Geomagnetic reversals and excursions and the anomaly of equinox precession from the TGD point of view

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Abstract

The field body (magnetic or electric) is a key notion of TGD inspired quantum biology. It carries macroscopic quantum phases and serves as the "boss" of the ordinary biological body. The aging of the field body induces the loss of the control over the biological body and eventually leads to the biological death. The cosmic strings, whose thickenings give rise to monopole flux tubes, explain the flat velocity spectrum for distant stars rotating galaxies. Also the cosmic strings connecting stars could have distant planets rotating them. This could explain the anomalous behavior of planet Sedna and also the anomalous behavior of comets in the Oort cloud.

The spin axis of the Earth could correspond to the axis connecting Sun and Stellar Polaris and involve a cosmic string carrying a very strong magnetic field B_{S-SP} parallel. The gravitational force between the cosmic string and solar system and objects rotating the cosmic string would modify the local direction of the cosmic string at Earth and therefore contribute to the precession besides the gravitational torque due to Sun and Moon. Also a magnetic torque between the monopole flux tubes of B_E and of B_{S-SP} would be generated by the objects rotating around the cosmic string and Sun and would tend to change the direction of B_E.

The basic idea of the TGD based model for the reversals and excursions of the Earth's magnetic field B_E is that monopole part of B_E occasionally makes a reversal and in this way refreshes the Maxwellian of B_E which decays due to the decay of Ohmic currents in time scale of about 20,000 years. The average periods between excursions are of the same order of magnitude as the period of equinox precession. Could the time varying magnetic torque between the monopole flux tubes of B_E and B_{S-SP} facilitate the magnetic reversals and even excursions. Stochastic resonance, occurring when the level of the noise is correct, could be a possible dynamical mechanism .

The stimulus for writing this article came from a new perspective to climate change and other phenomena. They could be argued to reflect the ethical and moral decay of our civilization. Could there be a much deeper reason for these phenomena and could they be unavoidable and implied by the basic physics? To put it provocatively: could our ethical and moral standards correlate with our physical environment in some sense? Could extinctions and collapses of civilizations reflect the aging of the magnetic body of Earth leading eventually to the decay of the magnetic body and re-organization to a new magnetic body with reversed orientation of B_E.

Contents

1   Introduction

The field body (magnetic [L5, L6, L3] or electric [L4]) is a key notion of TGD inspired quantum biology. It carries macroscopic quantum phases as phases of ordinary matter with effective Planck constant h_{eff}. In particular, gravitational and electric Planck constants assignable to the classical gravitational and electromagnetic fields can have a very large value. As a consequence, the field body serves as the "boss" of the ordinary biological body. The aging of the field body leads to the thermalization of the dark matter associated with it and would lead to the loss of control over the biological body. Eventually this could lead to the biological death [L9].

1.1   Cosmic strings and the anomalous precession of equinox

I have discussed the TGD based model for equinox precession in [K4]. The model to be discussed is an updated version of this model reflecting the progress of TGD occurred after the first version of the model was developed.

    The cosmic strings, whose thickenings give rise to monopole flux tubes, explain the flat velocity spectrum for distant stars rotating galaxies. Also the cosmic strings connecting stars could have distant planets rotating them. The anomalous behavior of planet Sedna and also of comets in the Oort cloud could be understood if Sedna rotates around a cosmic string connecting Sun or a PS and carrying a very strong magnetic field B_{S-SP}. The spin axis of the Earth could correspond to the axis connecting Sun and the PS.

    There are two candidates for the PS: Vega and Stellar Polaris. The periodicity of the motion of Vega is same as the periodicity of equinox percession so that remains a unique candidate.

    The gravitational force between the cosmic string and solar system and objects rotating the cosmic string would modify the local direction of the cosmic string at the Earth and therefore contribute to the equinox precession besides the gravitational torque due to the Sun and Moon. Also a magnetic torque between the monopole flux tubes of B_E and of B_{S-SP} would be generated

by the objects rotating around the cosmic string and Sun and would tend to change the direction of B_E.

1.2 Could equinox precession correlate with the reversals and excursions of the Earth's magnetic field?

The basic idea of the TGD based model [L2] for the reversals and excursions of the Earth's magnetic field B_E is that monopole part of B_E occasionally makes a reversal and in this way refreshes the Maxwellian of B_E which decays due to the decay of Ohmic currents in time scale of about 20,000 years.

The average periods between excursions are of the same order of magnitude as the period of equinox precession. Could the time varying magnetic torque between the monopole flux tubes of B_E and B_{S-SP} facilitate the magnetic reversals and even excursions. Stochastic resonance, occurring when the level of the noise is correct, could be a possible dynamical mechanism .

1.3 Could the excursions and reversals of B_E together with the aging of the magnetic body of Earth induce extinctions and collapses of civilizations?

