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The Solar System: Nature and Mechanics

Mario Ljubičić *

Posted Date: 19 July 2023

doi: 10.20944/preprints202105.0488.v9

Keywords: solar system; complete relativity; nature; mechanics

Article

The Solar System: Nature and Mechanics

Mario Ljubičić (Amenoum)

108. brigade ZNG 43, 35252 Sibinj, Croatia (amenoum.org) mljubicic99@gmail.com

Abstract: Origin, mechanics and properties of the Solar System are analysed in the framework of the Complete Relativity theory (by the same author). According to Complete Relativity, everything is relative. Any apparent absolutism (notably scale invariance of dimensional constants, absolute elementariness, invariance to time) is an illusion stemming from limits imposed by [or on] polarized observers that will inevitably lead to misinterpretation of phenomena (another illusion) occurring on non-directly observable scales or even on observable but distant scales in space or time. If everything is relative, reference frames will exist where particles are planets and where planets are living beings. Earth is, therefore, analysed here in more detail, both as a particle and, as a living evolving being (of, hypothesized, extremely introverted intelligence). The analysis confirms the postulates and hypotheses of the theory (ie. existence of discrete vertical energy levels) with a significant degree of confidence. During the analysis, some new hypotheses have emerged. These are discussed and confirmed with various degrees of confidence. To increase confidence or refute some hypotheses, experimental verification is necessary. Main conclusions that stem from my research and are further confirmed in this paper are: universes are, indeed, completely relative, Solar System is a scaled (inflated, in some interpretations) Carbon isotope with a nucleus in a condensed (bosonic) state and components in various vertically excited states, life is common everywhere, albeit extroverted complex forms are present on planetary surfaces only during planetary neurogenesis, anthropogenic climate change is only a part (trigger from one perspective) of bigger global changes, major extinction events on a surface of a planet are relative extinctions, a regular part of transformation and migration of life in the process of planetary neurogenesis.

Keywords: solar system; complete relativity; nature; mechanics

1. Introduction

Here I hypothesize that the Solar System is either a large scale ^{10}C atom (10-Carbon isotope) or a superposition of such atoms in a relatively special state and provide evidence for the equivalence of large (U_1) scale systems with standard (U_0) scale systems through the analysis of the Solar System in the context of Complete Relativity[1] (CR).

Note that ^{10}C isotope is unstable on standard scale, with a half-life of 19.3 seconds. Its apparent relative stability on U_1 scale must be a result of time dilation (ie. due to scale difference and/or difference in state/conditions) and/or exchange of strength between components of general force with possible inversion of stability between adjacent scales (discrete vertical energy levels, as postulated in CR).
In case of inversion, relatively stable systems on one scale would be relatively unstable on the other and vice versa.
Note that, in that case, due to instability of ^{10}B (decay product of ^{10}C and ^{10}Be) on U_1 scale, the Solar System could also be cycling between ^{10}C and ^{10}Be (^{10}B being the intermediate state) states.

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I hypothesize that structure of planetary systems is a result of inflation of gravitational maxima from standard scale atoms, likely in the events of annihilation at relative event horizons (gravitational maxima) of a particular scale.

Obviously, one should be familiar with CR in order to fully understand this paper.
Reader is therefore strongly advised to consult CR for definitions of gravitational maxima, general force and other important and commonly used terms in this paper if these sound unfamiliar or seem to deviate from conventional definitions.

I propose that, in this process, the electro-magnetic component of the general force has been exchanged with the neutral gravitational component resulting in the dominance of gravity over electro-magnetic force at this scale.

However, I also propose that such exchange is natural on standard scale - atoms are cycling between polarized and neutral states (although durations in particular states might be inverted between scales).

In any case, the hypothesized equivalence between the Solar System and the ^{10}C atom should be taken relative.

Implications of discrete vertical energy levels [and CR in general] on nature are large and particularly affect the understanding of life. Existence of these levels is required for conservation of relativity but one consequence is relativization of components of living beings (ie. living tissue, blood, etc.) between scales - they operate on different timescales and generally have different composition. In example, standard blood (blood of U_0 scale), scaled to U_1 scale will not be the same substance simply containing *zillion* extra standard cells, rather, to an U_0 scale observer it will appear much different. Indeed, what I will consider the blood of a planet is commonly interpreted as magma. Thus, the planets can be living beings and here I will analyse Earth not only as a particle but as an evolving living being.

2. Constants

Table 1 shows commonly used constants in the paper.
The values of planetary constants are taken from NASA Planetary Fact Sheet[2].

Table 1. Commonly used constants.

Description	Constant	Value
Neptune mass on scale 1	M_{U_1}	$1.02413 * 10^{26}$ kg
Neptune equivalent mass on scale 0	M_{U_0}	($9.10938356 * 10^{-31}$ kg / 510998.9461 eV) * (510998.9461 eV - 11.260288 eV) = $9.109182827 * 10^{-31}$ kg
Neptune orbital velocity	v_{U_1}	5430 m/s
Neptune spin velocity	s_{U_1}	2660 m/s
Neptune radius on scale 1	R_{U_1}	24622000 m
Neptune equivalent radius on scale 0	R_{U_0}	(24622000 m / 4495060000000 m) * $70 * 10^{-12}$ m = $3.834298096 * 10^{-16}$ m
Solar System charge radius = Neptune orbital radius	r_{U_1}	4495060000000 m
Sun mass	$M_\odot$	$1.988500 * 10^{30}$ kg
Sun radius	$R_\odot$	695735 km = 695735000 m
Earth mass		$5.9723 * 10^{24}$ kg
Carbon-12 atom mass		$1.992646547 * 10^{-23}$ g = $1.992646547 * 10^{-26}$ kg
Carbon-12 charge radius = Carbon-10 charge radius	r_{U_0}	70 pm = $70 * 10^{-12}$ m
Carbon-10 nucleus charge radius		$2.708 * 10^{-15}$ m
Carbon-10 nucleus mass		10.016853 u = $1.663337576 * 10^{-26}$ kg
Standard speed of light	$c = c_0$	$2.99792458 * 10^8$ m/s
Standard electron mass	M_e	$9.10938356 * 10^{-31}$ kg

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3. Definitions

Definitions of terms and expressions that may be used in the paper. Note that these may be different than standard or common definitions in everyday use.

Some terms in use in this paper have been defined in CR and reader should be familiar with these (and CR in general) if the aim is to understand this paper properly.

3.1. Elementary charge

Elementary particles, relative to a universe of a particular scale, are generally polarized.

Physical interpretation (manifestation) of polarization is dependable on environment, but any elementary particle can be interpreted as a more or less evolved graviton (as defined in CR).

> Note that, in CR, elementary particles are not absolutely elementary, reference frames will exist where existence of constituent particles is apparent.

In case its electro-magnetic component is dominant, the particle is electrically charged and represents a relative electric monopole.

However, electric component is generally a sum of multiple constituent charge quanta, typically 2 quanta of identical charge and 1 quantum of opposite (anti) charge, which are strongly entangled (there are no absolute monopoles). Spin momentum of charge is quantized, by a relative constant ($\hbar$) - a quantum of momentum.

Suppose the spin momentum of each is equal to $1/2\,\hbar$ in value, and spins of two dominant charges are perpendicular to each other (having a [fixed] phase difference of $\pi/2$ degrees). Two dominant charges now have a total magnetic spin momentum:

$$S_1 = \sqrt{\left(\frac{1}{2}\hbar\right)^2 + \left(\frac{1}{2}\hbar\right)^2} = \frac{\sqrt{2}}{2}\hbar = \frac{1}{\sqrt{2}}\hbar$$

Total spin momentum of the particle is thus:

$$\vec{S} = \vec{S}_1 + \vec{S}_2$$

If the S_2 (anti) charge momentum is perpendicular to S_1, the value of total spin momentum is:

$$S = \sqrt{\left(\frac{1}{\sqrt{2}}\hbar\right)^2 + \left(\frac{1}{2}\hbar\right)^2} = \sqrt{\frac{1}{2}\left(\frac{1}{2}+1\right)}\hbar = \frac{\sqrt{3}}{2}\hbar$$

Due to fixed $\pi/2$ phase and equal value, influence of components of S_1 on the orientation [of the momentum projection] cancel (the two components are fermions in the same quantum energy level, so their projections cannot both be oriented in the same direction), and the orientation of the projection of the momentum S on the axis of quantization will depend solely on the orientation of momentum S_2.

> Note that, due to Pauli exclusion principle, S_2 has to be on a different energy level (orbital).

With the applied magnetic field, projection of the momentum on the *magnetic* axis (ie. z) will thus be oriented either *up* or *down*:

$$S_z = \pm\frac{1}{2}\hbar$$

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This is a typical spin momentum of standard charges such as electrons and protons.

Figure1 a) shows charge in a collapsed state (as a particle) with acquired (coupled) real mass m, charge radii r_1, r_2 (corresponding to momenta S_1 and S_2, respectively) and radius of imaginary mass r_M, here having a momentum aligned with S.

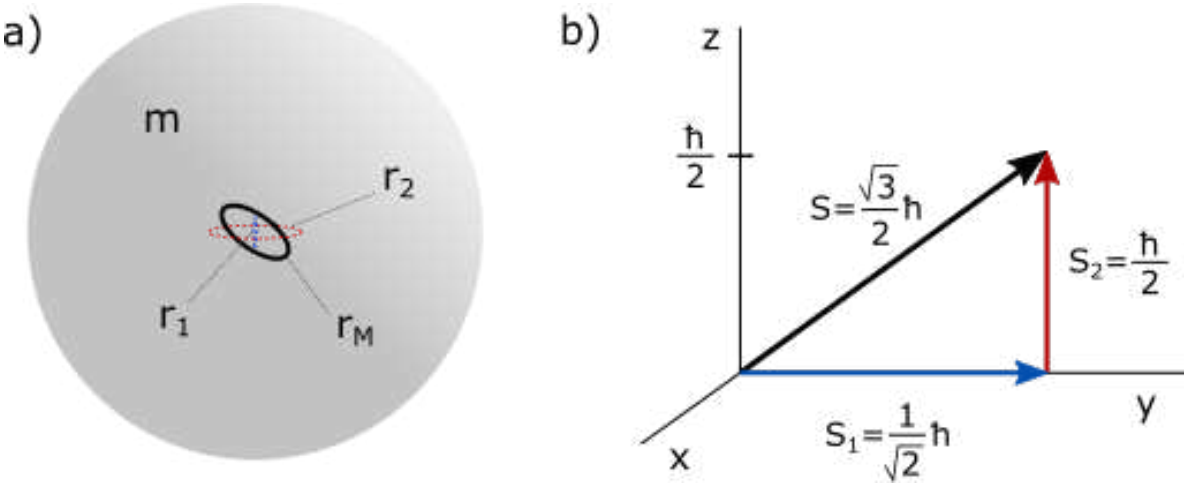

Figure 1. Spin momentum

Its momentum is quantized by $\hbar$, electric charge by e and gravitational force by $\hbar_{mg}$. The *private* space of such particle may be, depending on a reference frame, characterized either by properly scaled gradients or averages, of electric permittivity (ϵ) and magnetic permeability (μ) - or pressure and density.

With a decrease in environmental pressure (em/gravitational field interactions) a quantum may split into smaller quanta (which remain strongly entangled), spreading as far as possible (the range is finite and determined by the mass of smaller quanta - or environmental pressure on that scale), with a wave-like distribution of potential. Figure 2 illustrates such relatively unbound, *free* charge. Total momentum is the sum of individual momenta (and equal to original momentum of the particle in case of isotropic effect). With the splitting, the quantum of energy will decouple from real mass m unless the splitting is synchronized with the dilution or explosion of mass m where individual quanta of m are of appropriate scale and momenta to couple with individual quanta of img mass.

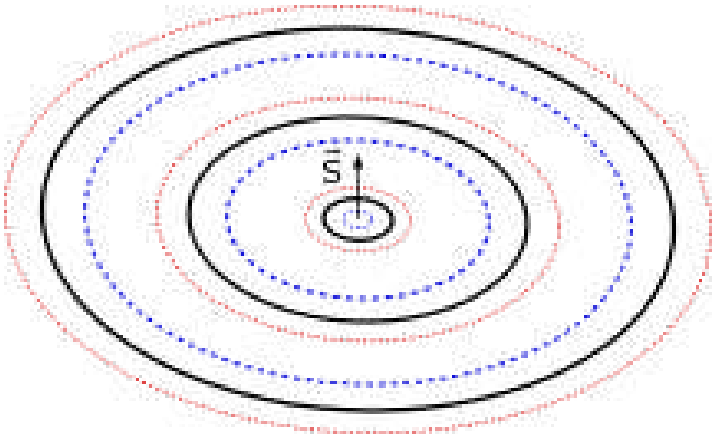

Figure 2. Charge wave

Figure 3 a) shows one interpretation of strength of forces of a wave with distance from centre (black = gravitational force, blue and red = electric force). Now each component (maximum) of a wave,

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starting from outer ones, can be excited independently, can change spin, merge with adjacent maxima and form moon charges.

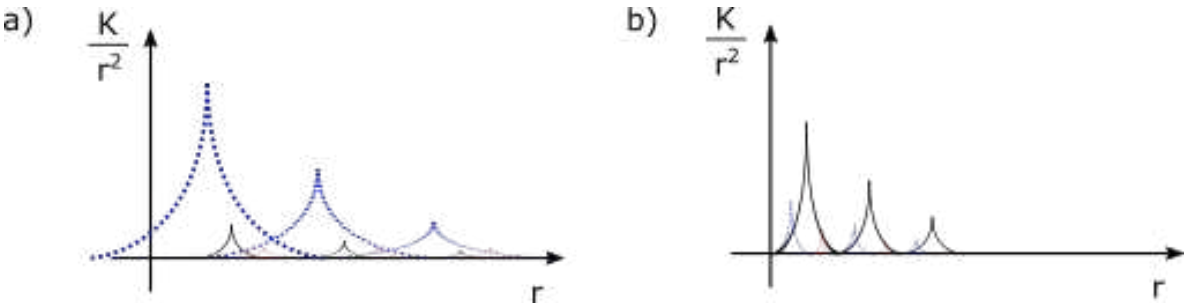

Figure 3. Charge wave forces

This allows the charge to interact (interfere) with itself in certain reference frames.

However, if components are strongly entangled in a particular reference frame, entanglement will be conserved with any interaction - the waveform may simply collapse (localize) into corpuscular form.

Figure 3 b) shows how the *private* space of the same particle can be modified by interaction with another particle - essentially, the electric force has been exchanged for gravitational force. Such interaction may also collapse the wave into a particle with moon charges, where the number of moons depends on the equilibrium point of interaction (difference in energy of interacting particles).

Note that it is possible for the effect to be strongly localized - local space may be modified to attenuate one force and strengthen the other, while particles outside that space may not feel such [degree of] change.

3.1.1. Equilibrium and nature of forces

Equilibrium state of 3 components of charge is maintained through angular momenta. Due to rotation of local space, general force is a centripetal force and in stable orbitals equal to centrifugal force.

In case of a completely neutral (gravitational) force:

$$\frac{mv^2}{r} = \frac{GMm}{r^2}$$

This is established when angular velocity of the orbiting body and angular velocity of space (effective graviton, or gravitational field tube) become equal:

$$v = v_s = \sqrt{\frac{GM}{r}}$$

If the body increases velocity ($v > v_s$), centrifugal force becomes greater than gravitational force and now acts as a fictitious repulsive force.

For $v < v_s$, gravitational force is higher than centrifugal force, and the body feels attractive force.

Nature (polarization) of the force can thus be changed with a change in radii (expansion/collapse) of gravitational maxima.

This allows for electro-magnetic force to be a fictitious force - a result of radii change of gravitational maxima due to absorption and emission of energy.

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Note that electric polarization of atoms is done through emission and absorption of electrons, which is affecting the atom radius - positive polarization will generally decrease radius (in common atom radius interpretation), while negative will increase it.
However, when radius is proportional to gravity, positive polarization would create repulsion, while negative would create attraction. Thus, the sole change in radii cannot be the equivalent of electro-magnetic force, as nature of EM force (attraction/repulsion) depends on the pair of interacting charges, not solely on the polarity of individual charge.
Thus, electric polarization of a graviton will, as hypothesized in CR, require deformation, creation of a bipolar structure. Nature and strength of force thus become dependent on correlation (entanglement) between particles.
A neutral graviton effectively curves space, proportionally to its scale and isotropically in ideal (completely neutral) case. However, with electric polarization, isotropic large scale curvature decreases and becomes quantized (fragmented) into smaller scale curvatures concentrated in [magnetic field] lines (small scale tubes).
Such particle will not strongly gravitationally attract particles of the same scale, but it will strongly interact with particles in the same configuration (having magnetic field tubes of the same scale). If this interaction is widening the tubes (increasing energy) of entanglement, the particles will be attracted, otherwise repelled.

