_{max}} E_n(h_n) = \sum_{n<n_{max}} n \times \frac{h_n}{m} \times .7 \times 10^2 \ \text{J}$$

.

The order of magnitude looks reasonable and could explain considerable fraction of the energy needed for acceleration.

4. One can estimate from the empirically determined power feed the needed power feed if power comes from thermal energy alone. A rough estimate for the total energy transfer is as $E = \int P dt = < P > T$, where T is the duration of the period of accelerated motion and $\langle P \rangle$ the average power. P was in the range 1-7 kJ/s. Equating the estimated total energy E with the estimate $E = \sum E_n(h)$, one obtains a rough estimate for the parameters if thermal energy alone is enough.

5.4   About the scaling of the system

The system of Roschin and Godin is rather massive and a natural question is whether it could be scaled down or made less massive otherwise.

1. Consider first the geometric scaling. If the interpretation of 10 Hz frequency as cyclotron frequency assignable to Fe ions, which can appear as dark ions in $B_{end} = 0.2$ Gauss is correct, then it would seem that the frequencies involved should scale down. This would mean geometric scaling of both radii and possibly also heights of the magnets.

   For instance, scaling by factor $x = 1/10$ would produce stator radius $R = 5$ cm and rollers with radius $r = 5/12 \simeq .42$ cm for $N = 12$. The single basic unit at roller circumference would have length $2\pi r/N = \times 10\pi/N^2 = 10\pi/144 \simeq .22$ cm, which is rather small value.

2. What about the scaling of magnetic fields? The magnetic field strength is about 1 Tesla originally. The distance between magnetic walls is about .5 m and corresponds to the radius of stator, which is very natural. On the other hand, if the monopole part of $B = .05$ Tesla for walls is 2/5 of B as in case of B_E, the distance between magnetic walls would be cyclotron wavelength .5 m of electron. If the monopole fraction of 1 Tesla magnetic field is also 2/5, cyclotron wavelength would be 2.5 cm whereas the thickness of flu walls is 5-6 cm.

   If one requires that cyclotron wavelength of electron corresponds to the stator radius, then one should scale B by the inverse of the same factor for lengths. This would for scaling factor 1/10 mean $B = 10$ Tesla not easy to realize. 1 Tesla seems to be upper bound for the field strength of commercially available magnets (`http://tinyurl.com/q286tm4`) and 50 Tesla the maximum field strength achieve in lab (`http://tinyurl.com/y9lgk6qr`). Maybe the reason for the massive size of the magnetic system is just this.

3. One might think of curing the situation by using a hollow cylindrical stator of same or even larger radius to reduce B. As argued, the structure of MB of stator could consist of very long dipole flux loops rotated by 2π to get flux walls having torus topology and located inside each other. The walls would correspond to a slicing of the stator by hollow cylinders inside each other.

   If the total flux is conserved and the number of walls is N and they have same thickness and field strength, one has

$$B\pi R^2 = B_{wall} \sum 2\pi R_n d = B_{wall} \sum_0^N n \times 2\pi R d = \frac{N(N+1)}{2} B_{wall} 2\pi R d \ .$$

   This gives for the number of walls

$$N(N+1) = \frac{B}{B_{wall}} Rd \ .$$

For $B/B_{wall} = 20$ and $R/d = 10$ this would give $N(N+1) = 200$ and $N = 1/2(-1+\sqrt{801}) \simeq$ 13.6. The number N of walls would be about 13. Replacing stator with a cylinder of radius 5 cm would still give single wall at distance of .5 m.

If the dark matter at magnetic walls extracts thermal energy from environment, the energy feed to the system would be reduced but this need not be fatal concerning if one is interested only in the demonstration and study of the effect using less massive system.

6   Appendix: Classical model fails

One can wonder whether the accelerated rotation could be explained in terms of Maxwell's theory. Could the transfer of energy, momentum, and angular momentum from classical fields to the rotating system allow to understand the acceleration rotation? The basic formulas for the stress tensor of Maxwell field in non-relativistic formalism are given at `http://tinyurl.com/ztdskmp` and help to understand the following.

Consider first the static fields.

1. External voltage sources is used to generate a radial electric field E corresponding to voltage of 20 kV, which presumably correspond to voltage difference between the stator and ground. This field would be in reasonable approximation $1/\rho$ as function of transversal distance from the stator origin. There are also a vertical magnetic fields associated with the rollers giving rise to rotor. The strength of this field is estimated to be of order .5 Tesla.

2. If the system is closed the energy momentum from the em fields can be transferred to the magnetic system and the total rate for these quantities for em fields equals to the negative of that for the magnetic system. It is enough to calculate what happens for energy momentum tensor of em field.

   Energy momentum tensor $T^{\alpha\beta}$ for em field can be expressed in terms of its 3-D projection T^{ij}- stress tensor and $T^{ij} \equiv S^j$ and knowns as Poynting vector, whose components are given by the cross product $S = E \times B$ represents energy flow per surface area in its one direction. Now the direction is azimuthal. Flow lines of energy current rotate around the stator.

   The divergence of em stress tensor integrated over surface S bounding a volume V gives the sum of total force f experienced by the matter in the volume V and of change of the momentum of the em field inside V given by the integral of $\partial S/\partial t$ over V. The flow of energy momentum from radiation fields to the volume can be calculated from the knowledge of fields outside the roller and stator.

   The flux of the momentum from the system is given by the flux defined by the stress tensor over the surface. Stress tensor T^{ij} has a component analogous to pressure and magnetic and electric contributions of form $B^i B^j$ and $E^i E^j$. In the approximation that pressure term is constant within roller, the pressure contribution vanishes. This is not quite true for electric field and the resulting small net force is radial and vanishes at the limit when roller is very thin. For magnetic field the flux integral vanishes and for electric field one can have small radial force. No torque is obtained. Therefore Maxwell's theory cannot explain the claimed "antigravitational effect" in terms of transfer of momentum from em field to the system.

3. One can also calculate directly the rate for the transfer of angular momentum from em field to the magnetic system. One has $dJ^i/dt = \epsilon^i_{jk} \int dS_k (x^i T^{kj} - x^j T^{ki})$. Here integral is over the surface of each roller cylinder since only rollers are allowed to rotate. Pressure term in energy momentum tensor proportional to δ^{kj} gives by rotational symmetry of the roller a vanishing contribution. Magnetic term vanishes identically at the surface of the cylinder. Also electric field gives identically vanishing contribution.

The presence of magnetic walls of thickness about 5 cm suggest the possibility of standing em waves with momentum in the radial direction and wavelength of order .5 meters. These waves are oscillating and this implies that the possible transfer of energy, momentum, and angular momentum over the period of oscillation vanishes. One can also perform calculations similar to those above for standing waves with radial electric field and vertical magnetic field and wave vector in radial direction to find that also now the transfer of angular momentum is vanishing. There can be small transfer of momentum in radial direction to a roller. One can consider the situation also for longitudinal standing wave but now the transfer of longitudinal momentum is vanishing by the standing wave property.

The conclusion is that Maxwell's theory does not explain the reported findings.

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