The stimulus for writing this article came from a new perspective to climate change and other phenomena. They could be argued to reflect the ethical and moral decay of our civilization. Could there be a much deeper reason for these phenomena and could they be unavoidable and implied by the basic physics? To put it provocatively: could our ethical and moral standards correlate with our physical environment in some sense? Could extinctions and collapses of civilizations reflect the aging of the magnetic body of Earth leading eventually to the decay of the magnetic body and re-organization to a new magnetic body with reversed orientation of B_E.

2 A TGD based view for the anomaly of the equinox precession

2.1 Precession of equinox

The prediction for the period of precession of the equinox is too short which suggests that some new physics is involved.

1. The precession of the equinox means that at the spring equinox the sun's position in relation to the fixed stars of the Milky Way changes very slowly at a rate of 1 degree per 71.6 years, so that the entire 360 degree cycle corresponds to 25,800 years. This corresponds to the precession of the Earth's axis of rotation, i.e. the change of the axis around which the rotation axis rotates (nutation).

2. This phenomenon cannot be explained by the gravitational physics of the solar system, and I have consider several TGD-based models for it [K4]. Monopole flux tubes connecting the Earth to the PS play a central role in these models. The flux tubes would pass through the Earth via the poles.

   One can imagine several options. The simplest option is that the direction of the flux tubes connecting the Sun to the PS defines the spin axis of the Earth. The precession of the flux tube axis would force the precession of the Earth's spin axis. The second option is that a local variation of the flux tube direction at the Earth induces the precession of the spin axis. The gravitational forces of the objects rotating the string cond affects its direction locally at the Earth. These effects alone could explain the precession in the radical option. For the conservative option they would contribute an additional effect to the effects caused by the Sun and Moon.

2.2 Some observations and questions

The precession problem involves three directions.

1. Pole Star (PS) is by a definition a star above the North pole. Stellar Polaris with distance 433-448 light years satisfies this definition. Vega was a PS in 12,000 years BCE and will be PS in 13,727. The period of Vega is in 1 percent accuracy the same as for the equinox precession. This motivates a milder definition of PS is that it is periodically a PS and will be used in the sequel. The Sun-PS axis is a physically significant direction if the cosmic string(s) or monopole flux tube(s) connecting these two stars defines the direction of the Earth's rotation axis.

2. The direction of the Earth's magnetic field B_E defined by the dipole moment in the dipole model is also an important direction. The recent direction of the monopole flux tubes of the Earth's magnetic field is rather near to the direction of the Sun-Stellar Polaris axis. The magnetic axis is a local notion since the B_E is not pure dipole field. The tilt angle of the magnetix axis with respect with to the spin axis varies with time and position.

3. How parallel is the axis of the Earth's magnetic field B_E to the precessing spin axis? Is the tilt angle between B_E and North defined by the direction to Vega slowly varying? At this moment the opening angle of the precession cone is 23.5 degrees. The varying tilt angle of B_E is estimated to be 11 degrees and is slightly smaller than half of the opening angle, that is 12.25 degrees. This would suggest that B_E is almost parallel to the Sun-Vega axis. Do the flux tubes of B_E roughly define the axis around which the precession takes place. Is the angle between the axes of PS and B_E 2.5 degrees?

Continental drift brings in an additional complexity since it implies that the position of the North Pole in the geological sense is dynamical. The regions near recent Poles have once been tropical regions. If the magnetization of various magnetic materials in the direction of B_E in various geological layers has been frozen to the permanently magnetized objects and if only the continental drift has changed the orientations of these objects, allows us to reconstruct the history for the direction of B_E in the coordinate system defined by the Stellar Polaris.

2.3 Could a cosmic string connecting the Sun and Vega induce the equinox precession?

Sun and Moon give a rather satisfactory but far from complete description of the equinox precession but several additional periodic perturbations would be involved with the equinox precession. The actual period of 25,800 years is longer than the predicted period of 24,000 years. The computational models cannot predict the behavior of the precession for long time spans. Some new elements are involved. In [K4] it was asked whether the precession of the orbital plane of the entire solar system could be in question and it was proposed that monopole flux tubes could be in question. The recent model is an updated version of this model.

Cosmic strings with a high string tension solve the problem of galactic dark matter and provide the TGD counterpart for inflation generating ordinary matter from the energy of cosmic strings. Cosmic strings and thickened flux tubes could be a new actor also in astrophysics. The basic prediction is that cosmic strings or magnetic flux tubes with a smaller string tension can connect stars and other astrophysical objects. Planets and perhaps even stars can form bound states with the cosmic strings connecting stars.

This motivates the question whether the cosmic strings and objects orbiting around the cosmic string connecting Sun and Vega, could relate the equinox precession. There are two views: radical and conservative.