Even if orbital changes are not electro-magnetic in nature, such changes imply radial polarization of reference frames, thus a reference frame can be polarized even if its mass is purely gravitational, and this will be reflected in a relativistic (ω) factor.

However, there are no absolutely pure gravitational reference frames and changes in stable orbits may generally happen with the exchange of gravitational for electro-magnetic potential.

In that case, gravitational polarization becomes electric polarization.

3.2. Primary atom radius

Generally, radius of an atom is assumed to be equal to the radius of its outermost electron orbit.

However, other particles can be bound to atomic nuclei. Here, I hypothesize that neutrinos and anti-neutrinos are standardly bound to nuclei, generally occupying separate energy levels but may also be bound to other particles (ie. forming an electron/neutrino pair).

Primary radius of the atom is then equal to the orbital radius of its outermost primary component.

At minimum, it is equal to the general (outermost electron orbit) radius of the atom. However, at equilibrium - with all primary neutrinos present, it may be over twice that radius.

Here, a bound particle is considered primary if it is a component of the system equilibrium state (this is further discussed in chapter *Initial structure hypothesis*).

3.3. MAU

MAU or Mars relative Astronomical Unit is a unit of distance. 1 MAU is equal to the distance of the outermost positive charge from the atom nucleus.

On U_1 scale ^{10}C atom equivalent, 1 MAU is equal to the distance of Mars from the Sun.

It is assumed that in the equivalent system on standard (U_0) scale Mars would be positively charged. On U_1 where, due to dominance of gravity, it may be difficult to associate specific electric charge to planets, charge may be correlated with other properties of a body (ie. difference between terrestrial and gas planets).

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Note also, that in *anti-matter* systems 1 MAU would be equal to the distance of the outermost negative charge from the nucleus.

3.4. Weak nuclear decay

Weak nuclear decay transforms a neutron into a proton or vice versa. If these are parts of an atom, this is nuclear transmutation - transformation of one atom of an element into an atom of another element.

With scale invariance of gravitational fields, neutrinos and anti-neutrinos can be, like electrons, bound to atomic nuclei (and, as other fermions, grouped into pairs). In equilibrium, the number of bound electron (e) neutrinos and electron anti-neutrinos within the [primary] radius of the atom correspond to the number of protons and neutrons, respectively. These are, together with nuclei and electrons, primary components of the atom.

Decay process involves annihilation of neutrinos and anti-neutrinos.

3.4.1. β^- decay

Transformation of a neutron to a proton, with emission of excess energy:

$$n \rightarrow p^+ + \Delta E$$

Here, bound non-primary e neutrino and bound primary e anti-neutrino annihilate to produce, depending on energy, either an electron/positron (e^-/e^+) pair, or up/anti-up quark pair:

$$e_v + \overline{v}_e \rightarrow (e^- + e^+) \,||\, (u^+ + u^-) \tag{1}$$

In case of electron/positron production, positron further partially annihilates with the down quark (here, both are composite particles), producing neutrino/anti-neutrino pair and up quark:

$$e^+ + d^- \rightarrow u^+ + v_e + \overline{v}_e \tag{2}$$

Neutrino bounds to the atom [as a primary component], while anti-neutrino and electron are ejected in a spin paired state (boson), before separating again:

$$e^- + \overline{v}_e \rightarrow W^- \rightarrow e^- + \overline{v}_e \tag{3}$$

In case of up/anti-up quark production in the first step, the up quark is absorbed, while anti-up quark pairs with the down quark before ejection:

$$u^- + d^- \rightarrow W^- \rightarrow u^- + d^-$$

Note that a decay of W^- into an electron and anti-neutrino even when it is created from anti-up and down quarks would suggest that charge in electron is a composite of 1/3 and 2/3 charge quanta. In the decay of a proton to neutron through electron capture, electron could then [inverse] decay to u^- and d^- by pairing with an anti-neutrino (inflating to W^- boson), u^- would annihilate with u^+, leaving 2 down and 1 up quark, forming a neutron.

Outside of atom, the pairing is unstable (short-lived), except at extreme conditions.

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Note that, in this case, to conserve equilibrium conditions, one of bound non-primary e neutrinos must reduce its orbit to become a primary component.
β^- decay is the effective transformation of a down quark to up quark of the atom nucleus.

Note that rest mass of a W boson is over 80 times that of a neutron and orders of magnitude higher than that of down and up quarks.
Thus, the production of a W boson is apparently a violation of energy conservation. In QM this is *solved* with the time-energy uncertainty principle which allows production of such particles out of vacuum providing they decay quickly (lifetime of a W boson is 10^{-25} seconds).
However, mass of the boson is also considered variable with probability of deviation from rest mass decreasing fast with amount of deviation, thus, making probability of beta decay proportional to creation of a low mass W boson.
In reality, there is no violation of energy conservation and high mass of a W boson is, in fact, a result of conservation of energy due to momentum - energy equivalence (note that, per CR postulates, even rest mass has a momentum), where one component of the angular momentum is exchanged for the other. In this case, the angular momentum of a particle orbiting the nucleus is collapsed [localized] to a spin momentum, where *radius* has been exchanged for mass.
This is, generally, a process of conversion of a polarized component of general force into a neutral (gravitational) component - effectively, exchange of charge for mass.
If this is temporary, like in case of β decay, radius is inflated again (restoring em component) and two components of the force are again separated (concentrated) into multiple particles (although neither component can be absolutely zero for any particle).
Thus, although W boson is theoretically charged, and charge is conserved between initial and final state of the system, it is not conserved in the boson itself (unless created mass is indeed extremely low compared to rest mass) - otherwise conservation of energy would be violated.
Probability of beta decay is then proportional to conservation of charge in created W boson.
Time-energy uncertainty is an interpretation of massive bosons based on the assumption of absolute charge conservation (it seems as an *ad hoc* solution where conservation of one physical phenomena - energy in this case, is discarded to conserve certain beliefs, and, as such leads to further alienation of small scale mechanics from intuitive and physical large scale mechanics).
However, stability of particles must be relative - in extreme conditions, a massive (*uncharged* or weakly charged) W boson can be stable (ie. in Bose-Einstein states of atoms).
Destabilization of systems (including beta decay) is likely generally sourced in spatial/temporal asymmetry in exchange between neutral (gravitational) and polarized (electric) potential.

3.4.2. β^+ decay

Transformation of a proton to a neutron, with emission of excess energy:

$$p^+ \rightarrow n + \Delta E$$

Here, bound primary e neutrino and bound non-primary e anti-neutrino annihilate to produce either an electron/positron (e^-/e^+) pair, or down/anti-down quark pair:

$$e_v + \overline{v}_e \rightarrow (e^- + e^+) \,||\, (d^+ + d^-) \tag{1}$$

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In case of electron/positron production, electron further partially annihilates with the up quark (here, both are composite particles), producing neutrino/anti-neutrino pair and a down quark:

$$e^- + u^+ \rightarrow d^- + v_e + \overline{v}_e \quad (2)$$

The anti-neutrino bounds to the atom [as a primary component], while neutrino and positron are ejected in a spin paired state (boson), before separating again:

$$e^+ + v_e \rightarrow W^+ \rightarrow e^+ + v_e \quad (3)$$

In case of down/anti-down quark production in the first step, the down quark is absorbed, while anti-down quark pairs with the up quark before ejection:

$$u^+ + d^+ \rightarrow W^+ \rightarrow u^+ + d^+$$

Note that, in this case, to conserve equilibrium conditions, one of bound non-primary e anti-neutrinos must reduce its orbit to become a primary component.
β^+ decay is the effective transformation of an up quark to down quark of the atom nucleus.

3.4.3. Inverse β decay

Transformation of a proton to a neutron by electron anti-neutrino scattering. Generally, this interaction will occur when the atom is not in equilibrium, more specifically - the number of bound e neutrinos is lower than the number of protons.

$$\overline{v}_e + p^+ \rightarrow e^+ + n$$

In this process, e anti-neutrino annihilates with a bound non-primary e neutrino, initiating a β^+ decay with electron/positron product:

$$e_v + \overline{v}_e \rightarrow e^- + e^+ \quad (1)$$

$$e^- + u^+ \rightarrow d^- + v_e + \overline{v}_e \quad (2)$$

However, since the number of bound primary e neutrinos was initially lower than the number of protons, now even the created neutrino is bound (as a non-primary component) rather than ejected with a positron:

$$e^+ \rightarrow e^+ \quad (3)$$

3.4.4. Electron capture

Transformation of a proton to a neutron by electron capture.

$$p^+ + e^- \rightarrow v_e + n$$

Bound electrons induce the creation of positrons from the atom nucleus, filling its outer energy levels. In low energy conditions this may not be possible and one of the innermost electrons may be captured to fill the vacant level. However, the electron in this level is highly unstable, it is attracted to the outer proton core where it partially annihilates with the up quark, proceeding further as β^+ decay:

$$e^- + u^+ \rightarrow d^- + v_e + \overline{v}_e \quad (1)$$

The anti-neutrino bounds to the atom as a primary component, while neutrino gets ejected. Like in case of inverse β decay, there is no W boson creation as no positrons were created:

$$v_e \rightarrow v_e \quad (2)$$

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4. Initial structure hypothesis

In planetary systems, outer (gas) planets are [groups of] electrons, while inner (terrestrial) planets are [groups of] positrons whose gravitational maxima have been extracted from the system nucleus to balance the electrons.

> Electrons and positrons here should be considered as relative electrons and positrons - they might be in different mass eigenstates. In general, outer planets may be vertically excited negative charges, while inner planets are vertically excited positive charges - or vice versa, in case of anti-matter counterparts.
> Relativity in positrons might even be greater - they could represent quarks (and possibly also electron holes, which are usually considered as quasiparticles).
> It should also be possible for any of these to be paired with neutral fermions (ie. neutrinos).

A planet can be in 1e or 2e configuration (state), while the star is a superposition of nuclei partons (quarks). Inner and outer dwarf planets in a planetary system are bound anti-neutrinos and neutrinos, respectively.

> Here, 1e or 2e should not be interpreted as states holding 1**e* or 2**e* charges, respectively (where *e* is equal to the amount of charge of an electron) - the states may hold particles with fractional charges (ie. quarks).
> The configuration 1e should thus be interpreted as a state holding 1 particle (whatever its charge), while 2e should be interpreted as a state holding a pair of particles (whatever their charges are).
> One could argue that it would then be more appropriate to label the states 1q or 2q instead, however, I wanted to highlight relativity here, even *e* is relative in CR.

Primary components of the Solar System are shown on Figure 4.

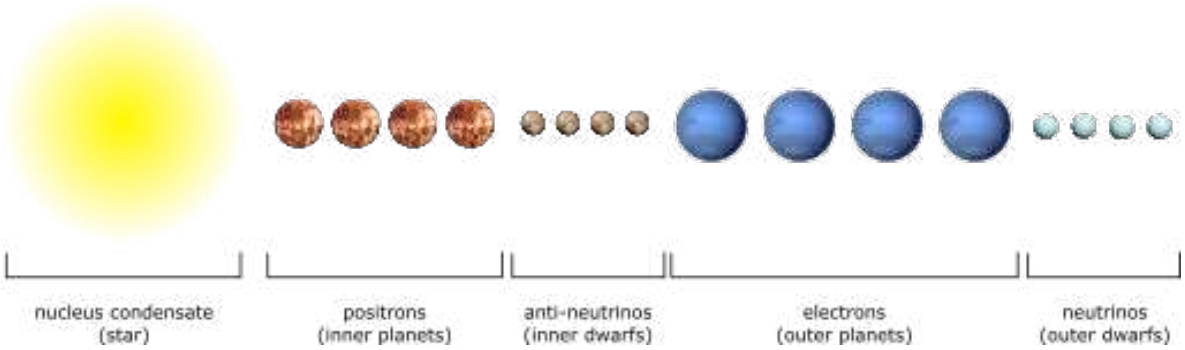

Figure 4. Primary components of the Solar System (planet images source: Pixabay/OpenClipart-Vectors[3])

> Note that components of momentum are exchangeable and it is the reason why bound neutrinos/anti-neutrinos have significantly inflated real mass compared to free streaming neutrinos/anti-neutrinos.

The current Solar System seems to be in a ^{10}C atom configuration, in transition to ^{10}Be through β^+ decay.

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Figure 5 a) shows the configuration of a ^{12}C atom (stable on standard scale, possibly unstable on U_1), on the left is the configuration of positrons, on the right is the configuration of electrons.

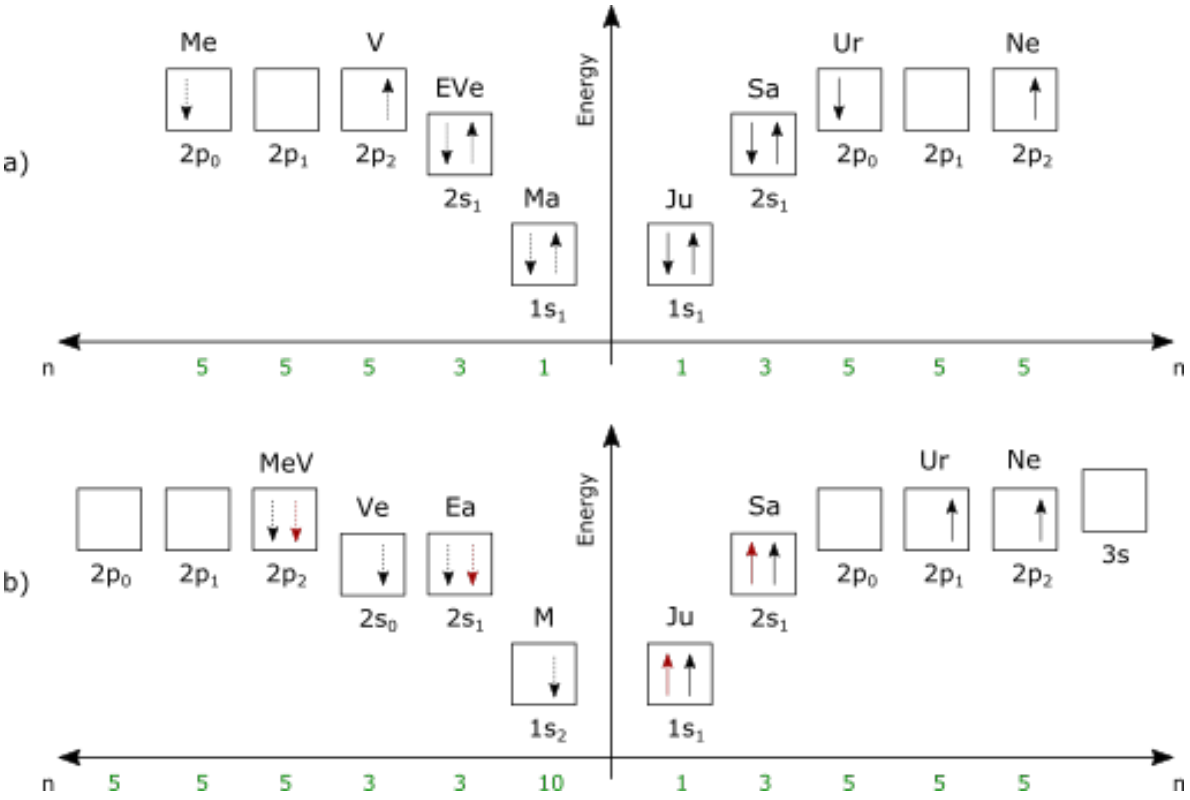

Figure 5. a) stable ^{12}C energy levels b) possible Solar System (U_1.^{10}C) energy levels

Figure 5 b) shows a possible configuration of a ^{10}C atom at time of inflation (configuration unstable on standard scale, relatively stable on U_1 scale).

Note that splitting of s levels on the left side should be attributed to lack of neutrons, as they provide neutral gravitational energy to inner planets.
This generally does not happen on the right side where this energy is provided by protons.
Note also that, due to condensation (the system may be carbon-like, not carbon), principal quantum number has an imaginary value (n) and effective value (N) which here is either 1 or 2.
Note also that 2 particles are allowed per sub-shell and there is no reason for a lone electron not to pair up with a bound neutrino, forming a [W] boson, although such pairing may be extremely unstable at room temperature/density, oscillating in existence.
Note also that, while Pauli exclusion principle generally prevents coupling of fermions with equal spin orientation, such coupling may become effectively possible with exchange of electro-magnetic potential for gravitational potential. It could be interpreted as a result of relative decay of magnetic momentum coupled with separation of constituent quanta into different energy levels of the particle itself.

