TGD inspired solution to three cosmological and astrophysical anomalies

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Abstract

I learned within a period of week about two cosmological anomalies. The first anomaly is the oscillations discovered by Kotov. Second anomaly is the ionization of the interstellar gas. About the third anomaly I learned a couple years later.

Kotov has discovered that many celestial objects involve $T = 160$ minute oscillation, whose origin is not identified. There is an overwhelming evidence that a non-local phenomenon is in question. TGD suggests an explanation as a kind of cosmic alpha rhythm. Fe^{2+} has 10 Hz alpha frequency with period $t = .1$ seconds, which is fundamental biorhythm as cyclotron frequency in .2 Gauss magnetic field assigned as endogenous magnetic field to living matter in TGD based quantum model of living matter. In .2 nT magnetic field which is consistent with empirically estimated values of interstellar magnetic field the cyclotron period is 160 minutes.

This co-incidence suggests that dark cyclotron photons with large value of Planck constant $h_{eff} = nh_0$ assigned with the phases of ordinary matter identifiable as dark matter and residing at magnetic flux tubes - in particular those carrying dark gravitons - induces the oscillations. The quantum coherence of dark matter would induce the coherence of oscillations in astrophysical length scales. The quantum effects on visible matter could be non-trivial since the energy $E = h_{eff}f$ of dark photons can be above thermal threshold. The same mechanism is central in TGD based quantum model for the control of visible bio-matter by dark matter.

The pulsations of Earth - kind of mini earthquakes - occurring with a period of 26 seconds represent second mysterious phenomenon. Also now the interpretation could be in terms of an analog of alpha rhythm.

The ionization of the intergalactic is very difficult to understand in standard cosmology. Could dark photons at magnetic flux tubes with energies in the range of ionization energies transform to ordinary photons and induce the ionization? Could the dark photons responsible for ionization be associated with the gravitational flux tubes of objects with mass of order solar mass. For ordinary 10 Hz oscillation they would be associated with the gravitational flux tubes of Earth. The ratio of solar and Earth masses is indeed of the order of $T/t = 10^5$.

Contents

1 Introduction

I learned within a period of week about two cosmological anomalies new to me. The first anomaly is 160 minute oscillations discovered by Kotov and associated with a wide range of astrophysical systems. Second anomaly is the ionization of the interstellar gas. There might be a connection between these anomalies.

Kotov has discovered that many celestial objects involve $T = 160$ minute oscillation, whose origin is not identified. There is an overwhelming evidence that a non-local phenomenon is in question. TGD suggests an explanation as a kind of cosmic alpha rhythm. Fe^{2+} has 10 Hz alpha frequency corresponding to period $t = .1$ seconds, which is fundamental biorhythm as cyclotron frequency in .2 Gauss magnetic field assigned as endogenous magnetic field to living matter in TGD based quantum model of living matter. In .2 nT magnetic field which is consistent with empirically estimated values of interstellar magnetic field the cyclotron period is 160 minutes.

This co-incidence suggests that dark cyclotron photons with large value of Planck constant $h_{eff} = nh_0$ assigned with the phases of ordinary matter identifiable as dark matter and residing at magnetic flux tubes - in particular those carrying dark gravitons - induces the oscillations. The quantum coherence of dark matter would induce the coherence of oscillations in astrophysical length scales. The quantum effects on visible matter could be non-trivial since the energy $E = h_{eff}f$ of dark photons can be above thermal threshold. The same mechanism is central in TGD based quantum model for the control of visible bio-matter by dark matter.

The pulsations of Earth - kind of mini earthquakes - occurring with a period of 26 seconds represent second mysterious phenomenon (`https://cutt.ly/ogI6soU`). Also now the interpretation could be in terms of an analog of alpha rhythm.