1. The radical view considered already in [K4] is that the equinox precession is due to the change of the orientation of the spin axis defined by the cosmic string connecting the Sun and PS. This suggests that the spin axis of the Earth is nearly orthogonal to the ecliptic plane at which the planets orbiting the Sun are.

   At this moment the instanenous tilt angle of the spin axis with respect to ecliptic is 23.44 degrees whereas the opening angle of the precession cone is 23.5 degrees at this moment.

The tilt angle has been in te range 22.0-24.5 degrees during the last 5 million years so that it seems to be an apppproximate constant of motion. This conforms with the assumption that the ecliptic plane precesses and its normal direction is defined by the flux tubes connecting the Sun to Vega. The periodic motion would induce the precession of the normal direction of the ecliptic plane and the direction of the spin axis of the Earth with respect to the ecliptic.

This precession would not be rigid body precession but reflect the presumably elliptic orbit of Vega. If the direction of the North is permanently defined by Stellar Polaris, this proposal fails. For the Vega option, the recent North is however predicted to be in the direction of Stellar Polaris so that one cannot draw this conclusion. If the observed precession is the precession of the spin axis relative to the elliptic, this proposal might work. If not, then the equality of the two periods forces us to consider the possibility that the motion of Vega somehow induces a rigid body precession around the direction of Stellar Polaris. The large distance of Vega leaves under consideration only an effect somehow caused by the cosmic string connection.

2. The conservative view is that objects orbiting the cosmic string could cause an additional torque on Earth if it is attached to the cosmic string (being analogous to a local flux tube tangle). One also expects that there are monopole flux tubes connecting Earth to these objects since all astrophysical objects should appear as nodes of a network of cosmic strings.

   (a) Since very distant objects cause a negligible torque on ordinary astrophysical objects, the torque should affect the cosmic string from the Sun to PS to which the Earth would be attached. The cosmic string, and the Earth with it, would experience the $1/\rho$ gravitational force caused by the objects rotating the string and tending to change the direction of the string at Earth. This would change the direction of the rotation axis of the Earth if it is parallel to the string and cause the equinox precession.

   (b) The conservative view about the equinox precession would look like follows. The period of equinox precession is $T = 25,800$ y. The gravitation of the Sun and Moon gives a good estimate of 24,000 years for T. Sedna's and possible other objects rotating the cosmic string connecting Sun and PS contribute an additional gravitational force on the cosmic string and change its direction at Earth if it is attached to the cosmic string. This would change the rotation axis parallel to the cosmic string. This would spoil the periodicity and could make the average period longer.

Vega and Stella Polaris are the two candidates for the PS to which the Sun would be connected by monopole flux tubes and whose direction axis could determine to a high degree the direction of the instantaneous spin axis of the Earth. The distance of the Stella Polaris is between 323-423 light years so that the direction of the monopole flux tubes to it should be essentially constant. Also their existence looks implausible. Vega is therefore a more plausible candidate.

1. Vega is .5 billion years old and located at a distance of about 25 light years whereas the Sun is thought to be about 4.6 billion years old. Vega is the brightest star near the Sun. Sun and Vega are thought to have condensed simultaneously from a proto disk. This could explain the flux tube connections between the Sun and Vega.

2. The declination of Vega, defined as the angular distance from the equator of Earth, was $\delta = +86$ degrees 4 minutes 12,000 BCE when Vega was the PS in a strong sense. The declination of Vega is now $\delta_{now} = 38$ degrees 47 minutes 01.2802 seconds now (2024) and will be the same as 12,000 years BCE in year 13,727. From this the period of for the variation of δ is 25,727 years, which equals with a one per cent accuracy to the period of equinox precession of about 25,800 years. This makes Vega a unique candidate. The equinox precession could be caused essentially by the precession of the direction of the flux tubes connecting Sun and Vega. The radical option would be therefore correct.

3. Now Stella Polaris is the PS and 14,024 years have passed $\delta = 0$ so that Vega has passed the middle point of the cycle corresponding to 12,863 years. This conforms with the fact that Stellar Polaris is now the PS and suggests that the declination of the Vega varies between $\delta = 0$ and maximum value larger than the recent value and should be decreasing now.

The cautious conclusion is that the flux tube connections to Vega cause the precession of equinox.

2.4 Could the objects orbiting a cosmic string connecting Sun and Vega allow us to understand the anomalous behavior of Sedna and Oort cloud?

The cosmic string connection between the Sun and Vega would bring a completely new element to astrophysics of the solar system, possibly explaining various anomalies. One can imagine several candidates for the objects orbiting around the cosmic string connecting the Sun to the Vega and having Earth attached to it.