4.1. General deduction of quantum structure

Here is an example how the element and exact isotope species can be determined from the number and types of planets.

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The discovered (star, planets) and hypothesized (dwarf planets) components of TOI-178 system are shown on Figure 6.

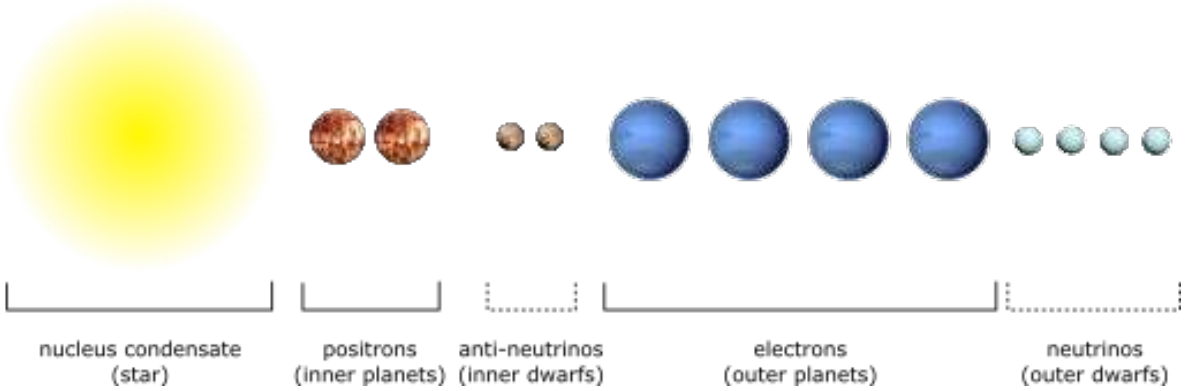

Figure 6. Primary components of the TOI-178 System (planet images source: Pixabay/OpenClipart-Vectors[3])

With the assumption of maximum 2 electrons (positrons) per planet, the TOI-178 system has these restrictions on the number of particles:

- 2 terrestrial planets limit the number of positrons to 2 - 4,
- 4 gas planets limit the number of electrons to 4 - 8.

Since the intersection of the two groups contains only one solution (4), the TOI-178 system must be a Beryllium atom.

If the number of terrestrial planets corresponds to number of neutrons, this must be a ^{6}Be isotope.

This can be confirmed by comparing the mass of the TOI-178 system [star] with the mass of the Sun. Assuming that the Solar System is ^{10}C (or ^{10}Be), the determined mass of TOI-178 ($0.647^{+0.035/-0.032}$ $M_{\odot}$[4]) agrees well with the hypothesis.

However, the measured mass is still somewhat larger than expected - reasons for this will be discussed later.

> Note that it is also possible for the number of terrestrial planets to actually reduce with the increasing number of neutrons due to increased gravitational potential provided by neutrons, but this also requires either low [properly scaled] temperatures/densities for boson condensation of charges beyond the 2e configuration or excessive number of neutrons compared to protons.
> Note also that, in heavy elements, due to condensation of mass and with no significant change in atomic radii, there is a possibility for all planets of a system to be gaseous giants. However, equivalents of dwarf planets should exist in between positively and negatively charged giants - in that case, these should be of significantly lower mass and may be equivalents of terrestrial planets with no significant magnetic dipoles.

The number of bound [primary] anti-neutrinos should also correspond to number of neutrons, while the number of bound [primary] neutrinos should correspond to the number of protons.

> Note that, while bound anti-neutrinos/neutrinos should correspond to number of neutrons/protons, they will not necessarily be in the same configuration as positrons/electrons. Thus, it is possible that TOI-178 has a single inner dwarf planet (holding 2 anti-neutrinos) instead of two, and two outer primary dwarf planets instead of four.

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Additional particles may also be bound to the system, however, orbits of these should lie beyond the primary components, unless these are lower mass particles with no distinct gravitational maximum (asteroids, comets).
Note also that, with the exception of the innermost planet, planets of the TOI-178 are in orbital resonance (18:9:6:4:3). The pattern does suggest one additional particle (or a binary) between the terrestrial and gas planets, one that would complete 13 revolutions for every 18 revolutions of the second planet (pattern 18:13:9:6:4:3).

5. Quantum nature

Solar System appears to be a Carbon-10 atom in the current state. Due to extreme conditions some of its components are at the lowest energy level - multiple nucleons have condensed into a single nucleus, orbitals are two dimensional (collapsed from spherical cloud structure), highly aligned (same plane), and momentum carriers are (scaled) point like structures.

Scale invariance of physical laws requires that non-dimensional ratios - those of radii, masses and velocities (energies in general) in two systems of the same species (carbon in this case) but of different scale are equal.

Radius of the outermost electron of ^{10}C can then be obtained from Neptune spin and orbital radius:

$$\frac{\text{Neptune spin radius}}{\text{Neptune orbital radius}} = \frac{\text{10C outermost electron spin radius}}{\text{10C outermost electron orbital radius}} = \frac{R_{U_1}}{r_{U_1}} = \frac{R_{U_0}}{r_{U_0}}$$

This gives electron radius R_{U_0} = 3.834298096 * 10^{-16} m. Note that radii of particles inside the atom can be different than outside of atom.

Generally, radii are affected by kinetic energy and oscillate with mass.

Sun core radius from ^{10}C nucleus radius and outermost electron radius:

$$\frac{\text{10C nucleus charge radius}}{\text{10C outermost electron spin radius}} = \frac{\text{Sun core radius}}{\text{Neptune spin radius}}$$

The above gives Sun core radius of 173894.6069 km, or 1/4 of the apparent Sun radius, in agreement with experimentally obtained values of Sun core size. More precisely, this is the Sun outer core [discontinuity] radius and also [approximately] U_1 classical electron radius.

The values of constants used here are values listed in chapter *Constants*.

Proton radius approximation:

$$\frac{\text{Sun radius}}{\text{Solar System charge radius}} = \frac{P}{N}\frac{\text{10 * proton radius}}{\text{Carbon-10 charge radius}}$$

The factor P/N = 6/4 = 3/2 is the ratio of protons to neutrons in Carbon-10 atom, factor 10 is the number of nucleons (P+N).

The above gives 0.722296 * 10^{-15} m = 0.722296 fm for the proton radius, close to experimentally obtained value of 0.8414(19) fm (2018 CODATA[5]).

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Same result can be obtained by using spin radii:

$$\frac{\text{Sun radius}}{\text{Neptune spin radius}} = \frac{P}{N}\frac{10 * \text{proton radius}}{\text{10C outermost electron spin radius}}$$

A precise value can be obtained by taking into account the influence of quarks instead of P/N (this will be elaborated later):

$$\frac{\text{Sun radius}}{\text{Solar System charge radius}}\left[(\frac{2}{3})^2 + \frac{1}{3}\right] = \frac{10 * \text{proton radius}}{\text{Carbon-10 charge radius}}$$

which gives 0.8426785306 fm, a value in agreement with the CODATA value.

Radius of a proton cannot be absolutely constant, due to hypothesized entanglement between vertical scales, it should probably be shrinking as the Solar System expands during weak evolution of the current state (6p4n).

Comparing masses:

$$\frac{\text{Sun mass}}{\text{Neptune mass}} \approx \frac{\text{10C nucleus mass}}{\text{10C outermost electron mass}} \tag{Q1.1}$$

This gives:

$$19416.48033 \approx 18260.0087$$

The above shows mass ratios agree not only to the order of magnitude but are actually very close in value. The excess energy is:

$$\begin{aligned}\Delta M &= \text{Sun mass} - \frac{\text{10C nucleus mass}}{\text{10C outermost electron mass}}\text{Neptune mass} \\ &= 1.18437729 * 10^{29}\, kg \approx 6\%\,\text{Sun mass}\end{aligned}$$

and it must be the locally accumulated relativistic energy of the Solar System (discrepancy arises due to non-invariant reference frames in the mass measurement - the mass of a standard ^{10}C atom is measured from an external frame, while the mass of the Solar System is derived from within the system and *improperly* treated as rest mass).

Although the Solar System is at rest relative to us, relativistic energy (deviation from rest velocity) of the system relative to underlying space is always locally real and must be stored somewhere within the system. The likely capacitor is local space (imaginary mass) and apparently the energy is stored in the form of gravitational energy.

If the energy is stored mostly in the Sun's gravitational maximum, this would imply non-homogeneous storage of kinetic energy as gravitational potential - likely proportional to the scale of the maximum.
However, it is also possible that energy was accumulated before the birth of planets.
Most likely, this energy was accumulated with nucleus inflation during the conversion of electro-magnetic potential to gravitational.
Of course, the Sun has lost some energy over time but lost mass is on the order of 10^{27} kg, significantly lower than hypothesized relativistic energy.
There are other possibilities for excess mass acquisition, however, acquisition of mass on the order of 10^{29} kg is, after inflation, probably unlikely, especially considering distances and motion of bodies in the galaxy.

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From this one can calculate the scaled speed of *light* for the U_1 scale (c_1):

$$M = M_{\odot} - \Delta M = 1.870062271 * 10^{30}\, kg$$

$$v = v_s + v_p$$

$$M_{\odot} = \frac{M}{\sqrt{1 - \frac{v^2}{{c_1}^2}}}$$

$$c_1 = \frac{v}{\sqrt{1 - \frac{M^2}{{M_{\odot}}^2}}}$$

If v is interpreted as the cumulative velocity against the CMB (Constant Microwave Background) radiation, a sum of secondary velocity v_s (velocity of the Solar System against CMB) and primary velocity v_p (equal to velocity of the local galactic group against CMB), for v_s = 368 km/s and v_p = 628 km/s, one obtains:

$$c_1 = 2.93 * 10^6\, m/s$$

Obtained c_1 is equal to one of possible values calculated in CR[6], but will also be confirmed here later in a different calculation.

At first, it may seem that this calculation cannot be valid since both velocities are relative to CMB and v_p should not be included in calculation. However, the obtained c_1 is confirmed later. This puts certain constraints on Sun's evolution, implying that Sun's gravitational maximum was, after initial inflation, accelerated to 628+368 km/s (additionally inflating) in the same direction as the local galactic group, then decelerated to 368 km/s, however, not losing the acquired energy (it is yet to lose it).
This is a plausible explanation if energy of the maximum is quantized and requires certain time to collapse to lower energy level. Indeed, if one assumes that fusion in the Sun started with the moment of deceleration when its speed became equal to 368 km/s and assuming at that point real mass (fusion fuel) was equal to the mass of the [surface] gravitational maximum it would be reasonable to assume that collapse would occur once energy transformed with fusion becomes equal to acquired relativistic mass (ΔM).
Since this mass has not yet been depleted, the collapse has not occurred yet, but, according to my calculations (see chapter *Quantization of the Sun: Energy replenishment*), this moment should be near.
The other possibility is that accumulated energy does correspond to current speed (368 km/s), but the mass of Neptune has been decreased instead, from 1.08 * 10^{26} kg to 1.02 * 10^{26} kg (current mass). Explanations for this may include mass oscillation, moon creation and conversion of gravitational potential to electro-magnetic potential, however, I consider this less likely, especially comparing the rates of energy absorption and emission between the Sun and Neptune.

Comparing masses of systems of different scales requires proper relativistic treatment. Apart from the speed of *light* being different between the scales, a proper reference frame must be chosen. In case of comparison of U_1 scale system (such as the Solar System) with an U_0 system

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(such as a ^{10}C atom) a proper reference frame is the CMB (Constant Microwave Background) radiation rest frame.
Proper equation is thus (for $v_1 = v_0 = v$):

$$\frac{\text{Sun mass}}{\text{Neptune mass}}\sqrt{1-\frac{v^2}{{c_1}^2}} = \frac{\text{10C nucleus mass}}{\text{10C outermost electron mass}}\sqrt{1-\frac{v^2}{{c_0}^2}}$$

$v = v_\odot$ = cumulative speed relative to CMB = 996 km/s
c_1 = speed of *light* on U_1 scale = 2.93 * 10^6 m/s
$c_0 = c$ = speed of *light* on U_0 scale = 2.99792458 * 10^8 m/s

Note that CMB radiation is of U_{-1} scale.
Note also that maximum speed (c_n) depends on pressure and density of space and it is generally not equal to the standard speed of light. Here thus, even though the term *speed of light* may be used, c_1 should be understood as maximum speed of U_1 particles (stars) in local space.
Within the galaxy, speed limit for orbiting bodies is generally defined by the gravitational maximum (event horizon) of the well - stars orbiting galactic centres with semi-major Keplerian velocities larger than c_1 might exist in other galaxies.

One can now attempt to resolve the excess mass of TOI-178 (^{6}Be) system. Assuming its velocity [relative to CMB] is 77.22 km/s larger than Sun's velocity, its mass should be:

$$M_{TOI-178} = \frac{M_{Be-6}}{M_{C-10}} M \frac{1}{\sqrt{1-\frac{v^2}{{c_1}^2}}} = 1.207764563 * 10^{30}\, kg$$
$$= 0.607\, M_\odot = 0.646\, M$$

M_{Be-6} = rest mass of ^{6}Be atom = 6.0197 u
M_{C-10} = rest mass of ^{10}C atom = 10.016853 u
M = rest mass of the Sun (relative to CMB) = 1.870062271 * 10^{30} kg
v = cumulative speed of TOI-178 relative to CMB = 1073.22 km/s

However, mass of TOI-178 obtained from measurements is $0.650^{+0.027/-0.029}$ $M_\odot$[4].
Apparently, *measured* mass is bigger by the relativistic [omega] factor:

$$\frac{1}{\sqrt{1-\frac{v^2}{{c_1}^2}}} \approx \frac{v}{v_\odot}$$

The cause of discrepancy is, again, in the reference frame - calculation is done relative to CMB, while measurements were done from the Solar System (Earth) reference frame.
From such reference frame Sun is at rest and its rest mass is equal to relativistic mass relative to CMB, $M_\odot$ (1.988500 * 10^{30} kg).
However, one must take into account the radial velocity [relative to the Sun] of TOI-178. Relative to the Solar System, the mass of TOI-178 should thus be:

$$M_{TOI-178} = \frac{M_{Be-6}}{M_{C-10}} \frac{M}{\sqrt{1-\frac{(v_\odot+v_r)^2}{{c_1}^2}}} \frac{1}{\sqrt{1-\frac{v^2}{{c_1}^2}}}$$

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v_r = radial velocity of TOI-178 = 57.4±0.5 km/s

This gives 0.650 $M_\odot$ for the mass of TOI-178, in agreement with measurements.
Note that relativistic effects are always physical, but not always on the same scale and not always in the same space - ie. some may be physical on small scale (mental) in space of the observer, some on a large scale in space of the observable, or vice versa[7].
Solar System is thus a [negatively] polarized reference frame relative to TOI-178 and to convert the measurement to a proper [neutral] reference frame, one must multiply the measured value with a positively polarized omega factor:

$$\left(\frac{1}{\sqrt{1-\frac{(v_\odot+v_r)^2}{{c_1}^2}}} \right)^{-1} = \sqrt{1-\frac{(v_\odot+v_r)^2}{{c_1}^2}}$$

Note also that TOI-178 is the only system I have analysed beyond the Solar System. The reason that an effectively randomly (non-consciously by my self) chosen system fits the hypothesis goes strongly in its favour. All planetary systems close to the Solar System, and probably all systems in the Milky Way, should conform to the same speed limit. However, I find that analysing all these is beyond the scope of this paper. Hopefully, other researchers will do these analyses eventually.

5.1. EH operator validation

The following is an attempt to validate the EH operator defined in CR. However, this is completely unnecessary for validation of main CR postulates and hypotheses.
Masses between discrete vertical energy levels have already been calculated in CR. This is simply an attempt at alternative calculation of these masses.

If the carbon atom at appropriate density/pressure is the Solar System equivalent, carbon photon is the carbon atom of lower scale (vertical energy level).

One can thus calculate the [average] mass of photons or photon scale particles, ie. electron half-photon:

$$\frac{\text{Neptune mass}}{\text{10C outermost electron mass}} = \frac{\text{10C outermost electron mass}}{\text{e half-photon mass}}$$

$$\text{e half-photon mass} = \frac{(\text{ 10C outermost electron mass })^2}{\text{Neptune mass}} = 8.102214736 * 10^{-87}\ kg$$

However, obtained half-photon mass above assumes linear progression of discrete states of scale invariance (vertical symmetry, distance in scale from U_0 to both U_1 and U_{-1} is equal), which is against the postulates of CR - although this can be the mass of a half-photon in another time (another cycle state).