The ionization of the intergalactic gas is very difficult to understand in standard cosmology. The obvious TGD based proposal is that dark photons at magnetic flux tubes having energies in the range of ionization energies transform to ordinary photons and induce the ionization. There could be a connection between the two anomalies: the dark photons responsible for the ionization could be associated with the gravitational flux tubes of objects with mass of order solar mass generating also 160 minute oscillation. For ordinary 10 Hz oscillation they would be associated with the gravitational flux tubes of Earth. The ratio of masses of Sun and Earth is indeed of order 10^5.

2 Could 160 minute oscillation affecting Galaxies and the Solar System correspond to cosmic "alpha rhythm"?

The blog posting in Tallbloke's talkshop titled "*Evidence for a 160 minute oscillation affecting Galaxies and the Solar System*" [L5] (see `http://tinyurl.com/y5en9cxz`) tells about the finding by Valery Kotov that many celestial objects have parameters, which correspond to a fundamental frequency of 160.0101 minutes. There is an overwhelming evidence that a non-local phenomenon is in question. For instance, Earth day is 9 times 160 minutes.

2.1 Background

The blog articles [L5, E3] give a long list of links to the works demonstrating the presence of this period: see for instance [E1, E2].

160 minute period occurs in many contexts.

1. Infrasonic oscillations, measured by Doppler effect, on the surface of Sun corresponds to a period of 160,01 minutes. These oscillations were discovered by Severny, Kotov, and Tsapp [E1, E2] and independently by Brookes et al. They were later conformed by two other teams - for references see the article "*Solar Activity, Wave of Kotov and Strange Coincidences*" [E3] (see `http://tinyurl.com/y6bfzy4q`). The following properties of Kotov waves are listed.

   (a) These waves are perfectly periodic and regular: no break of phase was observed over more than thirty years of observations

   (b) There are periods when the oscillation becomes blurred for the benefit of it's lobe in 159.956 minutes (modulation in 400 days).

   (c) The mode of vibration is badly identified.

   (d) The mechanism is not understood. V. Kotov proposes the influence of gravitational waves to explain the phenomenon but this explanation seems unrealistic.

2. The period of 160.0102 ± 0.0002 minutes appears also in solar eruptions.

3. There is a variation of the luminosity of Sun with period about 160/and or 80 minutes of Sun

4. The period of variations of luminosity of Delta Scuti stars has been found to be $162\pm$ 4 min and RR Lyrae stars 161.4 ± 1.6 minutes.

5. Kotov waves have been reported to occur even in quasars such as NGC 4151 and 3C 273 (see `http://tinyurl.com/yxcwh4rl`).

2.2 A possible TGD based explanation of Kotov waves

This finding relates in an interesting manner to the TGD based model of living systems in which cyclotron frequencies in endogenous magnetic field of $B_{end} = .2$ Gauss $= .2 \times 10^{-4}$ Tesla play a key role. The nominal value for the strength of the magnetic field of Earth varies since the value of B_E depends on position on surface of Earth. I have taken it as $B_E = .5$ Gauss but also $B_E = .3$ Gauss is mentioned. Whether $B_{end} = B_E$ can be assumed, is not clear.

1. For iron the cyclotron frequency of Fe^{2+}ion playing crucial role in oxygen based life is around 10 Hz, which serves as a fundamental biorhythm - alpha rhythm.

2. 160 min cyclotron frequency for Fe would correspond to magnetic field of .2 nT.

3. Interstellar or galactic magnetic field strengths are not far from this strength.

   - 1 nT for galactic magnetic field is claimed (see `http://tinyurl.com/yzesn4k`). This would give 32 min period.
   - For interstellar magnetic field the value 0.1 nTesla for interstellar magnetic field is claimed (see `http://tinyurl.com/y45hq72k`). Also the value .3 nT is claimed (see `http://tinyurl.com/glj8gvu`).

The proposed value .2 nT is half-way between these two values. Maybe there is fundamental biorhythm in cosmic scales! This is more or less predicted by TGD based vision about quantum coherence in all length scales made possible by the hierarchy $h_{eff} = n \times h_0$ of Planck constants predicted to define phases of ordinary matter identifiable as dark matter.