1. The trans-Neptunian object Sedna (see this) has an extra-long and unusually elliptical orbit around the Sun ranging between 76 AU and 938 AU. Its rotation period is T= 11,400 years. The inclination of Sedna is 11 degrees so that the magnetic field of Earth would be nearly orthogonal to its orbital plane around the cosmic string. This would conform with the assumption that the orbital plane of the Sedna has the Sun-Vega axis as a normal. The very strange orbital characteristics of Sedna could be due to the fact that it rotates around the cosmic string connecting the Sun and PS.

2. The strange behavior of comets in the Oort cloud involves a large increase of the number of comets visiting the inner Solar System with a consequential increase of impact events on Earth. The visit of Sedna near the Sun could catch the comets temporarily on orbits in the orbital plane of Sedna. The periodic visits of Sedna in the inner solar system could induce effects also at the level of civilization.

3. Planet 9 (see this) is a hypothetical object assumed to have semimajor axis of 100 AU and a rotation period in the range 9,900-15,400 years. Planet 9 is proposed to be a primordial blackhole, has been proposed to explain the orbital characteristics of Sedna. Its rotation period is of the same order of magnitude as with the equinox precession period and the rotation period of Sedna and it could rotate around the cosmic string connecting Sun and Vega. Planet 9 is not needed to explain the behavior of Sedna if Sedna rotates around the cosmic string connecting Sun and Vega.

4. Nemesis, "death star", is a hypothetical red dwarf or brown dwarf with mass $.005 M_{Sun}$ originally postulated in 1984 to be orbiting the Sun at a distance of about 95,000 AU (1.5 light-years) and somewhat beyond the Oort cloud. This distance is considerably smaller than the distance 25 light years of Vega. The proposal was that Nemesis could explain a perceived cycle of mass extinctions in the geological record, which seem to occur more often at intervals of 26 million years. In a 2017 paper, Sarah Sadavoy and Steven Stahler argued that the Sun was probably part of a binary system at the time of its formation, leading them to suggest "there probably was a Nemesis, a long time ago". Such a star would have separated from this binary system over four billion years ago, meaning it could not be responsible for the more recent perceived cycle of mass extinctions. The proposed explanation of equinox precession gives this role to Vega.

   Nemesis would be at a highly elliptical orbit that periodically disturbs comets in the Oort cloud, causing a large increase of the number of comets visiting the inner Solar System with a consequential increase of impact events on Earth. This became known as the "Nemesis" or "Death Star" hypothesis. The period of mass extinctions is 28 million years and very long as compared to the period of Sedna. The period of 28 million years of Nemesis is about 254 times longer than the period 11,400 years of Nemesis and has about 16 longer orbital radius.

   The hypothetical Nemesis could move along a very elliptic orbit around the Sun-Vega cosmic string made natural by the logarithmically varying gravitational potential of the string. It could deviate the orbits of comets in the Oort cloud so that they visit the Sun. They would orbit around the cosmic string in the orbital plane of Nemesis during the visits. The orbital

planes for Sun and hypothetical Nemesis have angle, which corresponds to the angle between magnetic field and rotation axis of Earth, and is therefore consistent with the assumption that the string connects Sun and PS.

2.5 Orbits around cosmic string/monopole flux and a possible problem with the gravitational Planck constant

A helical pair of flux tubes forming a flattened closed flux tube could be taken as the model of for the string like entity connecting Sun and PS. The strands of the U-shaped closed flux tube could be rather distant.

2.5.1 Classical model

Stringy gravitational potential v_{gr} is logaritmic, that is of form $V_{gr} = mv_{gr} = klog(\rho/\rho_0)$ and and very slowly varying. This allows very elliptical orbits. Energy $E = m\epsilon$ and angular momentum $L = ml$ are conserved and this allows too solve the equations of motion. Half Period can be exressed as a generalization of elliptic integral.

$$T = \int_{\rho_{min}}^{\rho_{max}} d\rho \frac{1}{\sqrt{\epsilon - v_{gr} - l^2/\rho^2}} \quad .$$

Here one has $l = m\rho\omega$. Turning points ρ_{min} and ρ_{max} correspond to the radii at which the quantity $\epsilon - v_{gr} - l^2/\rho^2$ vanishes. Circular orbits are obtained as a special case and for these velocity is constant $v = \sqrt{TG}$ irrespective of the radius and in the case of distant stars of galaxies.

2.5.2 Quantum model

The quantization of angular momentum is not quite straightforward. Nottale's quantization condition does not make sense for infinitely long string like objects since the mass is infinite. One an howewer ask whether the approximation as an object of effective finite length could work. At least for closed strings of length L, say DNA like helical pairs of strings, which are actually single strings turning back this should work. Only a finite portion of string defined in a natural way, for instance as a string connecting two ordinary astrophysical objects would be taken into account.