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There can be no symmetry between current space and time, but due to cyclic nature of a universe and with cycle states being inverse of each other, symmetry would exist between past and future dimensions (space and time dimensions exchange in a way that current space is symmetric with previous space).

Thus, CR predicts asymmetric invariance with exponential progression of discrete vertical states. Using this prediction, the masses of standard photon [scale] electron equivalent (half-photon) and carbon graviton have been calculated already in CR (yielding 9.10938356 * 10^{-73} kg for the half-photon mass, 1.663337576 * 10^{-68} kg for the half-graviton mass), but the values can also be obtained using EH operator.

Using EH factor 6/4 on the orders of magnitude of mass distances:

$$log_{10}\left(\frac{M_{U_1}}{M_e}\right) = EH_{6/4}\left[log_{10}\left(\frac{M_e}{M_n}\right), log_{10}\left(\frac{m_{U_1}}{M_n}\right)\right]$$

gives M_n = 3.910613743 * 10^{-68} kg for the mass of graviton in current cycle state, and m_{U_1} = 6.06011796 * 10^{19} kg for the mass of Neptune in current cycle state. Neptune mass is obviously not in agreement with current Neptune mass (unless one considers scaling of the gravitational constant G), however, if this is interpreted as initial real mass component of total mass than it may be correct (see next chapter, where real mass component of Neptune is calculated to be approximately on the order of 10^{20}).

Here, M_p = M_n / m_{U_1} = 6.453032383 * 10^{-88} kg could be interpreted as the mass of carbon half-photon in inverse cycle state.

Mass of a half-photon can now be obtained from M_n:

$$M_p = \frac{M_e}{^{10}C \text{ atom mass}} M_n \approx M_n * 10^{-5}$$

Note that, in current state the ratio of magnitude distances from electron to graviton and from electron to U_1 electron (Neptune) is:

$$log_{10}\left(\frac{M_e}{M_n}\right)\left[log_{10}\left(\frac{M_{U_1}}{M_e}\right)\right]^{-1} = \frac{4}{6}\frac{5}{5} = \frac{2}{3}$$

So, for the inverse state (4p6n):

$$log_{10}\left(\frac{M_e}{M_n}\right)\left[log_{10}\left(\frac{M_{U_1}}{M_e}\right)\right]^{-1} = \frac{6}{4}\frac{3}{7} = \frac{9}{14}$$

$$log_{10}\left(\frac{M_{U_1}}{M_e}\right) = EH_{4/6}\left[log_{10}\left(\frac{M_e}{M_n}\right), log_{10}\left(\frac{m_{U_1}}{M_n}\right)\right]$$

Respecting conditions for the EH inverse, the following values are obtained: mass M_e = 3.910613743 * 10^{-68} kg of [^{10}C outermost] electron equivalent in U_{-1}.4p6n (= M_n in U_0.6p4n), M_{U_1} = 9.10938356 * 10^{-31} kg for the mass of Neptune equivalent in U_{-1}.4p6n (= M_e in U_0.6p4n), M_n = 3.719162593 * 10^{-92} kg for the mass of graviton in U_{-1}.4p6n, m_{U_1} = 4.18129939 * 10^{-36} kg for the mass of Neptune in U_{-1}.4p6n (= m_e in U_0.6p4n).

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Note that here, mass of the photon is obtained from:

$$M_p = \frac{^{10}C \text{ atom mass}}{M_e} M_n = 6.791044478 * 10^{-88}\, kg$$

suggesting inverted roles of photon and graviton.

5.2. Outermost angular momenta and c_1 confirmation

With the conservation of angular momentum between the Solar System equivalent at U_0 scale (^{10}C atom at equivalent density/pressure) and the Solar System, one may attempt to calculate angular velocity of the outermost electron in the ^{10}C atom:

$$L = mvr = \frac{v}{r} mr^2$$

$$M_{U_1}\, v_{U_1}\, r_{U_1} = M_{U_0}\, v_{U_0}\, r_{U_0}$$

$$v_{U_0} = \frac{M_{U_1}\, v_{U_1}\, r_{U_1}}{M_{U_0}\, r_{U_0}} = 3.920242676 * 10^{82}\, \frac{m}{s}$$

The above gives the outermost electron velocity in case of conversion of both mass and orbital radius into angular velocity, for a point energy in constant vacuum density.

However, mass M_{U_0} must have been relativistic before the speed limit was reached (vertical energy level changed) and it became the rest mass M_{U_1}.

Thus, in order to get the orbital velocity just before the [vertical] energy level change, rest mass on one scale must be equalized with relativistic mass on another ($M_{U_1} = M_{U_0}$):

$$v_{U_0} = \frac{v_{U_1}\, r_{U_1}}{r_{U_0}} = 3.486882257 * 10^{26}\, \frac{m}{s}$$

With real mass not participating in inflation (maxima inflate naked), this velocity is the velocity of space, making it potentially valid even in the context of General Relativity (GR).

Using conservation of energy, one can now obtain the velocity of the outermost electron in standard non-excited ^{10}C atom:

$$E_{-1} = E_0$$

$$\rho_{vac} * V_{U_0} * {v_{U_0}}^2 = M_{U_0} * v^2$$

$$\rho_{vac} = \text{mean vacuum energy density} = 9.9 * 10^{-27}\, \frac{kg}{m^3}$$

$$\rho_{vac} * \frac{4}{3}\pi (R_{U_0})^3 * {v_{U_0}}^2 = M_{U_0} * v^2$$

$$2.842208873 * 10^{-19} = M_{U_0} * v^2$$

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Note that non-relativistic mass is used on both sides. Even though the relativistic c constant is different between the two masses (scales), the v/c ratio is equal between the scales, thus, the Lorentz factor on the left is equal to the one on the right and they cancel out.

This gives v = 5.585837356 * 10^5 m/s, for the velocity of the outermost electron of a standard ^{10}C atom [in Solar System equivalent state].

Note that the product of density and volume on the left (2.337660431 * 10^{-72} kg) should be close to the mass of a standard photon (coupled half-photons). Indeed, it is roughly equal to previously calculated photon rest mass in CR (1.821876712 * 10^{-72} kg).
Using momentum conservation, one can now calculate photon mass relative to standard (absolute) reference frame, where its speed is limited to c = c_0 = 2.99792458 * 10^8 m/s:

$$p = mv = mv_{U_0} = 2.337660431 * 10^{-72}\, kg * 3.486882257 * 10^{26}\, \frac{m}{s} = m_0\, c_0$$

$$m_0 = \frac{p}{c_0} = \frac{p}{c} = 2.719 * 10^{-54}\, kg$$

or, using photon rest mass from CR:

$$m_0 = 2.119 * 10^{-54}\, kg$$

This mass is in agreement with photon mass obtained from recent experiments[8].

To confirm validity of the result one can calculate this velocity differently. Introducing the term *total velocity* (v_{tot}) as the sum of electron's spin and angular velocity.

Per CR postulates, every spin momentum must be an orbital momentum. If one assumes that, once captured by the atom, the outermost electron self-orbital (spin) momentum becomes the nucleus-orbital momentum, in ground state (with quantum number l = 0) thus, total momentum of the electron is:

$$mr^2\omega_{tot} = \frac{1}{2}\hbar$$

$$v_{tot} = r\omega_{tot} = \frac{1}{2}\frac{\hbar}{mr}$$

Using m = $M_{U_0} \approx M_e$ and r = r_{U_0}, this gives v_{tot} = 8.269308487 * 10^5 m/s. This momentum in the atom is further divided between orbital and spin momentum. With the ratio of velocities equal to Neptune spin/orbital velocity, one obtains electron orbital velocity:

$$v = v_{U_0} = \frac{v_{tot}}{1 + \frac{s_{U_1}}{v_{U_1}}} = 5.5550351679 * 10^5\, \frac{m}{s}$$

The result is obtained from the following:

$$v_{tot} = v_a + v_s \qquad \text{(Q1.2)}$$

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$$M_e\, v_{tot}\, r_a = \frac{1}{2}\hbar \tag{Q1.3}$$

Splitting the momentum in scalar space:

$$m_{re} v_a r_a + m_{img} v_s r_s = M_e v_{tot} r_a$$

$$\frac{m_{re}}{M_e} v_a + \frac{m_{img}}{M_e} v_s \frac{r_s}{r_a} = v_{tot} \tag{Q1.4}$$

and assuming:

$$m_{re} = M_e$$

from Q1.2 and Q1.4, follows:

$$m_{img} = M_e \frac{r_a}{r_s} \tag{Q1.5}$$

M_e = standard electron mass = 9.10938356 * 10^{-31} kg
$r_a = r_{U_0}$ = orbital radius of the outermost ^{10}C electron = 70 * 10^{-12} m
$r_s = R_{U_0}$ = spin radius of the outermost ^{10}C electron = 3.834298096 * 10^{-16} m

In order for Q1.2 to be satisfied, masses of orbital and spin momenta must be different. With orbital mass equal to standard electron mass, spin mass m_{img} is:

$$m_{img} = 1.66303410 * 10^{-25}\, kg = 9.99817551 * {}^{10}C \text{ nucleus mass}$$

$$m_{img} \approx 10 * {}^{10}C \text{ nucleus mass} \approx 93.3\, GeV/c^2$$

Note that the increase in electron spin mass m_{img} is proportional to the increase of nucleus mass. In both, mass component of the spin momentum was increased at the expense of other components, as with electro-magnetic coupling the em energy was converting to neutral gravitational energy. Note also that, from this, it is possible to derive the rest mass and rest charge radii of a free electron. Assuming radius inflation proportional to mass inflation, rest mass radius of a free electron is:

$$r_{s_e} = \frac{r_s}{r_a} r_s = \frac{{r_s}^2}{r_a} = 2.100 * 10^{-21}\, m$$

Its rest charge radius should then be:

$$r_{c_e} = \sqrt{2} r_{s_e} = 2.970 * 10^{-21}\, m$$

Obviously the charge of the electron has to be spinning faster than light:

$$v = \frac{1}{2mr_{c_e}}\hbar$$

For m = 9.10938356 * 10^{-31} kg (which may seem wrong due to separate mass radius, however, if free electron is not naked, acquired real mass can be the charge mass shielding the mass of the maximum), this gives v = 9.745 * 10^{15} m/s.
This speed is the speed limit for particles in electron's space and it suggests that acquired real mass is of U_{-1} scale or lower, making the spin momentum of the electron effectively the rotation of space, relative to standard scale. The fact that imaginary mass is quantized by ^{10}C nucleus mass confirms the carbon-like nature of the Solar System equivalent on the standard scale, however, the magnitude of exchange of polarized (electro-magnetic) potential

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for neutral gravitational potential suggests the Solar System is a scaled Bose-Einstein condensate of multiple atoms.
Note that the mass is equal to predicted W boson mass in some Electroweak models[9].
From the calculated mass one can now obtain [initial] real component of Neptune's total mass:

$$\frac{m_{re}}{m_{img}} = \frac{m_{re_1}}{m_{img_1}} \approx \frac{m_{re_1}}{M_{U_1}}$$

$$m_{re_1} \approx \frac{M_e}{m_{img}} M_{U_1} = 5.60974244 * 10^{20}\, kg$$

In the above, it was assumed that charge radius is equal to mass spin radius (r_s) of the gravitational maximum. However, real charge radius is smaller.
If one assumes Earth's mass radius of the gravitational maximum is at the inner core boundary with gravity equal to Sun surface gravity (274 m/s^2), charge radius of Earth must be at a radius where gravity of the maximum is equal to half this value (this will be validated later):

$$r_c = \sqrt{GM\frac{2}{274}} = \sqrt{\frac{GM}{137}} = 1705704\, m \quad \text{(Q1.6)}$$

M = Earth's mass = 5.9723 * 10^{24} kg
G = G_0 = standard gravitational constant = 6.674 * 10^{-11} m^3/kgs^2

Using Q1.5, one can now calculate initial real mass component of the Earth:

$$m_{re} = \frac{r_c}{r_a} m_{img} \approx \frac{r_c}{r_a} M \approx 6.81 * 10^{19}\, kg \quad \text{(Q1.7)}$$

r_a = Earth's orbital radius = 149.6 * 10^9 m

This real mass will be further validated later. However, obtained charge radius is, as it will be shown later, induced charge radius, rather than the primary or primordial charge radius.
Calculating m_{img} for other planets shows weak signals that all may be correlated with condensates of standard particles, as shown in Table 2.

Table 2. Calculated m_{img} and standard particle candidates

planet	equivalent standard m_{img} (GeV/c^2)	particle
Saturn	12.58	10 * charm quark, or 2 * charmed B meson
Jupiter	5.69	ADM (asymmetric dark matter) particle ?
Uranus	57.87	10 * ADM ?
Mars	34.36	?
Earth	12	?
Venus	9.14	?
Mercury	12.13	?

There are no obvious candidates for terrestrial planets, and excluding Saturn and Neptune, even the candidates for outer planets may be questionable.
However, there are various possibilities behind this - mass oscillation/excitation, *unusual* pairing (as in case of Neptune), unknown particle (having extremely short lifetimes on standard scale, unstable outside of atom), etc.
Multiples of atomic nuclei have also not been taken into account, which may be the most likely candidates, given the strong agreement of quantization of outermost particle mass with ^{10}C

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nuclei and the fact that, in a condensed state, an atomic nuclei is a viable equivalent of a particle (quantum of energy).
In any case, the approach above is flawed and stronger correlation with standard particles will be found later.

Two results for the velocity are in good agreement. Small difference can be attributed to uncertainty in vacuum energy density - a value of 9.79 * 10^{-27} kg/m^3 would yield the correct value. From this one can also obtain the scaled speed of light:

$$\frac{v_{U_0}}{c_0} = \frac{v_{U_1}}{c_1}$$

$$c_1 = \frac{v_{U_1}}{v_{U_0}} c_0 = 2.930445979 * 10^6 \frac{m}{s}$$

The result is in agreement with c_1 previously obtained from relativistic energy of the Solar System (2.93 * 10^6 m/s).

5.3. The extent of validity of c_1

The speed c_1 (2.93 * 10^6 m/s) has been calculated as the relevant quantization constant and speed limit for particles of Sun's scale in local space. But what is the extent of that space?

Any private space should be associated with a specific gravitational maximum. The Sun should be orbiting this maximum. Therefore, its centre should be the galactic centre, while its radius can be inferred from motion of stars - stars orbiting close to this maximum should orbit at average velocities close to c_1.

Note that, according to CR, all velocities are average values of oscillation. Therefore, in eccentric orbitals, stars can exceed c_1 at periapsis - this is not forbidden, but the average (semi-major) velocity should not.
There are two interpretations of this - either the *orbit* (shape) of the maximum itself is eccentric or the star is in [properly scaled] thermal motion relative to the maximum - oscillating perpendicularly to maximum's surface (the gravitational maximum generally has a torus shape).

According to measurements, stars with such velocities are concentrated at the galactic centre, near the supermassive black hole Sagittarius A* (Sgr A*). It appears that there are no stars in Milky Way orbiting at velocities $\geq c_1$. In example, as of August 2019, the fastest star orbiting Sgr A* is S62[10].

For the enclosed mass M of 4.15 * 10^6 M$\odot$, its Keplerian orbital velocity at determined semi-major (r = 740.067 AU = 1.10714 * 10^{14} m) is:

$$v = \sqrt{\frac{GM}{r}} = 2.23 * 10^6 \frac{m}{s}$$

G = standard gravitational constant = 6.674 * 10^{-11} m^3/kgs^2

As of 2020, S4711 is the star with fastest semi-major velocity[11]: 2.44 * 10^6 m/s, still under 2.93 * 10^6 m/s.

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This is a strong evidence for c_1 being the maximum velocity for all stars in Milky Way. The radius of the associated gravitational maximum should thus be the radius of the event horizon for these stars. For mass M of 4.15 * 10^6 M$\odot$, this radius (semi-major) is:

$$r = \frac{GM}{{c_1}^2} = 6.41541 * 10^{13}\, m = 428.838\, AU$$

Plausible locations for gravitational maxima of galactic space are radii of maximal velocities of stars in a galaxy. However, if angular velocity of stars is much lower than the expected velocity of the maximum, any such extreme is unlikely the location of the gravitational maximum. However, these stars could be fossils of the body of matter previously bound to a gravitational maximum - which has collapsed. Since collapse must include a reversal of momentum, the spiral galaxies could be the result of collapse through discrete energy levels.
Consider the rotational profile of the Milky Way galaxy in Figure 7 (right). Assume that the gravitational maximum was initially located at ≈13.33 kpc, at which point the stars at that location had 10 times higher angular velocities, when the maximum started collapsing:

1. the reversal of momentum slowed down the stars at the location 10 times,
2. another reversal occured at ≈7.33 kpc restoring the velocity of the maximum, accelerating and igniting local stars,
3. another collapse, slowing down the stars 10 times,
4. restoration at ≈1.33 kpc, acceleration then reversal and deceleration of stars 10 times,
5. ... possible intermediate levels ...
6. restoration at 428.838 AU, stars accelerated.