1. For large values of h_{eff} predicted by TGD the energies of the dark cyclotron photons can be above thermal threshold in living matter. This implies that the dark cyclotron radiation can have non-trivial effects on living manner: this kind of effects actually led to the idea about hierarchy of Planck constants. Now it can be deduced from what I call adelic physics [L2] (see `http://tinyurl.com/ycbhse5c`). The proposal is that bio-photons covering at least visible and UV range - the range of molecular transition energies - result as dark photons with say EEG frequencies transform to ordinary photons [K4].

2. In TGD inspired biology the cyclotron frequencies define coordinating rhythms [K3, K2] and the recent proposal [L9] (see `http://tinyurl.com/y4vtcv8u`) is that both sensory perception and motor actions and long term memory rely on a universal mechanism based on formation of holograms and their reading using dark cyclotron photon beam as reference beam. Could this mean that this mechanism is used even in galactic and cosmic scales so that life would be everywhere as TGD based theory of consciousness predicts?

3. If quantum coherence in astrophysical scales is involved, the values of h_{eff} would be very large and given by the Nottale formula $h_{eff} = h_{gr}0GMm/v_0$, where $v_0 < c$ is velocity parameter and M and m are the masses connected by the magnetic flux tubes carrying gravitons [L3]. The dark photons involved would have large energies $E = h_{eff}f$ and could therefore energies in the range of molecular transition energies and have effects on the dynamics of astrophysical system just as they would have on the physiology of brain behavior [**?**].

4. Note that the magnetic flux tubes as parts of topologically highly non-trivial space-time surface would have sphere rather than disk as cross section. Although the value of Kähler magnetic and ordinary magnetic fields are non-vanishing at it, the total flux vanishes so that there is no observable magnetic field in the scale of cross section. No current is needed to generate the magnetic field in question. This kind of flux tubes are not possible in Maxwell's theory.

In this framework Kotov waves could be seen as a direct support for the magnetic flux tubes along which gravitons propagate. The control action forcing the synchronous oscillations would be by dark matter at gravitational flux tubes and the large value of h_{gr} would make possible coherent oscillations with 160 minute period to have effect on ordinary matter.

3 26 second pulsation of Earth: an analog of EEG alpha rhythm?

There is an interesting article in Discover Magazine with title "*The Earth Is Pulsating Every 26 Seconds, and Seismologists Don't Agree Why*" (`https://cutt.ly/ogI6soU`). That mini earthquakes would appear with a period of 26 seconds is a rather fascinating possibility and one can ask what the TGD based explanation for the poorly understood origin of the rhythm might be.

3.1 What has been observed?

The pulsations are Rayleigh waves in which the motion of the mass is vertical. The source of these pulsations can be located near the coast of the Gulf of Guinea. The amplitude of pulsations is largest during storms and during summer time, which suggests that ocean waves feed energy to some kind of waves.The first proposal is that deep ocean waves striking at the shore are the source of the pulsations. The problem is that the periods of these waves vary up to 20 s and shorter than the period 26 s of the pulsations.

Second hypothesis suggests that these microseisms are a form of harmonic tremor associated with the magmatic activity beneath the South Atlantic Ocean. The source is located suspiciously near a large volcano on the island of Sao Tome in the Bight of Bonny proposed to be the source. Also some other volcanoes are accompanied by microseism but the problem is why not all volcanoes would serve as sources.

The popular article talks about periodic pulsations and calls them mini earthquakes. What does this imply if one assumes that the author of the article is using the words in precise sense?

1. Stresses in the Earth's crust are involved with seismic waves. There are three basic kinds of stresses. The stress can due to the compression or stretching: in this case one speaks of tension. This could cause an oscillation. Oscillating string is a very simple example. Pulsations would be oscillations in the vertical direction. This phenomenon could be purely classical and involve no quantum jumps.