1. The string does is closed and finite length L. If the radius R of the orbit is considerably smaller than L approximation as straight infinitely long string is reasonable. But does the quantization condition allow this kind of situation which are physically possible (galactic dark matter and cosmic strings)

2. Nottale's gravitational constant $hbar_{gr} = GMm/\beta_0$. The parameter $\beta = \sqrt{TG}$ gives a good estimate for β_0.

   One must approximate the string so that it has finite length L. Double helical string for instance. A natural identification of L would be as the length of the string portion connecting two astrophysical objects. One would have $M = TL$, where T is the string tension which is reduced for the flux tubes.

3. Consider the quantization of antular momentum for an object rotating the string. Mass m disappears from the condition. Also $\beta \equiv TG$ disappears from the condition and one obtains

$$R\beta = n\frac{GM}{\beta_0} = \frac{nTGL}{\beta_0} = n\frac{\beta L}{\beta_0}.$$

This gives

$$\frac{R}{L} n \frac{\beta}{\beta_0} \quad .$$

One should have $R/L < 1$. This is not possible except for $n < \beta/\beta_0$. For $L \sim 300 ly$ associated with Sun-PS string and $R \sim .007$ ly associated with Sedna one should have $\beta/beta_0 < 10^{-5}$.

The string one should have $\beta = \sqrt{TG} < 10^{-5}$. From other considerations, $\beta = TG$ has an upper bound in the range $10^{-6} - 10^{-7}$ [L5]. The string in question could be even cosmic string.

3 TGD based view of geomagnetic reversals and excursions

I have discussed a model [L2] for what occurs in the geomagnetic reversals based on idea that the stable part of the Earth's magnetic field consisting of monopole flux tubes changes its orientation and in this way generates ohmic currents refreshing the Maxwellian part identifiable as magnetization. A slightly updated model of this view will be discussed first. In this model the dynamics of B_E would not involve external influences.

3.1 An updated view of the model for the maintenance of the magnetic field of the Earth

The basic problem of the dynamo model is that the time scale for the decay of ohmic currents generating the Earth's magnetic field in the dynamo model is about 20,000 years to be compared with the average period 45,000 years between excursions. The average period between reversals is 450,000 years.

The TGD view of magnetic fields deviates dramatically from the Maxwellian view and leads to an explanation for the stability of the Earth's magnetic field and also predicts a mechanism for the polarization reversals [L2].

1. The key prediction is that the magnetic field contains a stable component consisting of closed monopole flux tubes not present in the Maxwellian world. The monopole flux loops could flow along the Earth's surface and return from the South pole to the North pole along North-South-axis or, more plausibly, parallel to the Earth's surface as assumed in the case of the Solar magnetic field. The presence of the monopole flux tubes generates the Maxwellian component by magnetization whereas in the dynamo mechanism the currents in the core of the Earth generate the magnetic field.

2. The orientation reversal for the flux tubes could involve a temporary decay of the closed monopole flux tubes by reconnections to short loops which then reconnect to flux tubes with opposite polarization. This kind of decay would be associated with the polarization reversals of the solar magnetic field [L6]. In Mars, the reconnection would have failed so that it would have lost the monopole component of the magnetic field in the planetary scale.

3. The reversed monopole flux component would generate magnetization refreshing the Maxwellian component. The excursions and reversals and essentially randomly but the average period 45,000 years for the excursions has the same order of magnitude as the estimated lifetime of ohmic currents assumed to generate the magnetic field in the dynamo model. The average period between the reversals leading to a longlasting change of the polarity is 45,000 years.

The magnetic flux tubes with the monopole component change their polarity in excursions and reversals. What could cause these events? Materialist would require that the reversal should have a purely mechanistic explanation. TGD however forces to consider a different explanations.

1. These events would occur when the Maxwellian component of B_E produced by the magnetization becomes too weak. Could one say that the monopole component takes care that the Maxwellian component is not lost. This would conform with the idea that the magnetic body of the Earth is a conscious intelligent entity, which controls the biosphere.

2. An alternative explanation, more in line with the materialistic thinking, generalizes the proposal for biological aging as a thermalization of the magnetic body [L9]. As the temperature at the monopole flux tubes increases, their geometry develops random fluctuation and they thicken so that the magnetic field strength weakens.

   As a consequence, reconnections of the flux tubes become probable and lead to the decay to short flux loops as a magnetic counterpart of biological death. After that they would

reconnect back to flux tubes with opposite magnetic polarizations. In zero energy ontology
(ZEO) the decay and fusion would correspond to a pair of "big" state function reductions
(BSFRs) involving changed arrow of time.

Note that the reduction of entropy in these two BSFRs involving also the Maxwellian part
of the magnetic field should reduce the entropy of both components of the magnetic field
(consisting of flux tubes). The interpretation of a period of sleep as a period of opposite
arrow of geometric time and involving a pair of BSFRs helps to understand the reduction of
entropy. Sleep indeed has a healing effect.