The above assumes inflation/deflation is simultaneous with a change in radii. This may not be true. It is also unlikely for velocity to remain constant over all [scales of] radii.
Thus, the initial velocity of the gravitational maximum might have been 10 times lower than c_1, it only increased 10 times once the radius decreased to smaller scale (< 1 kpc).
Note that constant velocity across different radii [with non-changing gravitational constant] implies angular momentum was not conserved (some quanta have radiated away or perhaps collapsed to smaller spin momenta - forming future stars, etc.). The primary question then is - is the gravitational maximum currently located at 428.838 AU? And is there a standard supermassive black hole at all in the centre of the Milky Way [or any other galaxy]?
The profile of the Milky Way galaxy suggests that velocity of the maximum remains constant with collapse (the GM product and radius change equally) at least to some extent, while speed of stars around 428.838 AU suggests the gravitational maximum is still there. After all, assuming the maximum has collapsed to the radius of a hypothesized supermassive black hole (≈0.1 AU radius), the Sun and other stars should conform to the speed limit of c = c_0 = 2.99792458 * 10^8 m/s, not 2.93 * 10^6 m/s.
In any case, the gravitational maximum at 428.838 AU appears to be the *black hole* for stars and similar large scale objects of the Milky Way.
This does not rule out the existence of standard black holes (event horizons for standard particles) in the centre but, if they do exist, their individual masses should be much smaller than 10^6 M$\odot$.

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5.3.1. Explaining galactic structure

The collapsing spin-alternating gravitational maximum can explain extremes in angular velocities of a galaxy and bright (ignited) regions. It can also explain the young counter-rotating disk(s) of massive stars close to galactic centre[12].

Not only that, it can explain the structure of a galaxy, assuming it is a large scale quantum system:

- the gravitational maximum is oscillating between discrete energy levels,
- there are energy levels it is more likely to occupy than others (explaining discontinuities in density),
- stability of states is different for different galaxies and may differ between levels (stability is inversely proportional to eccentricity of arms),
- an energy level may split into two.

As the maximum is spiralling between states it is affecting momenta of gravitational maxima of smaller scale (ie. those forming stars and planets).

The number of spiral arms is then proportional either to age of the galaxy, or to the number of oscillating gravitational maxima.

Oscillation of this large scale energy should affect [and thus imply oscillation of] smaller scale energy (possibly explaining at least one order of general oscillation of stars, as hypothesized in chapter *The cycles*).

6. Initial setup and regular disturbances

Solar System is the product of inflation (likely through annihilation) of smaller scale particles or/and deflation [through annihilation] of larger scale particles.

Suppose that at the moment of annihilation the carbon atom was briefly ionized and its mass and charge were condensed into the core when it started inflating. With the electrons inflating along, eventually, the charge would separate from mass again.

The energy provided for transition between adjacent energy levels is generally higher than required, thus, the flattened carbon atom likely expanded to multiple times its current radii, then compressed to current size, trading charge area for neutral gravitational volume.

The atom nucleus in the process expanded up to the main asteroid belt, then compressed, leaving behind orbiting gravitons which collapsed to form terrestrial planets. The collapses were recorded in the Sun, forming discontinuities.

> Note that the effect is the same even without initial ionization - in that case, discontinuities would be inflated along with the atom, rather than produced in the process.

In the transition from charged two-dimensional ring to three-dimensional sphere, equatorial spin momentum has been fragmenting and [due to spin decoupling] spreading to (forming) polar regions.

Latitude variable rotation may have been initially established as the product of conservation of momentum in such redistribution of mass, even if it now may be sustained differently.

Besides the long lived energy level changes, short lived (temporary) inflation/deflation of gravitational maxima will occur with the absorption/emission of [properly scaled] gravitational waves, which may be electrically polarized (electro-magnetic).

> In case of dipole waves, absorption will induce separation of charges and collapse of a spherical form of the maximum into a two-dimensional ring form.

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Such disturbances will generally occur at regular intervals, with periods generally increasing proportionally to the scale of the system and the scale of disturbance. On the scale of stellar systems, common minimum periods are on the order of millions of years (although smaller periodic disturbances of the system should exist too, these may be of different nature).

Large scale events are always preceded and superseded by smaller scale events so accelerated evolution may proceed for years on smaller scales before the actual disruption on larger scale occurs.

One may now attempt to calculate how much such disturbances last on the large (cataclysmic) scale.

With no change in energy level, orbital areal velocity of bodies, per Kepler's 2nd law, must remain constant and there should be no change in constitutional mass either.

With a temporary collapse of a gravitational maximum, escape velocity is extremely reduced and orbiting neutral real mass will be increasing orbital radii (although solid mass will generally preserve volume due to smaller scale electro-magnetic and neutral gravitational forces).

In order for this to be a temporary disturbance (no loss of entanglement), collapse must not exceed a specific time period - orbital period of the constituting mass.

Approximating gravitational maximum as a point maximum (linear ejection of mass from centre) and assuming Sun's constitutional mass barycentre at the [inner] core radius at the time of collapse of the Sun's core maximum, maximal allowed ejection distance r at the time the gravitational well is fully restored is:

$$r = \frac{2\pi r_c}{2} = \pi r_c \approx 0.63 R_\odot$$

$R_\odot$ = Sun radius = 695700 km
r_c = inner core radius = $1/5$ $R_\odot$ = 139140 km

Maximum time between the collapse and full restoration of the well is then:

$$t_c = \frac{2\pi r_c}{v_c} = \frac{1}{f_c} = 608272.5061 \text{ s} \approx 7 \text{ days}$$

where f_c (1644 nHz[13]) is the rotation frequency of the Solar core.

Note that there is a discontinuity in the *seismic* profile of the Sun at $0.63R_\odot$. This is where Sun's angular velocity starts differentiating with latitude (it rotates as a solid from $0.63R_\odot$ down to the core).
Note also the following:

$$\frac{1}{v_c} * 10^{12} = \frac{1}{2\pi r_c f_c} * 10^{12} = \frac{1}{2\pi * 0.2 * 695700 * 1644 * 10^{-9}} * 10^9$$
$$= 695771\ km \approx R_\odot$$

suggesting that this should be satisifed:

$$v_c * R_\odot = 1 * 10^{12} \frac{m^2}{s}$$

or, in terms of areal velocity of the core:

$$v_a = \frac{1}{2} v_c r_c = \frac{{R_\odot}^2 \pi}{5^2 t_c} = 1 * 10^{11} \frac{m^2}{s}$$

A hint of *deeper* entanglement between the Solar core and surface maximum (quantization).

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In the context of CR, evolution of systems is not a steady continuous process over all time, but a process with cyclic strong (cataclysmic) changes and a slow (weak) continuous evolution through the cycle.

> *As I came to realize this I went outside, in despair still burdened by the thought. It was 2 past midnight, I lied on concrete, still entangled with the summer day.. Looking upon the heavens, once again for signs of confirmation I was not expecting to find - "a comet would suffice", I've told my self inside. Not a minute away, there it was, a comet passing right in that patch of the sky I've been absorbing with the eyes.*
>
> *Enlightened by the dark, a thought emerged from my self.. Up until recent times my life seemed like a movie scripted by dice thrown by chance, but now, now I did not believe in things anymore, I simply knew..*
>
> *This life ain't a fairytale based on true events, but reality based on a fairytale...*

7. The cycles

Changes in energy of the Solar System cannot be exempt from general oscillation and remain uniform over its lifetime.

For the Solar System, I hypothesize the following 3 periods (some evidence for which will be provided in this paper, some in follow-up articles) for the first three orders of general oscillation:

1. $4.25 * 10^9$ years,
2. $25.7 - 25.92 * 10^6$ years,
3. $1.512 * 10^6$ years.

These are cycles of existence of the Solar System and its bodies.

Only the 1st order cycle may result in large scale horizontal energy level changes, but all these disturbances are sourced in gravitational stresses and have strong effect on the evolution of the system (and all life within), which is temporarily accelerated at the end of each cycle.

> I believe that the currently accepted age of Earth and the Solar System of ≈ 4.54 billion years is incorrect and should be closer to 4.25 billion years (this will be elaborated later). This seems to imply that the system is at the end of a 1st order cycle, however, these periods should be understood as averages and the length of the 1st order cycle may vary by up to a couple hundreds of millions of years.

The 1st order period should be interpreted as *lifespan* of the Solar System as a whole. At time of death, gravitational maxima of the Sun [and likely all planets] collapse exchanging spin momenta for galactic angular momenta. Eventually, this system will couple with real mass and inflate again, probably even into same species (^{10}C in this case). It may even couple with the same real mass again, in which case the collapse may be interpreted as temporary loss of consciousness (this recurring coupling should be manifested as reignition of the star after the explosion/expansion of plasma during collapse).

The system of naked gravitons may also inflate or deflate through annihilation or fusion with another system, and then start evolving as new lifeform of another generation or new species, acquiring real mass in vicinity.

In any case, death and new conception are relatively synchronized, and, for these species death is likely not the same as death on our scale. In these species, discarded real mass may be fully reused by another soul - with no temporary and/or spatially large decay and recycling of the mass involved (regarding the individual components of the system, this seems more likely for planets but not as likely for stars as planets are not expected to expand fast with the graviton collapse).

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2nd order period should be interpreted as the *lifespan* of Sun's core and Jupiter, and possibly all outer planets. Based on current evidence, these collapses should be temporary regardless of nature (death or loss of consciousness). Naturally, even if the large bodies of real mass of gas giants are not disturbed much, the collapses should cause orbital disturbances, and are likely to induce bombardment of terrestrial planets with asteroids.

These should thus be correlated with large extinctions on these planets.

Note that it has been recently discovered that Saturn's rings are much younger than previously thought. The age reported is $\leq$100-400 million years[14], with 10-100 million years being most likely, as already suggested by others[15]. Due to proposed orbital disturbances, the age of rings is likely to correlate with the length of the 2nd order cycle. In that case, assuming they are recreated with each cycle, the rings should be 26 million years old at most ($\pm$ a few million years).
Interestingly, cosmic-ray exposure ages of chondrites (86% of all meteorites) are less than 50 million years. Exposure ages of achondrites, in example, cluster between 20 and 30 million years. This too certainly could be correlated with the hypothesized 2nd order cycle. Note that typical origin of achondrites are differentiated bodies (planets, moons and dwarf planets) which, unlike asteroids, should have a distinct large scale graviton coupled to real mass. Thus, ejection of achondrites could by synchronized with collapses of gravitational maxima of these bodies with the end of a 2nd order cycle while additional collisions and orbital disturbances could be sourced in the collapse of Jupiter's maximum.

The 1st order period should be interpreted as the *lifespan* of Earth and possibly all inner (terrestrial) planets (at least in the order of magnitude). Based on evidence, this collapse too is temporary.

Collapse of Earth's maximum should be synchronized with accelerated evolution of life on its surface. Evidence exists for accelerated human evolution 1.4 - 1.6 Ma[16]. Thus, another such event (effective time compression) should be happening right about now if the 3rd order period is 1.512 My.

All of these periods are time averaged, deviations will exist, but larger periods should be relatively quantized by smaller periods.

Ongoing extinction on Earth may be correlated with the end of a 3rd order period, however, everything suggests this is also the end of a 2nd order period. And, considering the age of Earth and the Solar System, we are likely at the end of a 1st order period too. Thus, major cataclysmic changes should be relatively imminent. While I am convinced that the ongoing 6th major extinction on Earth is sychronized with the end of the current 2nd order cycle, the end of a 1st order cycle may be more synchronized with the end of an additional 2nd order cycle, some 26 million years away.

One may argue that the 6th major extinction is caused by humans, therefore, unnatural and should not be correlated with the end of a 2nd order cycle. I disagree, for various reasons. First, this cause could be much more relatively natural (as shown later, in chapter *Earth, as a living organism*) than relatively unnatural. Secondly, causality in CR is relative - the end of a 2nd order cycle could be interpreted as the cause for the ongoing extinction through influence on human psyche (it should be clear now that *free will* can only be relatively free).
Note that I have associated consciousness with gravitons. If Earth's graviton is near the collapse and constituent small scale gravitons of Earth's space are coupled to human bodies (providing consciousness to humans) why wouldn't Earth's sense, or expectation, of collapse manifest itself through collective human action?

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Why would nature care for human intelligence or human egos? In my experience, effect matters much more than the cause in a universe and collective human actions are simply a manifestation of convergence to a certain effect. But this is not a one-way communication, theoretically at least, human action should also be able to influence the Earth's soul (graviton). I believe, however, that *we* are effectively helpless here. This development is all coded and if cataclysmic changes are scheduled, humans may soon become an insignificant actor in the play.

Currently accepted age of Earth and the Solar System, based on uniform evolution and absolute decay rates of elements, must be wrong. Per CR postulates, decay rates of elements cannot be constant over all time, they must change, either directly with changes in pressure and density of space (ie. at times of graviton collapses), or effectively - ie. with cosmic ray bombardment.

The rates may be relatively constant during weak evolution, however, at the end of a cycle that is synchronized with graviton collapse (ie. the 2nd order cycle) the rates should be significantly, even if temporary, disturbed (accelerating decay). Full collapse is probably not even required. Most likely, the rates are disturbed with the end of a cycle of any order, only the magnitude of disturbance is proportional to the cycle magnitude (period). The magnitude of disturbances will be calculated later.

7.1. Smaller periods

Assuming the ratio of a 3rd to 4th order period is equal to the ratio of a 1st to 2nd order period, and the ratio of a 4th to 5th order period is equal to the ratio of a 2nd to 3rd, the following periods are obtained for the 4th and 5th order:

- 9221.4 years,
- 537.9 years.

Here, a 2nd order period of $25.92 * 10^6$ years was assumed.

While 4th order disturbances could be cataclysmic they (and their effects) should be relatively short-lived and may not generally produce global effects on Earth.

The analysis of recent magnetic excursions and supervolcanic eruptions shows excellent agreement with the proposed 4th order period, as shown in Table 3, for the last 9 cycles.

Table 3. 4th order period correlation with excursions

cycle	years before present	correlated event
0	0	current events (extinction, climate change, ozone depletion, likely magnetic excursion or reversal, ...)
1	9221.4	^{10}Be enrichment in ice cores ≈9200 years ago[17] (hypothesized extreme solar storm event), Lake Michigan/Erie magnetic excursion 10-9 ka and 14-12 ka[18]
2	18442.8	Hilina Pali magnetic excursion 18.5 ka[19]
3	27664.2	Lake Mungo magnetic excursion 30780±520 - 28140±370 and ≈26000 years b.p.[20], Oruanui eruption ≈26.5 ka[21]
4	36885.6	Mono Lake magnetic excursion 36 - 30 ka[22] (34.5 ka[19]), Dome C/Vostok ^{10} Be enrichment (likely due to excursion) ≈35 ka[23]
5	46107.0	Laschamp magnetic excursion 46.6±2.4 ka[24] (41.2 ka[19]), Neanderthals extinction
6	55328.4	?
7	64549.8	Norwegian-Greenland Sea magnetic excursion 64.5 ka[19]
8	73771.2	Toba volcanic eruption ≈74000 years ago[25]

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Note that the same results can be obtained with a period of 9157.4 years (obtained using 25.74 * 10^6 years for the 2nd order period) and a phase shift of 64 years, assuming year 1958 (3rd Industrial Revolution, rapid rise in CO_2 emissions) should be associated with current events.

Agreement with hypothesized associated events is remarkable, however, if the proper date for Laschamp is 41.2 ka and assuming Gothenburg magnetic excursion (13.75 - 12.35 ka[26]) is also a part of this cycling, it is possible that the 4th order period of 9221.4 years occasionally (or regularly?) breaks into two equal periods (2nd harmonic) - which could, apart from these two, also *explain* the 14-12 ka Lake Michigan/Erie excursion, enhanced ^{10}Be deposition in Antarctic ice ≈60 ka[23] and the Younger Dryas cooling/extinctions ≈12900 years ago[27].