2. Ordinary earthquakes are however generated by shear stress: in an earthquake two parallel layers of rock touch each other in a fault. Faults need not be non-horizontal. When a large enough external force parallel to the fault acts on the second layer, the friction fails to keep the pieces together, and the layers start to slip. This event would be naturally quantum jump by its discontinuity. A phenomenological description is in terms of catastrophe theory but there is no proper classical description for what really happens when slippage starts.

3. Periodic mini earthquakes result if these slippages are induced by a periodic force acting on the other piece of rock in the direction of the fault. The analog of local pulsation would require a nearly vertical fault. The challenge would be to explain this periodic force. Standard physics might satisfactorily explain the periodic force and provide an estimate for the period but the description of the discontinuous transition might require TGD based quantum theory.

For the purpose of building a simple mental model, consider a 2-D lattice like structure consisting of cylindrical tectonic plates touching each other. At the border of the abyss at which the water depth suddenly increases deep ocean waves would act as an oscillating pressure to a cylinder and force it to oscillate.

If pulsations are indeed in question, the resulting horizontal motion of cylinders should be transformed to vertical motion. How this could be achieved? The pressure of ocean waves causes a compression in the horizontal direction. Since the material in question is incompressible and therefore preserves its volume, the cylinder must stretch in the vertical direction. The non-linearity of the coupling making possible period doubling could be due to the fact that the vertical stretching is a secondary effect. In the situation considered the coupling could be especially strong and make possible period doubling. The nearness of the volcano could increase the strength of coupling.

3.2 Could period doubling be involved?

Pulsations represent a special case of microseismic waves.

> The microseism spectrum involves two parts: first part the period extends to 15 s as for deep ocean waves and for the second the frequencies are above 30 s and extend to 300s. However, 30 s is rather near to 26 seconds. If there is a coupling of deep ocean waves arriving at shore with microseism waves, one must explain how the almost period doubling results. In general linear coupling between oscillations preserves frequency so that non-linearity suggests itself. What comes in mind is that the system exhibits for frequency around $T = 13$ s a period doubling occurring universally in non-linear systems near chaos. Originally closed orbits in the configuration space of the system with period T are transformed in bifurcation to orbits with period $2T$. Why should $T = 13$ s be so special? In the TGD Universe, magnetic body carrying dark matter as $h_{eff} = nh_0$ phases acts as master controlling ordinary matter. The basic rule is that $h_{eff} \to nh_{eff}$ scales the energies $E = h_{eff}f$ of say phonons by n. The frequencies for the transitions preserving energy are scaled by $1/n$. Could the period doubling correspond to a transition $h_{eff} \to 2h_{eff}$ at MB and occur for $T = 13$ s, which could correspond to a cyclotron frequency of $1/13$ Hz for MB. Quite generally, the cyclotron frequencies of MB of Earth would couple resonantly to various frequencies appearing in the dynamics of ordinary matter with $h_{eff} = h = 6h_0$. This would make the control possible. For $B = 2^{-7}B_{end}$ with $B_{end}02/B_E/5$, $B_E = .5$ Gauss, the cyclotron period of iron ion would be near 13 s. 25.6 Hz is rather near to 26 Hz and corresponds to 2^8:th sub-harmonic of the alpha rhythm 10 Hz, which suggests period doubling appearing in the approach to chaos as an explanation: 8^{th} period doubling of EEG alpha frequency could be in question!

3.3 Trying to understand the pulsation frequency

Could one understand the origin of the frequency 26 s in TGD framework as reflecting the presence of magnetic body (MB)? First some background about TGD.

1. TGD based quantum theory relies on zero energy ontology [L8] (`https://cutt.ly/jgI6du1`) and predicts quantum coherence in all scales being assignable to the magnetic bodies of systems consisting of ordinary matter. MBs would carry dark matter as $h_{eff} = n \times h_0$ macroscopically quantum coherent phases.