Why should the magnetic polarization be opposite for the reincarnated monopole flux tubes?
What could change the orientation of the short flux tube fragments before they fuse to long
flux tubes? Or could it be that it need not change always: the events in which does not occur
would be non-events as far as magnetic field is considered?

In TGD, the magnetic bodies of ordinary physical systems carry macroscopically quantum
coherent phases of matter being able to control the associated systems consisting of ordinary
matter. TGD inspired quantum biology relies on this notion. Therefore there are good motivations
to ask whether the correlation between the weakening of the magnetic field and even phenomena
like climate warming could exist.

3.2   Could the magnetic torque between the monopole flux tubes of B_E and Sun-Vega cosmic string induce magnetic reversals?

The proposed model for the magnetic reversals and excursions does not consider possible external
influences inducing them.

The updated model for the equinox precession involves in an essential manner the cosmic strings
connecting the Earth to Vega (this) defining the direction of the spin axis of Earth. This axis does
not quite coincide with the magnetic axis of Earth.

Could the magnetic torque between the magnetic flux tubes of the Earth's magnetic field and
the magnetic field of monopole flux in the direction of the Vega define the periodic driving forces
inducing stochastic resonance if the noise level is correct? The model for the reversals of the solar
magnetic field [L7, L6] involve the decay of the monopole flux tubes to loops followed by a fusion
to flux tubes with opposite magnetic polarity. Also in the recent case the decay is necessary. This
makes the process probabilistic so that it is characterized by the probability for the change of the
polarity in fusion.

If the noise level is correct for a half of all cases, the flip of the magnetic polarization occurs
for half the cases and the average period would be two times the period of equinox precession that
is 51,600 years. The average period is 45,000 years if the probability for the excursion is $p \simeq .43$.
The magnetic reversals with a period of 450,000 years might be caused by a similar mechanism.

3.3   Could stochastic resonance be involved?

I have discussed stochastic resonance from the TGD point of view earlier in [K3] and recently
in [L8]. Also the reversal of the stochastic resonance plays a key role in TGD inspired quantum
biology. The following arguments suggest that stochastic resonance cannot relate the magnetic
excursions to equinox precession.

1. Stochastic resonance appears in bistable systems in presence of a periodic perturbation when
   the amplitude of the external noise is suitable. The frequency of stochastic resonance equals
   $f_{spont} = 2f$. f_{spont}, defined as the frequency for the transitions between the two states of
   the bistable system, is determined by the amplitude of the noise. f_{spont} is proportional to
   an Arrhenius factor having also interpretation as (quantum) tunnelling probability, whose
   dependence on the amplitude of the noise is exponential. Also the harmonics nf_{spont} of this
   frequency are induced but are exponentially damped.

2. In the recent case the two states of the bistable system correspond to the orientations of
   the Earth's magnetic field. The thermalization of the Earth's magnetic body could cause
   the noise leading to stochastic resonance inducing the polarization flip. The periodic driving

    force with period T could be caused by Sedna or equinox precession. The period T_{exc} for excursions would be $T_{exc} = T/2$ or its sub-harmonic.

3. The periodic driving force would be the magnetic torque between the monopole flux tubes of the Earth's magnetic field (or magnetic dipole characterizing it) and the monopole flux tubes connecting the Earth to Vega defining the direction of the Earth's temporary spin axis. This force would vary periodically and could cause the spin flip if the condition for the stochastic resonance is satisfied. Also other periodic perturbation due to the objects rotating around the Sun-Stellar Polaris cosmic string would be involved. The problem with the stochastic resonance is that the period would be one half of the period of precession: that is 12,400 years.

4. If the stochastic resonance is involved, this would suggest local shortlasting reversals of B_E not reported. The absence of a noise with a correct amplitude could cause long periods without reversals and excursions and also the occurrence of only few excursions. The harmonics of f_{spont} would give periods T_{exc}/n and as special case sub-octaves $6,200$ years, $3,100$ years, etc... suggested by the p-adic length scale hypothesis.

   If the rotation of Sedna defines the periodic perturbation, stochastic resonance gives the period $5,200$ years plus its subharmonics, in particular sub-octaves with period $2,600$ year, etc...

4 Could magnetic reversals and excursions relate to extinctions and declines of civilizations?

The stimulus for the writing of this article came from a new perspective to climate change and other phenomena, which can be argued to reflect the ethical and moral decay of our civilization. Could there be a much deeper reason for these phenomena and could they be unavoidable and implied by the basic physics? To put it provocatively: could basic physics correlate with our ethical and moral standards?