Note that, since the 4th order period was derived from the first three periods, evidence for the 4th order period may also be interpreted as the evidence for these three.

The presence of harmonics probably should not be surprising given how common is resonance in celestial mechanics. Evidence exists for the 2nd harmonic (≈13 million years) of the 2nd order period (25.92 million years) too[28].

Evidence can also be found for additional harmonics of the 4th order period.
The 3rd harmonic could be correlated with the Noah's Great Flood (dated to ≈6000 years by Biblical scholars), giving a date about 6148 years ago.
The same harmonic could also be correlated with the recent rapid shrinkage of human brains (recently dated to ≈3000 years ago[29]), giving a date some 3074 years ago.
The 2nd harmonic (1536.9 y) of that harmonic (or, 6th harmonic of the 4th order period) could be correlated with Dansgaard-Oeschger warm events (for which some have previously hypothesized a 1470 year period[30]).

Of course, as there are no absolute constants in CR, these periods should be oscillating and evolving, even if weakly. Also, temporary disturbances of oscillation cannot be excluded, as well as the possibility for some harmonics to only be present occasionally (ie. close to events of strong evolution). For these reasons, the hypothesized periods should probably be understood primarily as relatively constant average intervals between associated events at times these are occurring.

However, possible deviation is proportional to period length, and remarkable agreement of the 4th order period with correlated events suggests deviation for the 4th order period may be generally small, up to a couple of decades at most.

Particularly interesting is then the ^{10}Be enrichment about 9197 years ago[17] (9125 b.p.), which would give year 2046 for the next excursion, assuming there's no deviation.

8. Effects of mass and gravitational stresses on Keplerian motion

Orbits of bodies in gravitationally bound systems should obey the following equation (orbital law):

$$v^2 = \frac{GM}{r}$$

G = gravitational constant

where v and r are orbital (Keplerian) velocity and radius, respectively, while M is the mass contained within the radius r.

 doi:10.20944/preprints202105.0488.v9

In planetary systems, most of the mass M is contained within the star, while in galaxies, greatest mass concentration is in the central supermassive black holes (with no outer dark matter taken into account).

However, in both systems, there are orbits at which the equation is apparently not satisfied - v is either higher or lower than *expected* for detected mass M.

In galaxies, it is assumed that the discrepancy is caused by exotic gravitational mass - *dark matter*.

In planetary systems, spin of bodies does not obey the equation, but this is largely ignored (not considered as discrepancy), possibly due to current understanding of gravity and accepted theories on formation of planetary systems.

It is however, a legitimate question - why should a gravitationally bound mass in a galaxy obey the orbital law, while clouds of gas orbiting near the surface of a star should not (if most of M is below the surface)?
Of course, the source of *anomaly* can be conversion to thermal (radial) motion but can it fully explain the deviation and how is the conversion linked to it?

In CR, gravitational force of bodies with a distinct gravitational well may be largely provided by the gravitational maxima so [ordinary] matter content (real mass) may be low.

Thus, a potential equivalent *dark matter* problem may exist in stars, planets, dwarf planets and larger moons (asteroids and comets are composites of smaller scale wells [held together in most part by electro-magnetic force] so their spin momentum should not be Keplerian, even if their orbit around a body with a distinct maximum should).

All bodies with a distinct gravitational well have a *dark matter* source (gravitational maximum), however, the addition (acquisition) of smaller scale matter (real mass), in one interpretation, shields the existence of the maximum, effectively decreasing imaginary mass content of the well.
Note that, in this exchange of *dark* gravitational potential for *real* gravitational potential, net gravitational force remains constant, but the capacity of the well (for real mass) is decreasing. In another interpretation, total mass is increasing with acquisition of real mass, however, the well still has finite coupling capacity equal to img mass, although the well can become over-capacitated. In CR, it was established that velocity is Keplerian at full capacity, faster in under-capacitated wells, lower in over-capacitated wells. A body may also have multiple maxima, in which case, the outermost (surface) maximum may shield existence of deeper maxima.
The shielding effect is not limited to the neutral gravitational component of general force, electro-magnetic component may be shielded as well.
Thus, if there is no exchange of neutral gravitational potential for electro-magnetic potential, and if there are no changes in kinetic energy, despite the loss of matter, the gravity of a star, in case of shielding interpretation, should not change its average value with age (it should still oscillate). The attraction remains, but its nature changes - from being mostly in its looks (real mass) to being mostly in its mentality (dark matter), as in any living being.
Luminosity is thus, generally, a good measure of gravitational mass only if the well is at full capacity, otherwise it is only correlated with real mass, and age (if there is no fuel replenishment).
However, even if real mass may not be correlated with total gravity at all times, these should get synchronized periodically. The reason why they are not synchronized at all times may

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simply be a difference in scale - since energy changes are discrete, burning of real mass (small scale mass) will appear continuous, while on large scale, where energy quanta are orders of magnitude larger, change in mass (gravity) may require millions or billions of years.
It is thus possible that the Sun does not have much fuel (real mass) left at this point, its gravity is rather in dark matter associated with the maximum that is yet to collapse.
It is then likely that a collapse is synchronized with depletion of fusion fuel.

The solution for terrestrial bodies lies in the loss of entanglement between space and matter orbitals due to interaction (collision) with other bodies, during formation of the body of matter.

Due to interaction of the atmosphere with a solid body beneath (or its origin), neither the gases of the atmosphere (or trapped particles from outer space interacting with the atmosphere) may obey the orbital law.

This suggests that even below a gas cloud rotating around a distinct maximum at non-Keplerian velocity there should be a solid core, at least in case of a neutral gas, however, angular component of velocity may be converted to radial and then to temperature.

Note that even if pressure from high temperature (kinetic energy) is balancing gravitational force, the thermodynamics (within the gas cloud) cannot break the orbital entanglement of the gas cloud as a whole.

If that gas is in the form of plasma (as in the case of Sun), it is more likely to be entangled with the charge component of a maximum (general force), which then should be the source of its non-Keplerian motion.

The neutral gravitational equivalent of electro-magnetic influence on gas on the equator of the Sun can be calculated:

$$v = v_e = \frac{2\pi r}{T} = \sqrt{\frac{GM_2}{r}} = 2066.95\,\frac{m}{s}$$

v_e = equatorial velocity of the Sun surface
G = gravitational constant = $6.674 * 10^{-11}$ m^3/kgs^2
r = equatorial radius of the Sun = 695500 km
T = rotation period at equator = 24.47 days

which gives for the mass of the hypothetical neutral maximum:

$$M_2 = 4.45215 * 10^{25}\,kg$$

If the electro-magnetic component of the maximum would be exchanged for neutral gravitational component, the equatorial matter could remain entangled with such maximum.
The observed angular velocity could be interpreted as the evidence of spin change during the transition between vertical energy levels and transformation of electro-magnetic potential for neutral gravitational potential.
Suppose that entire potential was initially electro-magnetic but with an opposite spin. During transformation, Keplerian velocity component would be decreasing total angular velocity and, as the neutral component becomes larger than the electro-magnetic component, real mass would start spinning in another direction - aligned with Keplerian velocity. With complete transformation, real mass would have a Keplerian angular velocity.

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However, with the exchange of potential and inflation of space, [assuming real mass is acquired not inflated] increasing gravity must be radially compressing orbitals, increasing density of real mass. If the compression is not isotropic and the mass is spiralling inwards (as expected for interaction of binaries at the event of annihilation), angular velocity (being exchanged for radial) will be decreasing from Keplerian with orbital radius.
This will be increasing pressure and temperature around the centre which will balance the neutral gravitational force at equilibrium.
Angular velocity of matter around stars is thus generally proportional to a difference between neutral and electro-magnetic potential and, in magnitude, inversely proportional to temperature/density of real mass.

However, stability of a gravitational maximum is proportional to its mass and inversely proportional to gravitational stress.

That gravitational stress affects the number of sunspots has already been shown[31], and here I hypothesize that a sunspot pair is the result of a collapse of a quantum of a neutral gravitational surface maximum into a pair of [electrically] oppositely charged and relatively unstable smaller maxima.

Note that orbital radius of a sunspot pair is equal to the radius of the maximum before collapse. Gravitational wells of planets, dwarf planets and major moons have likely been formed in the similar way as sunspots.
Note also that size of sunspots ranges from the size of a moon to the size of the biggest planet (Jupiter), which I do not believe is a coincidence.

A neutral component of a naked gravitational maximum is gravitational energy that may be referred to as *dark matter*, while *visible* or ordinary matter is real mass attracted to the gravitational well of such maximum. The velocity curves of the Sun and the Milky Way galaxy likely have the same solution - in the form of gravitational maxima and relativity of their nature due to exchange between polarized and non-polarized potentials of general force.

Rotation frequencies of the Sun (from the core up) and rotational velocities of several spiral galaxies are shown on Figure 7.

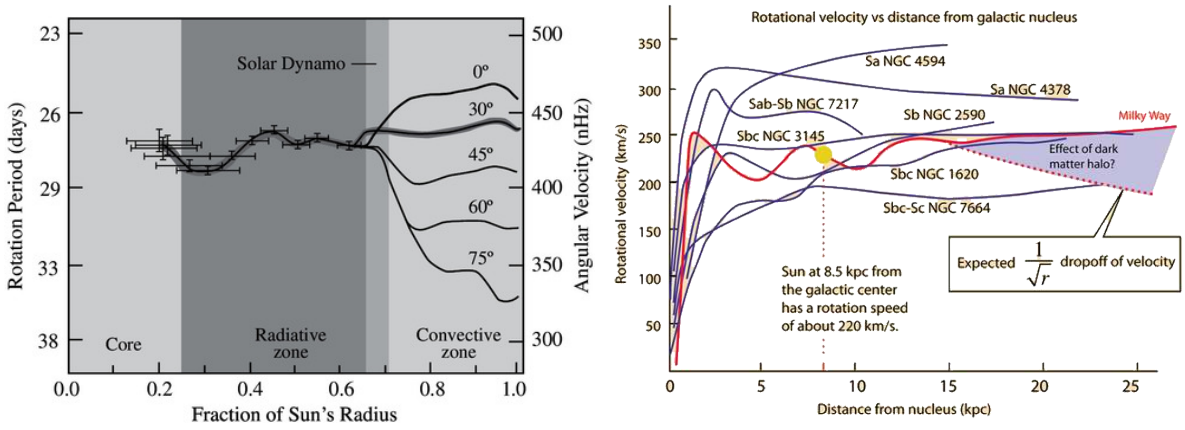

Figure 7. left) internal rotation of the Sun[32], right) rotation of spiral galaxies[33]

On the left, Figure 8 shows the rotational velocities of the Sun based on rotation frequencies from two independent studies, one for the core ($r < 0.2R_{\odot}$) and other from the core up (black dots are interpolated values, red dots show velocities at 30° latitude).

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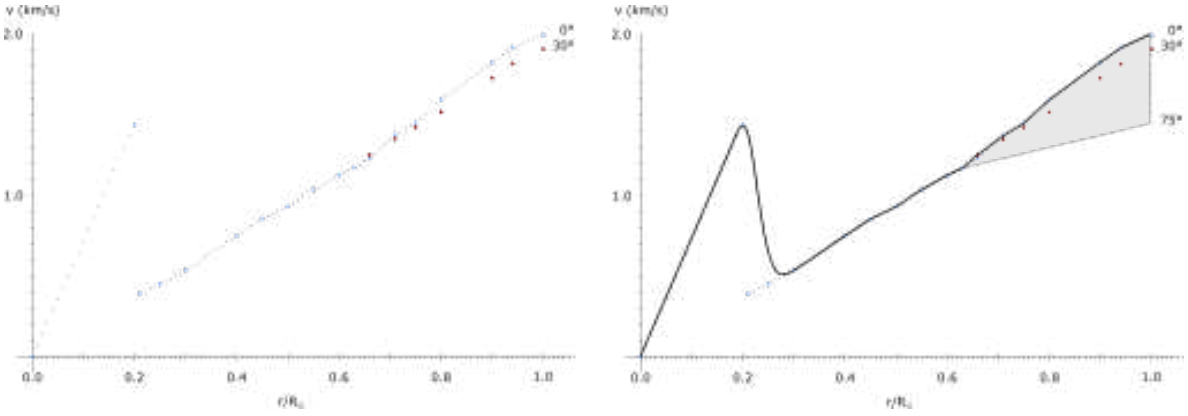

Figure 8. Rotational velocities of the Sun

On the right, Figure 8 shows the complete velocity curve (with interpolated *connection* between two curves) and dispersion of velocities (shaded area) due to differential rotation in the convective zone.

> Note that interpolated values do not represent the current state, rather initial state at the core when the discontinuity had more pronounced thickness. In the current state, discontinuity is extremely compressed and velocities increase sharply at 0.2R⊙. This will be elaborated below.

What is obvious from the figures is that Sun rotates like a composition of two solid or rigid bodies (diverging only in the polar regions of the convective zone), consistent with condensation of U_1 scale down and up quarks (energy levels) into two ground states (+1s/-1s).

> Assuming the Sun is not solid anywhere (as expected in conventional theories), it should be mainly composed of plasma.
> However, there is a possibility that fusion in stars operates differently (or at least has a secondary component) - through the bombardment of solid (or solid-like) material with particles produced in the radiative zone. These may be high energy photons produced through matter/anti-matter annihilation and/or high temperature of plasma.

Evidently, velocity curve of the Sun is similar to a typical velocity curve of a spiral galaxy - in both cases there is an initial sharp increase in velocity in the core, followed by a decline, with each next increase in velocity being less steep than the previous one. Note that latitude dependent differential rotation may also be common at specific places in galaxies too.

If the spin momentum of the Sun is effectively immune to [large scale] collisions (even if the core would be solid, everything approaching the Sun is vaporized before reaching the surface), the only disturbance of Keplerian orbits must come from incomplete conversion of electro-magnetic potential and increase of temperature.

Assuming that orbital velocity is decreasing (from Keplerian velocity) proportionally to electro-magnetic potential, as hypothesized, orbital velocity of plasma should keep increasing with radius until it becomes equal to Keplerian velocity, beyond which point there should be no accumulation of charge and the radial component of the solar wind should dominate.

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Using approximation of the velocity/radius dependence based on the velocity curve of the Sun (up to 130000 km from surface[34]), and equalizing with orbital law:

$$v = \frac{2533.61175}{1.18686 - 0.1}\left(\frac{r}{R_\odot} - 0.1\right) = \sqrt{\frac{GM_\odot}{r}} \tag{S1.1}$$

one obtains the orbit of such discontinuity:

$$r = 32.8\, R_\odot = 22.826 * 10^6\, km \approx 33\, R_\odot$$

First results from the Parker solar probe indicate a significant rotational velocity of the solar wind around 40 $R_\odot$, peaking at the closest approach. The results indeed indicate a high probability of a maximum velocity around 33 $R_\odot$ in case a rigid rotation of the solar wind is maintained up to that point.

Rigid rotation is a consequence of relative cancellation of neutral and electro-magnetic influence on angular velocity, making it dependent on real mass (solar wind) density (pressure) which for particle orbitals falls of proportionally to distance r (number of particles per $2\pi r$ is constant).

Note that, even without rigid rotation, the discontinuity should occur near the point where velocity becomes Keplerian, otherwise, higher velocity would indicate dark matter presence - another maximum.

Note that 33 $R_\odot$ is equal to 0.1 MAU (Sun-Mars distance), while the above equation gives 0.1 $R_\odot$ for v = 0. This correlation of the radius of the Sun with the orbit of Mars is not a coincidence - Mars is the outermost positive charge of the $U_1.{}^{10}C$ atom (Solar System).

If the same is applied to the core of the Sun, the velocity at 0.2 $R_\odot$ should be equal to Keplerian velocity. Here, however, this velocity is the sum of Keplerian velocity of the surface maximum and a core maximum. For a surface maximum at $R_\odot$:

$$v = s\sqrt{\frac{GM}{0.2R_\odot}} + s_\odot\sqrt{\frac{GM_\odot}{{R_\odot}^2}\frac{(0.2R_\odot)^2}{{R_\odot}^2}0.2R_\odot} = s\sqrt{\frac{GM}{0.2R_\odot}} + s_\odot\sqrt{GM_\odot\frac{(0.2R_\odot)^3}{{R_\odot}^4}}$$

$s, s_\odot \in \{-1, 1\}$

where M is the mass of the core maximum, s is the spin polarization of gravity of the core maximum and $s_\odot$ is the spin polarization of gravity of the surface maximum.