2. Ordinary ("big") state function reductions (BSFRs) would change the arrow of time and this implies that they look like deterministic smooth time evolutions leading to the final state of BSFR. The world would be quantum coherent but look classical in all scales! The change of the arrow of time leads to a radically new view about self-organization and about biology

and also self-organized quantum criticality emerges naturally and leads to the emergence of "breathing systems" so that the applications to living systems are natural. In fact, evidence for very simple "breathing" systems is emerging [L7] (`https://cutt.ly/QgI6fuE`).

Earthquakes have some strange features and this led to the proposal that earth quarks could involve BSFR in macroscopic scales at the level of MB of Earth [L6] (`https://cutt.ly/ogI6gc3`). Could also these mini earthquakes involve BSFRs? Could they be interpreted as a sequence of life cycles for a conscious entity with a life time of about 26 seconds assignable to Earth?

3. It is known that electromagnetic activity accompanies Earth quarks and this activity is such that the interpretation in terms of time reversal suggests itself. Could 26 seconds define a period for an analog of alpha rhythm in EEG? There is also another strange rhythm with a period of 160 minutes assignable to astrophysical systems and I have proposed an interpretation as a "cosmic" alpha rhythm [L5] (`https://cutt.ly/SgI6h92`).

This picture leads to ask whether the p-adic length scale hierarchy predicted by TGD could provide some understanding concerning the period of $T = 26$ seconds associated with the pulsations.

1. TGD predicts a hierarchy of p-adic length scales $L_p \propto p^{1/2}$, $p \simeq 2^k$, $k > 0$ preferred integer, coming as half octaves. TGD does not deny the possibility of scaled variants of various particles. For instance, electron could correspond to several integers k with masses proportional to $2^{k/2}$).

2. Secondary p-adic length scales correspond to scales $p^{1/2}L_p \propto p$. There also tertiary etc. time scales forming a fractal hierarchy coming in powers of $p^{1/2}$ and by p-adic length scales as preferred half octaves.

3. For instance, electron corresponds to p-adic prime $p = 2^{127} - 1$ (the largest Mersenne prime, which does not yet correspond to super-astrophysical length scale). Secondary p-adic length scale corresponds to a period $T_e \simeq .1$ seconds. This is a fundamental biorhythm appearing in alpha band of EEG. Also quarks correspond to secondary p-adic length scales which correspond to human time scales.

   $T = 26$ seconds is rather precisely equal to $2^8 \times T_e$, $T_e = .1$ seconds: the relative error is $1/64$ or about 2 per cent. A scaled version of electron with mass $m = m_e/2^4 \simeq 32$ keV would correspond to 25.6 seconds. The p-adic prime $p \simeq 2^k$, $k = 127 + 8 = 135$ defining p-adic scale about .4 Angstrom. This is not far from Bohr radius $a_B = .53$ Angstrom for hydrogen atom.

Of course, the new dark particle need not be electron. One can consider more detailed attempts to understand the situation.

Option I:

The first attempt involves the notion of electropion or more generally, leptopion, see [K5] (`http://tgdtheory.fi/pdfpool/leptc.pdf`) for which there is empirical support and empirical evicence that ordinary pion allows p-adically scaled up variants.

1. The scenaro would be based on axion-like states proposed also as candidates for dark matter predicted by TGD. They would be indeed dark also in TGD but in TGD sense being particles having $h_{eff} = n \times h_0 > h$. This would explain why they are not seen in decay widths in particle accelerators (and excluding them).

2. There is evidence for electropion with mass $2 \times m_e$ (already from 1970's) decaying to an electron-positron pair but forgotten since it does not conform with the standard model (it would increase decay widths of weak bosons). TGD provides a model for this state and predicts similar states for muon and tau and evidence also for these states have been found but also forgotten.