    Climate warming and other phenomena that cause disorder in the biosphere bring to mind the second law of thermodynamics. Could a deeper explanation be based on the second law of thermodynamics of its generalization. We turn too much ordered energy into dis-ordered energy. Could carbon dioxide emissions be a secondary phenomenon?

    I did not take these considerations very seriously because it is difficult to see the reduction to the atomic level. The loss of order also manifests itself in a rather abstract form, for example on a social level as violence and inequality. Recently, however, I saw a mention of a study in which I claimed that the increase in entropy produced by human energy consumption starts to be significant at the atomic level. Could the decline of civilization have an explanation in terms of a generalization of the second law forced by TGD?

4.1 Some interesting observations

There are several interesting observations which have stimulated the ideas to be discussed in the sequel.

1. The Earth's magnetic field is changing rapidly near the poles (see this). Interestingly, global warming is fastest near the poles. It is expected that the direction of the field can change within a very short period of time. The shortest known polarization change has occurred in a year and global polarization reversals can last hundreds of years. Bjarne Lorentz has proposed on basis of correlations between temperature and the strength of the global magnetic field (see this) that the geomagnetic reversal could relate to global warming because it no longer protects the biosphere from cosmic radiation.

   This proposal however challenges the standard view about dynamo mechanism as the origin of the Earth's magnetic field. The dynamo mechanism (see this) however has severe difficulties: in particular, a simple estimate (see this) suggests that the magnetic field should disappear in about 20,000 years. The magnetic field changes its direction in eccurions which on the

average take place with a period 45,000 years and in reversals occurring with a period of 450,000 years.

Mainstream scientists do not take proposal seriously (see this) since there no standard physics mechanism justifying the claim seems to exist. Also I am personally skeptical about the proposal that standard physics mechanisms could explain global warming and geomagnetic reversal and in the following I willd considere a much deeper level explanation based on TGD inspired theory of consciousness and quantum biology. The problems of human kind could be due to the aging of the magnetic body of Earth so that it is no more able to control the biosphere.

2. In the last global reversal of the direction of the magnetic field about 41,000 years ago, the Neanderthals disappeared, although the reversal was short-lived about 250 years. The average period between reversals between long lasting global reversals is 450,000 years. For short lasting global reversals created in excursions, the average period is 10 times shorter, about 45,000 years (see this). There can also be local excursions and the strength and direction of the magnetic field of Earth indeed fluctuates.

3. Callahan have studied magnetic fields around the world [I2, I1] (see this) and noticed that the magnetic field and as a consequence the Schumann resonance can be very weak, for instance in the Near East. There are serious social problems in these areas. Why would the strength of the magnetic field correlate with the coherence the social atmoshere? Could the magnetic field strength correlate with the coherence of collective consciousness?

4.2 Could the entropization of field bodies facilitate magnetic reversals and excursions and relate to extinctions and declines of civilizations?

The above considerations lead to the key idea.

1. Magnetic bodies control biomatter in TGD [L5, L6]. Specifically, the Earth's gravitational magnetic body, which would determine the collective consciousness of the Earth's and also affect the consciousness of living organisms since their magnetic bodies interact with the Earth's magnetic body.The gravitational magnetic body of the Sun would be also involved.

2. Could the fundamental cause of the problems of humanity and the biosphere be the increase of entropy at the level of magnetic bodies. The aging magnetic body would be due to entropization. This mechanism could also explain the aging of biological organisms [L9]. The entropization would lead to a loss of quantum coherence and the magnetic body would gradually lose control over the processes at the level of the biological body. This would eventually lead to a death struggle of the magnetic body and magnetic body.

   More concretely, the monopole flux tube pairs of the Earth's magnetic field would split to short flux tubes. Later they could fuse back to flux tubes with a reversed direction of magnetic field. The process would be the same as in the reversal of the solar magnetic field.

   As a result, the quantum coherence scales would shorten and the control of the magnetic body over the bio-matter would be lost. Biomatter would be forced to cope without the help of the magnetic body. During sleep a similar situation takes place and during motor activities and sensory input are absent. The decay of the flux tubes can be local or global and the resulting magnetic flux tubes could be long lasting or only temporary.

3. In zero energy ontology (ZEO), the transition period leading to regeneration of the monopole flux tube would correspond to two "big" state function reductions (BSFRs) in macroscopic scale. It can be local or global and also short-term. In BSFR, the magnetic body would lose its consciousness reincarnating with an opposite arrow of time. In the second BSFR it would wake up with the original arrow of time.

4. One life cycle of the Earth's magnetic body would end (or a little more gently, the magnetic Mother Gaia would fall asleep and live in another direction of time). Eventually, a new cycle would begin with a new magnetic field. These cycles are analogous to the counterpart of sunspot cycles with a duration of 11+11 years. Could one think of a year cycle with a period

about 45,000 years in which the magnetic field with reverted direction is short lived. For us, it might mean the collapse and rebirth of civilization. One can wonder what our fate in the next reversal is?