Equalizing this velocity with measured velocity at the core discontinuity:

$$v = 2\pi * 0.2R_\odot * f = 2\pi * 0.2R_\odot * 1644 * 10^{-9} = 1437.2545\,\frac{m}{s}$$

and setting spin polarization positive for counter-clockwise rotation [of the surface maximum], gives s = -1 and gravitational mass of the core roughly 3/2 the Jupiter mass:

$$M = 2.951797 * 10^{27}\, kg$$

which gives mean core density of:

$$\rho = 261.602486\,\frac{kg}{m^3}$$

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implying the primary gravitational mass of the Sun is above the core. Difference in mass between the core and outer layers is roughly equal to the mass difference between inner and outer planets.

For the ratios to be equal, core mass must be 3 times higher, which indicates that space has been stretched (compressed, relative to core) from 0.286 $R_\odot$ (1.43 * 0.2 $R_\odot$) to 0.2 $R_\odot$. Modifying the equation for Keplerian velocity accordingly would give the initial mass (8.90211033 * 10^{27} kg):

$$v = s\sqrt{\frac{GM}{0.2R_\odot}\frac{1.43}{1.43}} + s_\odot\sqrt{GM_\odot\frac{(1.43 * 0.2R_\odot)^3}{{R_\odot}^4}}$$
$$= s\sqrt{\frac{GM}{0.2R_\odot}} + s_\odot\sqrt{GM_\odot\frac{(0.286R_\odot)^3}{{R_\odot}^4}}$$

Radius independent Keplerian velocities, like those at the outskirts of galaxies, are the effect of stretched space between maxima.
With shorter distance between maxima, minimum is more localized and changes in velocity are sharper.
Apparently, such stretching occurs in the Sun too, which is not surprising, considering established (and predicted in CR) self-similarity of universes.
Note that the equation S1.1 is defined by the straight line passing through 0.1 $R_\odot$ and 1.18686 $R_\odot$, so if one assumes that, without space stretching, the defining points would be 0.0 $R_\odot$ and 1.0 $R_\odot$, 0.286 $R_\odot$ is the sum of translation of both points in radial direction due to stretching.
Note also that, if the Sun loses all outer mass with the collapse of the outer maximum, with leftover mass roughly equal to initial core mass, the Solar System becomes geocentric.

This stretching of space is evident on Figure 9 in the sharp increase of velocity from 0.286 R to 0.2 r. To conserve momentum, this increase in velocities in the inner half had to decrease velocities in the outer half of the Sun, up to 1.18686 $R_\odot$.

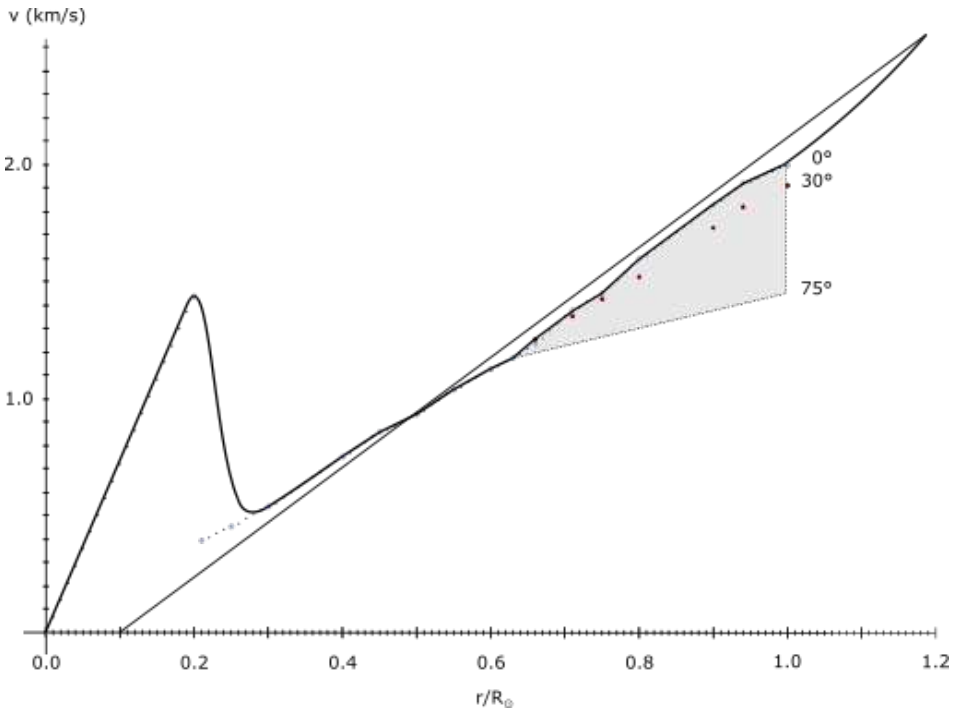

Figure 9. Rotational velocities of the Sun and near corona

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Note that slower polar convective rotation could be the result of loss of shielding of the core maximum [charge] due to conversion of potential of the surface maximum (convergence from spherical to ring form).

Gravity between the two maxima must be cancelled near 0.2 $R_\odot$.
Therefore, any particle escaping the core will overcome escape velocity at the surface of the Sun (if not slowed down by other particles). The same is true for the other direction. Thus, orbitals of particles at the discontinuity must be highly unstable and it should be the area of lowest [real mass] density.
However, gravitational stress can induce the collapse of the surface maximum. If that stress is low (insufficient for full collapse), the maximum will be fragmenting and collapsing into quanta of smaller charged maximum pairs, starting in polar regions (and, without further increase of stress, limited to polar regions).
At these places (sunspots), gravitational escape velocity is decreased allowing higher bandwidth of escaping mass, although significant transverse velocity component will exist, especially for charged particles.
Note that orbitals at polar regions seem to be entangled with the core.
Strong entanglement between [quark] pairs may exist between the core and surface, it is also possible that gravitational stress is adding energy to such entanglement and inflating maxima of such pairs (creating wormholes).
In that case space is stretched from the core to the surface (at sunspots) entangling orbital velocities but also being fixed to specific latitude by magnetic field lines (*shielding* inclined velocity component), the period of rotation of such plasma on the surface would be equal to:

$$T = \frac{2\pi R_\odot}{v} = 3041363\,s = 35.2\,days$$

which is the rotation above 75° latitude and should be the location of sunspot creation (inflation) at surface. Note that, once the orbital entanglement is lost, being charged, the sunspots will drift along the magnetic field lines.

The specific core discontinuity radius is a result of two competing sources of force, the outer maximum attracting inner maximum outwards while the inner maximum is pulling it inwards (forces cancel near the discontinuity). These are entangled - collapse of the inner maximum would cause expansion of the outer one, while the collapse of the outer one would cause contraction of the inner one.

Note that the collapse of the outer maximum would act as *dark energy* to the gas inside the convection zone - it would expand and cool. At the same time, with the collapse of the inner maximum, the accumulated real mass (in the *radiative zone* and below) would contract. If now the planetary systems are equivalents of atoms, *dark energy* is large scale atomic gas expansion, the observable universe is a gas, expanding possibly in a large scale *convection zone* (it thus has a torus like shape) and at the same time orbiting a central contracting or already contracted mass - possibly even a large scale black hole. However, considering the properly scaled density/pressure of this gas it is more likely the expanding gravitational maximum itself.
The core gravitational maximum of the Sun might be the effect of vacuum induction, but, likely, all gravitational maxima are a result of vacuum induction and quantization.

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In example, similar to inner Solar planets, the stars of a particular arm of a spiral galaxy could be a result of vacuum collapse into smaller quanta (maxima).
One may understand the creation of vacuum as stretching of space and decrease of density, but no space can be absolutely empty. Thus, if one is stretching space, one is also inflating smaller scale maxima.
The stretching of space between galaxies would result in creation of dark matter filaments between them. Intergalactic and galactic dark matter was thus likely created with inflation of space.
Due to discretization of stable energy [levels], with enough energy applied to vacuum creation, the inflation will result in [relatively] permanent maxima of larger scale.
Vacuum inflation may be most likely in annihilation events, due to high symmetry and energy localization. However, stretching of space between strongly entangled particles can also result in permanently inflated particles (as in quark/anti-quark pairs).
If inflated particles are always of equal species to the original particles, evidently the [private] space of such particles is composed of the same particles but of lower scale.
In case of annihilation, the stretched (inflated) space might not be the space of the annihilating pair, rather the *underlying* space, making the product of inflation highly dependent on the point of interaction. It may be more appropriate to state that, rather than being stretched in between, space is compressed at maxima. Similar to the 1st law, one could then construct another law:

Space remains at constant density unless acted upon by gravitational force.

Thus, even if it may appear that, once deformed, no force is necessary to act on bodies in space to accelerate their radial motion relative to the sources of gravity, force (energy) is necessary to maintain such state of space.
As everything must conform to general oscillation, some force is always present, with relative magnitude and distance it is acting upon.
The speed of motion (radiation) will depend on density of space and, if gravitational force is limited, there will be a speed limit on motion. However, constancy of density is relative and even density is relative to the scale of the 1st order *observer*, or, more precisely, the strength of its entanglement with such space.
Absolute, and absolutely invariant limits are impossible. In any case, it seems that everything must be mirrored, and when it appears that is not the case, the cause is simply a large distance - in scale of space/time.
If the point of interaction of an annihilating pair imparts energy to the pair in highly asymmetric manner, the inflation would result in a pair of maxima of different scale (in fact, one of the particles could even be deflating).
Thus, a possibility exists that even the proton and electron particles are a result of an *anomaly* in annihilation of particle/anti-particle pairs of equal scale.
Note that a gravitational maximum must have a real radius - a point maximum would imply infinite gravity and no possibility for containment of smaller maxima.

Somewhere around the discontinuity, conditions may even be suitable for standard life. Note that radius of the core is almost 22 times Earth radius, if density is not isotropic, smaller bodies (moons) might be orbiting inside. Considering momentum of the Solar System barycentre, density should not be isotropic.

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The idea of planets or moons, even habitable ones, inside the Sun is not that ludicrous as it seems.
Note that, in the hypothesis, Sun's core is a Jupiter-like planet and nuclear fusion in the Sun is occurring outside the core, within the *radiative zone* - in case of thermonuclear fusion, and possibly also at its edge about 0.66 $R_{\odot}$ - in case of low energy nuclear reactions if these are occurring at this time. If there are moons at the core discontinuity, the matter in *radiative zone* area must be actually shielding the core from radiation. Discontinuity implies there is a layer of vacuum between the core and the outside matter - providing insulation from conduction and convection of heat. This only leaves radiative transfer of energy between the core and the *radiative zone* as the potential problem but definitely not an unsolvable one (radiation can be reflected or attenuated).
How did matter accumulate in the *radiative zone*?
Assuming the Sun's outer gravitational maximum was initially dominantly electro-magnetic (it should have been, if it was inflated from standard scale, as hypothesized) it was in the form of a two-dimensional ring. Its strong magnetic field would be channelling charged particles (initially protons and electrons, afterwards possibly also alpha particles followed by heavier ions as well - assuming these were available) into the middle. This was creating a core but with a magnetic field of its own due to [differential] angular momenta of charges, which, with increasing strength would be expelling particles farther and farther from the core, in the end resulting in majority of the mass concentrated between the core and outer maximum, at which point the outer maximum has exchanged most of its electro-magnetic potential of general force for gravitational (also becoming almost completely spherical).
Although this does not seem to require existence of the core gravitational maximum (coupled with accumulated real mass), most likely it does exist and has been there from the beginning (it was inflated together with the outer maximum) rather than being coupled to accumulated real mass at some point later.

9. Symmetry between inner and outer planets

Obviously, inner planets differ from outer planets in terms of energy, size and composition, but the hypothesis of equivalence with (or inflation from) atomic constituents also requires certain symmetry between the two groups of planets - it is predicted that they are oppositely charged and should be spin entangled (or at least were initially).

The orientation of planetary magnetic fields goes in favour of the hypothesis - in one group of planets magnetic north is aligned with mass spin momentum vector, in other it is anti-aligned. Not only that, 3rd inner planet (Venus) relative to the main asteroid belt (*event horizon*) and 3rd outer planet (Uranus) from the belt seem to have inverted spins relative to other planets in the group. The fact that inversion occurs in the same place within the group (3rd planet relative to the asteroid belt) is further strengthening the hypothesis.

Note that spin of Uranus' real mass is more horizontal than vertical, but its obliquity is still over 90° so its original obliquity was likely the same as Venus' - 180°. The current obliquity is probably a result of later perturbation. However, Uranus' magnetic field is still pretty vertical (suggesting it is independent of real mass, not as sensitive to perturbation). It is anti-aligned to magnetic fields of other gas planets and aligned with the magnetic field of Earth, Mercury and Mars. Likewise, Venus' magnetic field (if present) should be anti-aligned to the magnetic field of other terrestrial planets and Uranus, or at least it was originally.

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Note also that, if symmetry is conserved over time (as it seems), magnetic reversals must be relatively synchronized between the entangled planets (ie. a magnetic reversal on Venus should be synchronized with a reversal on Uranus).

But, as it will be shown later, symmetry, relative to the asteroid belt, exists elsewhere too.

10. Quantization of momentum

Previous works based on Titius-Bode law have shown that planetary orbits are quantized[35]:

$$r = ae^{2\lambda n}$$

More recently it has been shown that distances and orbital periods are consistent with quantized scaling[36] (stable orbits are in harmonic resonances), rather than logarithmic spacing - from the Sun reference frame.

However, proper reference frame in this case is not the Sun, rather the asteroid belt.

If orbital radii are quantized, orbital (Keplerian) velocities are quantized.

Here, it will be shown that angular momentum is quantized (from a proper reference frame), as well as surface gravity.

If QM cannot describe the Solar System as an atom, it is QM that should be revised, not reality.

Orbital and spin angular momenta are correlated.

Note that spin radius cannot be 0 in CR. Every spin radius is thus orbital radius and if orbital radii are generally quantized, spin radii [and associated Keplerian velocities] should be too.

Gravitational maxima (event horizons) are, in an ideal case (no electro-magnetic polarization), sphere surfaces with a well defined radius. Mass spin radius and spin velocity of a body (particle) are radius and spin velocity of its gravitational maximum.

Surface gravity of a planet depends on real mass content (defining surface radius) of the well and mass of the maximum. Assuming ratio of used capacity to full capacity for real mass between the planets is roughly the same and assuming ratio of mass of a gravitational maximum to [the square of] its radius is equal between particles on the same energy level, surface gravities of planets will be correlated.

If velocities and radii are quantized, and if momentum is quantized, gravitational mass must be quantized too.

If gravitational mass and radius of a maximum are quantized, its surface gravity must be quantized.

For outer planets, radius of the maximum is here hypothesized to be equal to what is currently defined as the surface radius (1 bar pressure level).

When quantized, orbital angular momentum satisfies the following equation in Bohr interpretation:

$$mvr = n\hbar$$

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where $\hbar$ is a constant, n is a positive integer number and m, v, r are components of orbital angular momentum - mass, velocity and radius, respectively.

Using total mass of the planet for m will not reveal quantization. In example, using Neptune's mass of 1.02413 * 10^{26} kg and setting n to 5:

$$mvr = 5\hbar = 2.499714508 * 10^{42}\ Js$$

one obtains the scaled $\hbar$ (Planck's) constant for outer planets:

$$\hbar = \hbar_{m_2} = 4.999429016 * 10^{41} \approx 5 * 10^{41}\ Js$$

While the result is certainly interesting, the same $\hbar$ will not produce quantized momenta for other planets (it needs to be scaled).

The mass which should produce quantized angular momenta is, as previously established (equation Q1.4), *real* part of total mass.

However, if surface gravity is correlated with spin momentum, it must be correlated with orbital momentum too, and one may obtain the following equation for surface gravity:

$$g = \frac{vr}{n\hbar} M_N g_N$$

where $\hbar$ is equal to the obtained $\hbar$ above, M_N and g_N are Neptune's mass and surface gravity, respectively. In Table 4, required total mass is the total mass (gravitational energy) required to satisfy the quantization by the QM Bohr interpretation (showing how far it can be from reality) based on obtained $\hbar$ relative to Neptune, calc. gravity is calculated surface gravity, while acc. is the surface acceleration taking rotation into account.

Table 4. Calculated gravity for outer planets

n	planet	orbital velocity v (m/s)	orbital radius r (10^6 km)	total mass M (10^{24} kg)	required total mass (10^{24} kg)	calc. gravity g (m/s^2)	gravity (m/s^2)	acc. (m/s^2)
5	Neptune	5430	4495.06	102.413	102.413	11.15	11.15	11.00
5	Uranus	6800	2872.46	86.813	127.976	8.92	8.87	8.69
3	Saturn	9680	1433.53	568.340	108.084	10.565	10.44	8.96
1	Jupiter	13060	778.57	1898.190	49.168	23.225	24.79	23.12

Protons and electrons are parts of two different universes (as difference in scale suggests), so one should use a different $\hbar$ constant for terrestrial planets (proton partons).