TGD also suggest fractally scaled variants of pion states with different p-adic length scales $p \propto 2^k$ and there is empirical evidence for these states with masses both larger and smaller than pion mass.

1. One can also imagine scaled variants of electropion with different p-adic lengths scales. The primary p-adic time scale assignable to electropion scales corresponds to $k \leq 127$. How to estimate k?

   If the mass squared (conformal weight is additive in p-adic mass calculations then mass squared of electropion is $m^2 = 2m_e^2$ giving $m = 2^{1/2} \times m_e$ for $k = 127$. Correct mass requires $k_e = 127 \to 126$. Compton time of electropion would be $T(electropion, 126) = T_c(126, e)/2$, where $T_c(126, e)$ is the Compton time of electron with $k = 126$.

   The secondary p-adic time Compton time associated with the scaled variant of $k = 126$ electropion corresponds to $T(electropion, 126 + \Delta k) = 2^{\Delta k} T_e/2$. One must have $\Delta k = 8 + 2 = 10$ and $k = 137$. Amusingly, $k = 137$ corresponds to atomic length scale and to fine structure constant. This co-incidence could be regarded as a cosmic joke.

Why this atomic length scale, or rather the corresponding secondary p-adic length scale of scaled electropion, would be associated with the Earth's pulsations? Electropions should be dark and perhaps form a coherent state as in the model for the production of anomalous electron-positron pairs based on electropion involving in an essential manner non-orthogonal electric and magnetic fields of colliding nuclei?

Option II: The second proposal is based on TGD inspired quantum biology involving Bose-Einstein condensates of Cooper pairs of electrons, protons, and fermionic ions and also of bosonic ions at magnetic flux tubes and characterized by effective Planck constant $h_{eff} = nh_0$, $h = 6h_0$, making possible quantum coherence in length scales longer than Compton length.

1. Consider the Bose-Einstein condensate of electron Cooper pairs. Electron Cooper pairs has Compton length equal to $L_{2e} = L_e/2$, L_e the electronic Compton length. Secondary Compton time equals to $T_{2e}^{2)} = 2^{127/2} T_e/2 = .05$ s. Superconductivity in longer length scales than Compton length requires $h_{eff} > h$. The scaled up Compton scale $L_{n,2e} = nL^{2e}$ gives the coherence length of a superconductor and the secondary Compton time scales to $nT_{2e}^{2)} = .05n$ s. This time equals to $T = 25.6$ s for $n = 2^9$.The interpretation in terms of period doubling can be considered.

2. The general hypothesis [K1] is that there is resonance between dark and p-adic length scales so that this dark scale would correspond to identical p-adic length scale which would correspond to $L(k = 127 + 18 = 145) \sim 1.25$ nm equal to the transversal length scale for DNA.

3. TGD predicts that ordinary dark DNA in aqueous environment is accompanied by dark DNA realized as flux tubes carrying dark proton triplets realizing genetic code. Also amino-acids would be accompanied by these dark proton triplets and electrons would neutralize proteins charge which would be 3 proton charges per amino-acid. This would suggest that this scale relates to dark DNA, RNA, and proteins, which would involve space-time sheets which are electronic super conductors, and that the 26 second rhythm reflects the presence of water.

Option III: This alternative is nearest the idea about 260 Hz rhythm as analog of alpha rhythm. Iron ion has cyclotron frequency 10 Hz in B_{end}. Period doublings could correspondto the scalings of B_{end} by powers 2^{-n} of two scaling the cyclotron frequency by factor 2^{-2n}. The area of the flux tube would be scaled up by 2^n. If h_{eff} is scaled by 2^n, the energies are unaffected. For $n = 8$ the cyclotron frequency of iron ion would be near to 25.6 s. Could also the powers $2^{-n} \times 10$ Hz appear in the microseismic spectrum as period doubled alpha rhythm in the approach to chaos?