5. There are reasons to ask whether our species is approaching extinction. On the other hand, an enormous progress in science and technology is being made at the same time. This paradox applies more generally, as, for example, biologist Jeremy England has observed [I3]. Biological evolution is generally accompanied by an increase in entropy. p-Adic vision about cognition leads to exactly this prediction [L1]. When the p-adic negentropy associated with quantum entanglement as a measure for the amount of conscious information is large, the standard entropy is also large. The smarter we get, the more we produce entropy.

6. Homo sapiens appeared 300,000 years ago. The oldest Neandertal fossils are 430,000 years old. The most recent global and long-lasting direction change, the Brunhes Matuyama reversal, occurred 780,000 years ago.

   The periods between magnetic reversals and excursions seem to be random. 45,000 years is a reasonable estimate for the average period for the magnetic excursions (see this). The last magnetic excursion was 41,000 years ago. The reversal lasted only 250 years but Neanderthals disappeared. Also now, a change in direction is taking place: could it lead to the extinction of our species or at least the destruction of civilization within a few hundred years? If recursions are periodic, our species would have survived 7 recursions. This gives a cause for optimism.

REFERENCES

Cosmology and Astro-Physics

[E1] Katz JI. *High Energy Astrophysics*. Addison Wesley Publishing Company, 1987.

Biology

[I1] Earth's magnetic field regions of weakness correlated to sites of political unrest and war: the paradigm quaking measurements of professor Phil Callahan. Available at: `https://www.acacialand.com/Callahan.html`.

[I2] Callahan P. *Paramagnetism–Rediscovering Nature's Secret Force of Growth*, volume 2003. Acres U.S.A.. Available at: `https://www.nexusmagazine.com.`, 1995.

[I3] England J Perunov N, Marsland R. Statistical Physics of Adaptation, 2014. Available at: `https://arxiv.org/pdf/1412.1875v1.pdf`.

Books related to TGD

[K1] Pitkänen M. Magnetic Bubbles in TGD Universe: Part I. In *Physics in Many-Sheeted Space-Time: Part II.* *https://tgdtheory.fi/tgdhtml/Btgdclass2.html*. Available at: `https://tgdtheory.fi/pdfpool/magnbubble1.pdf`, 2023.

[K2] Pitkänen M. Magnetic Bubbles in TGD Universe: Part II. In *Physics in Many-Sheeted Space-Time: Part II.* *https://tgdtheory.fi/tgdhtml/Btgdclass2.html*. Available at: `https://tgdtheory.fi/pdfpool/magnbubble2.pdf`, 2023.

[K3] Pitkänen M. Quantum Model of EEG. In *TGD and EEG: Part I.* *https://tgdtheory.fi/tgdhtml/Btgdeeg1.html*. Available at: `https://tgdtheory.fi/pdfpool/eegII.pdf`, 2023.

[K4] Pitkänen M. TGD and Astrophysics. In *Physics in Many-Sheeted Space-Time: Part II.* *https://tgdtheory.fi/tgdhtml/Btgdclass2.html*. Available at: `https://tgdtheory.fi/pdfpool/astro.pdf`, 2023.

Articles about TGD

[L1] Pitkänen M. Jeremy England's vision about life and evolution: comparison with TGD approach . Available at: `https://tgdtheory.fi/public_html/articles/englandtgd.pdf`., 2015.

[L2] Pitkänen M. Maintenance problem for Earth's magnetic field. Available at: `https://tgdtheory.fi/public_html/articles/Bmaintenance.pdf`., 2015.

[L3] Pitkänen M. Comparison of Orch-OR hypothesis with the TGD point of view. `https://tgdtheory.fi/public_html/articles/penrose.pdf`., 2022.

[L4] Pitkänen M. About long range electromagnetic quantum coherence in TGD Universe. `https://tgdtheory.fi/public_html/articles/hem.pdf`., 2023.

[L5] Pitkänen M. Magnetic Bubbles in TGD Universe: Part I. `https://tgdtheory.fi/public_html/articles/magnbubble1.pdf`., 2023.

[L6] Pitkänen M. Magnetic Bubbles in TGD Universe: Part II. `https://tgdtheory.fi/public_html/articles/magnbubble2.pdf`., 2023.

[L7] Pitkänen M. Some solar mysteries. `https://tgdtheory.fi/public_html/articles/Haramein.pdf`., 2024.

[L8] Pitkänen M. Taos hum, stochastic resonance, and sensory perception. `https://tgdtheory.fi/public_html/articles/taoshum.pdf`., 2024.

[L9] Pitkänen M and Rastmanesh R. Aging from TGD point of view. `https://tgdtheory.fi/public_html/articles/aging.pdf`., 2021.