Could 26 second rhythm be kind of a bio-rhythm for Earth analogous to heart-beat or breathing? These two rhythms are highly varying and assignable to self-organization. EEG alpha rhythm is however universal. Could the Earthly bio-rhythm be analogous to the alpha band in the analog of EEG of Earth with frequencies scaled down by factor 1/256?

Each period would correspond to a mini earth quake. Also the ordinary EEG would involve similar BSFRs as an analog of sleep-awake rhythms and all bio-rhythms could be this kind of sleep-awake rhythms. One could of course check whether the 26 second rhythm has an electromagnetic analog?

There exists also another analogous rhythm, the 160 minute rhythm assignable to many astrophysical objects. I have proposed an interpretation as a kind of cosmic alpha rhythm.

1. 160 minute period is obtained from 26 second rhythm by scaling by a factor about $369 \simeq 2^{8.5}$ with error of 2 per cent - half octave again.

2. For the electro-pion option, one can think that one scales electropion with $k = 127$ having mass $2^{1/2} \times m_e$ to $k = 127 \to 127 + 17 = 144$ to get secondary Compton time scale $2^{16+1/2)}T_e = 154.5$ minutes not too far from 160 seconds. The interpretation as 17^{th} period doubling for $k = 127$electro-pion with $T_c = \sqrt{2}T_e$ could make sense. There is indeed evidence for the period doubling of pion-like state. $f_c = f_e/\sqrt{2} \simeq 7.1$ Hz is lower than the nominal value $f_S = 7.8$ Hz of the lowest Schumann frequency. The cyclotron frequency of K^+ in B_{end} is 7.7 Hz and rather near to f_S.

3. For the Cooper pair option one could argue that since h_{eff} is integer valued, one can allow a value of n near to $2^{17.5} \simeq 185364$: this would give p-adic length scale $L(162)$, $L(163)$, which corresponds to one of the miracle length scales $k \in \{151, 157, 163, 167\}$ defining scales assignable to DNA coiling, would have been a more desired outcome.

4 Why is intergalactic gas ionized?

I became aware about new-to-me cosmological anomaly (see `http://tinyurl.com/y6ps6tb8`). FB really tests by tolerance threshold but it is also extremely useful. The news is that the sparsely distributed hot gas in the space between galaxies is ionized. This is difficult to understand: as universe cooled below the temperature at which hydrogen atoms became stable, it should neutralized in standard cosmology.

In bio-systems there is similar problem. Why biologically important ions are indeed ions at physiological temperatures? Even the understanding of electrolytes is plagued by a similar problem. It sounds like sacrilege to even mention to a fashionable deeply-reductionistic popular physicist talking fluently about Planck scale physics, multiverses, and landscape about the scandalous possibility that electrolytes might involve new physics! The so called cold fusion is however now more or less an empirical fact [L1] (see `http://tinyurl.com/y7u5v7j4`) and takes place in electrolytes - also living matter is an electrolyte.

TGD explanation is based on the hierarchy of Planck constants $h_{eff} = n \times h_0$ predicted by adelic physics as kind of IQ of the system.

1. The energy of radiation with very low frequencies - such as EEG frequencies - can be in the range of ionisation energies of atoms by $E = h_{eff} \times f$ - typically in UV range. Hence interaction between long and short length scales characterized by different values of h_{eff} becomes possible and in TGD magnetic body (MB) in long scales would indeed control biomatter at short scales in this manner. Cyclotron radiation from magnetic flux tubes of MB carrying dark ions would be used as control tool and Josephson radiation from cell membrane would be utilized to transfer sensory input to MB.

2. TGD variant of Nottale's hypothesis predicts really large values of h_{eff}. One would have $h_{eff} = h_{gr} = GMm/v_0$ at the magnetic flux tubes connecting masses M and m and carrying gravitons ($v_0 < c$ is a parameter with dimensions of velocity) [L3] (see `http://tinyurl.com/y6317624`). What is important that at gravitational flux tubes cyclotron frequencies would not depend on m being thus universal. For instance, bio-photons with energies in UV and visible range would result from dark photons with large $h_{eff} = h_{gr}$ for frequencies even in EEG range and below.

The ordinary photons resulting from dark photons would ionize biologically important atoms and molecules. In the interstellar space the situation would be the same: dark photons transforming to ordinary higher energy photons would ionize the interstellar gas.

This relates closely to another cosmological mystery.

1. Standard model based cosmology cannot explain the origin of magnetic fields appearing in all scales. Magnetic fields require in Maxwell's theory current and in cosmology thermal equilibrium does not allow any currents in long length scales. In TGD however magnetic flux tubes carrying monopole fluxes are possible by the topology of CP_2. They would have

closed 2-surface as cross section rather than disk. They are stable and do not require current to generate the magnetic field. These flux tubes would be carriers of dark matter generating the dark cyclotron radiation ionizing interstellar gas in the scale of wavelength, which would be astrophysical.

2. There are also another kind of magnetic flux tubes for which cross section is sphere but the flux vanishes since the sphere is contractible. hese flux tubes are not stable against splitting. There would be no magnetic field in the scale of flux tube. Magnetic field is however non-vanishing and ions in it generate dark cyclotron radiation. These flux tubes would naturally carry gravitons and photons. These flux tubes could could mediate gravitational and electromagnetic interactions: gravitons and photons (also dark) would propagate along them.

3. This picture leads to a model for the formation of galaxies as tangles of long monopole flux carrying cosmic strings looking like dipole field in the region of galaxy (for TGD based model of quasars [L4] see `http://tinyurl.com/y2jbru4k`): the energy of these tangle would transform to ordinary matter as the cosmic strings would gradually thicken - this corresponds to cosmic expansion. The process would be the analog of inflation in TGD. Also stars and even planets could be formed in this manner, and thickened cosmic strings would be carriers of dark matter in TGD sense. The model explains the flat galactic rotation curves trivially.

4. Dark ions responsible for the intergalactic ionization could reside at these monopole flux tubes or at the flux tubes which vanishing magnetic flux carrying mediating gravitational interactions. Which option is correct? Or can one consider both options?

   There might be a connection with the $T = 160$ minute period appears in astrophysics in many scales from stars to quasars. The observation is hat dark cyclotron photons created by Fe^{2+} ions in interstellar magnetic field about .2 nT have period of 160 minutes.

   (a) In TGD inspired biology the endogenous magnetic field is about .2 Gauss and now the time scale is $t = .1$ seconds which corresponds to alpha rhythm, the fundamental bio-rhythm. 160 minutes would correspond to cosmic alpha rhythm! Also cyclotron photons with this frequency could induce ionization of interstellar scales. This would require h_{gr} which is by a factor $T/t = 10^5$ higher. For ordinary alpha frequency M is naturally proportional to the mass of Earth: $M = k_E M_E$. Solar mass is 3.33×10^5 times higher than the solar mass M_S, which suggests that the flux tubes of system with mass of Sun are involved. Could the dark matter in question be associated with the flux tubes connecting Sun to smaller masses m mediating gravitational interaction? The ratio of Planck constants would be

   $$\frac{h_{gr,S}}{h_{gr,E}} = \frac{k_S}{k_E} \times \frac{v_{0,E}}{v_{0,S}} \times \frac{M_S}{M_E} \quad .$$

   This would demand

   $$\frac{k_S}{k_E} \times \frac{v_{0,E}}{v_{0,S}} = \frac{1}{3.33} \simeq 3 \quad .$$

   (b) Note that the 160 minute period was discovered in the dynamics of Sun: no mechanism is not know for an oscillation coherent in so long length scale. Could this mean that the MB of Sun controls dynamics of Sun just as the MB of Earth controls the dynamics of biosphere? Is Sun a conscious, intelligent, entity?

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