The angular momentum of Mercury (m = M = 3.3011 * 10^{23} kg):

$$mvr = 5\hbar = 9.053654959 * 10^{38}\ Js$$

gives the scaled $\hbar$ constant for inner planets:

$$\hbar = \hbar_{m_1} = 1.810730992 * 10^{38}\ Js$$

Surface gravity for inner planets, using obtained $\hbar$, Mercury mass M_M and gravity g_M:

$$g = \frac{vr}{n\hbar} M_M g_M$$

In Table 5, showing calculated surface gravity for inner planets, required total mass is the total mass based on $\hbar$ relative to Mercury, while the *mirror* is an outer planet candidate for [magnetic] spin entanglement.

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Table 5. Calculated gravity for inner planets

n	planet (*mirror*)	orbital velocity v (m/s)	orbital radius r (10^6 km)	total mass (10^{24} kg)	required total mass (10^{24} kg)	calc. gravity g (m/s^2)	gravity (m/s^2)
5	Mercury (Neptune)	47360	57.91	0.330	0.33011	3.70	3.70
3	Venus (Uranus)	35020	108.21	4.868	0.14335	8.52	8.87
3	Earth (Saturn)	29780	149.6	5.972	0.12193	10.02	9.798
10	Mars (Jupiter)	24070	227.92	0.642	0.33006	3.70	3.71

Quantization can also be shown without using mass (directly), through the volumetric space-time momentum (gravitational momentum):

$$gvr = nh\,[\frac{m^3}{s^3}]$$

With h obtained from above, substituting mass with gravity, the equation for gravity becomes:

$$g = \frac{vr}{nh}{g_0}^2\,,$$

where g_0 is the gravity of Neptune, or, in case of terrestrial planets, the gravity of Mercury, and it yields the same results.

While the second equation will yield the correct results for gravity, the equation gvr = nh will not, showing the inverse coupling of gravity to momentum:

$$\frac{1}{g}vr = nh\,[ms]$$

This gives, for outer planets:

$$h = h_{g_2} = 4.378148126 * 10^{14}\,ms,$$

for inner planets:

$$h = h_{g_1} = 1.482496 * 10^{14}\,ms$$

Now, one can couple mass with gravity:

$$mvr = n\hbar_m,\ \frac{1}{g}vr = nh_g,\ \hbar_{mg} = \frac{\hbar_m}{h_g}$$

$$g = \frac{vr}{nh_g} = \frac{n\hbar_m}{m}\frac{1}{nh_g} = \frac{1}{m}\frac{\hbar_m}{h_g}$$

$$g = \frac{\hbar_{mg}}{m},$$

and obtain relation to Sun's gravity:

$$r = \frac{n\hbar_m}{mv} = \frac{gnh_g}{v}$$

$$r^2 = n^2\hbar_m h_g\frac{g}{mv^2}$$

$$\frac{mr}{g}\frac{4\pi^2 r^3}{T^2} = n^2\hbar_m h_g\,[kg\,m^3]$$

$$mr^3\frac{g_S}{g} = n^2\hbar_m h_g\,[kg\,m^3] \rightarrow v^2 = rg_S$$

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$$m^2 r^3 g_S = n^2 \hbar_m{}^2 \left[\frac{kg^2\, m^4}{s^2}\right]$$

where g_S is the gravity of Sun at orbital radius r.

For outer planets:

$$\hbar_{mg} = \hbar_{mg_2} = 1.14190495 * 10^{27}\, \frac{J}{m} = 1.14190495 * 10^{27}\, N$$

For inner planets:

$$\hbar_{mg} = \hbar_{mg_1} = 1.221407 * 10^{24}\, N$$

The above obtained $\hbar_{mg}$ constants are based on total mass, for relative real mass, the quantum of gravitational force ($\hbar_{mg}$) may be treated as invariant between inner and outer planets (with properly defined *surface* gravity g):

$$\hbar_{mg} = 6.968267285 * 10^{20}\, N$$

Small deviation in calculated gravity from real gravity stems mainly from oscillation of surface gravity. Note, for example, with rotation taken into account (g_N = 11.0 m/s^2) calculated gravity for Saturn would match exactly the measured value of 10.44 (which is the value without rotation!). On the other hand, the gravity of Jupiter with rotation closely matches the calculated value (without rotation). This confirms that the definition of surface relative to fixed pressure (1 bar in this case) is appropriate for outer planets but should oscillate (cycle) between planets to take into account fossilization of a previous maximum in rotation period.
Correlation with rotation is expected, as conversion between electro-magnetic and gravitational potential affects both gravity and rotation of mass.
For terrestrial planets surface gravity is defined unrelated to pressure, as gravity at ground (sea) level. The calculated value matches Venus gravity at the transition zone between mesosphere and thermosphere.
For Earth, the value matches the transition zone between upper and lower mantle, or, if one calculates with constant mass, it is, just like in case of Venus, the value of height of the mesosphere/thermosphere transition zone, but negative (below surface). So, here too, the cyclic nature of surface gravity (and fossilization) is evident.
The *constants* h ($\hbar$) and G (gravitational constant) are scale dependent, but they also must oscillate. The above results could thus be interpreted as due to oscillation of energy of space (as h/G directly depend on it).
This oscillation may be, for the electron, confined to the atom, at least at non-condensing temperatures.
Another interpretation for the excitations of G is the absorption of large scale external gravitational waves, however, these cannot explain the confinement of the oscillation to atoms.
In any case, when comparing small scale atoms with large scale atoms (ie. planetary systems), one must not only choose a proper reference frame and take into account the possible effects of measurement, but resolve the issues of QM - make *constants* (properties of space) relative, with proper attribution of relativistic effects.

If surface gravity and spin radius are both quantized, then mass of the maximum must be quantized too:

$$g = \frac{GM}{r_s{}^2}$$

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$$M = \frac{g}{G} {r_s}^2$$

g = gravity of the maximum
M = mass of the maximum
r_s = radius of the maximum

and, with all three components quantized (m, v, r), the orbital angular momentum would now be quantized if mass would be the same for all inner/outer planets.

Indeed, looking at required total mass in Table 4, the sole required mass that doesn't match others well is that of Jupiter. But that can easily be solved, if one assumes that energy level n is 2 instead of 1.
It is similar for inner planets, setting n = 6 for Venus and n = 9 for Earth, yields good results.
Note that, in both cases, n is decreasing with a decrease in distance from the Sun.

However, masses between planets are not the same. But solution for that exists and it must be in vertical energy (mass) oscillation of particles between generations.

The fact that similar planets (Venus/Earth, Uranus/Neptune) share the energy level (n) fits well with the quantum hypothesis.

The relative high excitation of Mars (n = 10) and no excitation of Jupiter (n = 1) indicates the system is in 6p4n state.

Note that the following should be satisfied (with oscillations in superposition):

$$\frac{N}{P}\frac{\hbar_{m_2}}{\hbar_{m_1}} = \left(1 - \frac{h_{g_1}}{h_{g_2}}\right)\frac{\hbar_{m_2}}{\hbar_{m_1}} = \frac{m_p}{m_e},$$

where m_p, m_e are masses of standard proton and electron, respectively. The factor N/P is the ratio of neutrons to protons in the Solar System.

Some examples of planetary configurations for various states is shown in Table 6.

Table 6. Examples of discrete surface gravity and orbital distance for inner planets

base	state	N/P	surface gravity/orbital distance examples
Carbon	6p4n	4/6 = 2/3	Mercury 3.7 (0.25 MAU, n=5), Venus 8.87 (0.5 MAU, n=3), Earth 9.798 (0.66 MAU, n=3), Mars 3.71 (1 MAU, n=10)
Boron	5p5n	5/5 = 1	Mercury B 3.32 (0.2 MAU, n=5), Venus/Earth A 5.25 (0.5 MAU, n=5), Earth B/Mars 6.43 (0.75 MAU, n=5)
Beryllium	4p6n	6/4 = 3/2	Venus/Earth A 1.85 (0.25 MAU orbit, n=10), Earth B/Mars 37.1 (1 MAU, n=1)

This shows direct entanglement of standard proton and electron mass with planetary mass and configuration.

As all *constants*, constant masses of standard protons and electrons are a superposition of oscillation. As with the $\hbar$ constant, the oscillation can be detected on large scale.
On standard (U_0) scale, proton to electron mass ratio is:

$$\frac{m_p}{m_e} = 1836.15267343(11)$$

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On U_1 scale:

$$\frac{N}{P}\frac{\hbar_{m_2}}{\hbar_{m_1}} = 1840.66694172611441$$

$$\left(1 - \frac{h_{g_1}}{h_{g_2}}\right)\frac{\hbar_{m_2}}{\hbar_{m_1}} = 1826.09096003909666$$

From these, the value of superposition might be obtainable using the EH operator, ie. using 12/4 for the 1st order approximation:

$$EH_{12/4}(,\lambda) + \left(1 - \frac{h_{g_1}}{h_{g_2}}\right)\frac{\hbar_{m_2}}{\hbar_{m_1}} = \frac{m_p}{m_e} = 1836.182024284$$

$$\lambda = \frac{N}{P}\frac{\hbar_{m_2}}{\hbar_{m_1}} - \left(1 - \frac{h_{g_1}}{h_{g_2}}\right)\frac{\hbar_{m_2}}{\hbar_{m_1}} = \left(\frac{h_{g_1}}{h_{g_2}} + \frac{N}{P} - 1\right)\frac{\hbar_{m_2}}{\hbar_{m_1}}$$

The transition from 6p4n to 5p5n state likely includes:

- collapsing (vertical) scale of gravitational maxima,
- loss of one outer gravitational maximum (death of Neptune electron), dead matter remains,
- Mars' gravitational maximum fusing with one of Earth's gravitational maxima,
- fusion of Venus' gravitational maximum with remaining Earth's gravitational maximum,
- Mercury losing one gravitational maximum,
- small possibility of life changing base to boron,
- formation of a new dwarf planet in the main asteroid belt,
- space between planets expanding (Solar System expanding),
- Solar System increasing orbital momentum (velocity), decreasing spin momentum,
- spin momentum of planets increasing.

The transition from 5p5n to 4p6n state likely includes:

- scale collapse stop,
- loss of one outer gravitational maximum (Uranus e), dead matter remains,
- significant increase of Mars' gravity,
- death of Mercury, dead matter remains,
- significant increase of Venus' real mass, decreasing surface gravity,
- no complex surface life on Earth,
- formation of a new dwarf planet in the main asteroid belt,
- further expansion of space between planetary orbits,
- further increase of orbital momentum (velocity), decreasing spin momentum,
- further increase of planetary spins.

10.1. Proper quantization in QM

If one wants to compare the Solar System with a room temperature equivalent of a carbon atom in the context of QM, one must reduce the effects of exchange of em potential with neutral gravitational potential due to condensation and lepton oscillation.

In that case, real mass component of the total initial momentum (Q1.3, Q1.4), which is equal (relatively, but difference is negligible) between bound electrons, is the correct mass to be used in comparison.

Total initial momentum is the angular momentum, it is quantized and for all electrons in ground state should be equal to:

$$m_{re}\, v_{tot}\, r_a = \frac{1}{2}\hbar$$

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However, generally, total momentum is the sum of orbital and spin components.

Each quantum sub-shell may contain up to 2 electrons. If these are in condensed (bosonic) form, their momenta are strongly coupled, they will *behave* as a single body, and the proper equation for the magnitude of total angular momentum per sub-shell is:

$$m_{re}\, v_{tot}\, r_a = \sqrt{l\,(l+1)}\hbar + s\hbar \qquad \text{(Q2.1)}$$

$$v_{tot} = v_a + v_s = v_a + \frac{2\pi R_s}{T_s}$$

R_s = spin radius
T_s = spin rotation period

where s is the total [magnetic] spin of electrons in a sub-shell.

> Generally, two fermionic particles have to have anti-aligned spin (ie. -1/2 and +1/2) to occupy the same sub-shell, however, with the exchange of electro-magnetic potential for gravitational potential the fermionic nature is converting to boson nature and some spin components can be annihilated. The annihilation of spin can be confined to single axis (in other directions, electro-magnetic magnitude is exchanged for gravitational), thus it is possible for a sub-shell to have 0 total spin even if it is occupied by a single particle (1e). It is also possible for total spin to be equal to 1 in 2e states, but this may indicate that conversion started when 2 particles were separated (had the same magnetic spin).
> Therefore, here spin momentum magnitude s can have the following values: 0, ±1, ±1/2.
> Another interpretation of integer spins in 1e states is pairing with a neutral fermion (ie. neutrino).

Since the value of m_{re} here is constant, its value is irrelevant to prove QM equivalent quantization. For the sake of argument, let it be equal to $7 * 10^{19}$ kg.

Since Jupiter has to be in 2e configuration (even if Solar System would not be the carbon [equivalent] atom), it is appropriate to derive $\hbar$ from its momentum.

Assuming n = 1 (as expected) for Jupiter, l must be equal to 0, with s equal to 1, the $\hbar$ is:

$$\hbar = m_{re}\, v_{tot}\, r_a = 1.382 * 10^{36}\ Js$$

Derived values of l and s (and obtained $\hbar$ using these values) for all the outer planets are shown in Table 7. The obtained value of $\hbar$ for Uranus shows remarkable agreement with Neptune. The $\hbar$ values for Saturn and Jupiter still agree well with Neptune's $\hbar$ (up to the second decimal), but increase in value with increase in spin radius is obvious. Likely reason for this is oscillation of spin velocity (radius) as noticed previously in quantization of gravitational momentum. Note that this is equivalent to $\hbar$ oscillation, if one is to conserve discrete quantum numbers.

Table 7. Obtained values for l, s and $\hbar$ for outer planets

n	conf.	l	s	planet	orbital vel. v_a (m/s)	orbital radius r_a (10^6 km)	spin vel. v_s (m/s)	spin radius R_s (km)	spin rot. period T_s (h)	calc. $\hbar$ (Js)
5	1e	1	1/2	Neptune	5430	4495.06	2668	24622	16.11	$1.3310 * 10^{36}$
5	1e	1	0	Uranus	6800	2872.46	2568	25362	17.24	$1.3319 * 10^{36}$
3	2e	1	0	Saturn	9680	1433.53	9538	58232	10.656	$1.3636 * 10^{36}$
1	2e	0	1	Jupiter	13060	778.57	12293	69911	9.9250	$1.3817 * 10^{36}$

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However, the orbital radius oscillates too. Note that orbital velocity is almost equal to spin velocity for planets in 2e configuration (Jupiter and Saturn). Setting orbital velocity equal to equatorial spin velocity and decreasing spin velocity proportionally yields much better results for Jupiter:

$$\hbar = m_{re}\, r_a\, v_{tot} = m_{re}\, r_a \left(\frac{v_e}{v_a} v_a + \frac{v_e}{v_a} v_s\right) = 1.33 * 10^{36}\ Js$$

v_e = 12571 m/s

and, similarly, for Saturn:

$$\hbar = m_{re}\, r_a\, v_{tot} \frac{1}{\sqrt{2}} = m_{re}\, r_a \left(\frac{v_a}{v_e} v_a + \frac{v_a}{v_e} v_s\right) \frac{1}{\sqrt{2}} = 1.3372 * 10^{36}\ Js$$

v_e = 9871 m/s

These results show that constants in QM are the result of superposition (average) of oscillating values.

One may attempt to do the same with positive charges (terrestrial planets), however, here, determination of spin radius is more challenging and spin rotation period is not primordial.

Instead of using matter velocity, better results should be obtainable using space (Keplerian) velocity at R_s (which is primordial):

$$v_s = \frac{2\pi R_s}{T_s} = \sqrt{\frac{GM}{R_s}}$$

G = G_0 = standard gravitational constant = 6.674 * 10^{-11} m^3/kgs^2

One possible configuration is shown in Table 8 (with l and s of Earth/Mercury mirroring Saturn/Jupiter, Venus/Mars mirroring Uranus/Neptune, and spin velocity of Mercury set to its perihelion velocity). Note that roughly the same $\hbar$ for Earth can be obtained by setting l to 1, s to -1/2, and spin velocity equal to Keplerian velocity at surface.

Table 8. Possible configuration of inner planets

n	conf.	l	s	planet	total mass (10^{24} kg)	orbital vel. v_a (m/s)	orbital radius r_a (10^6 km)	spin vel. v_s (m/s)	spin radius R_s (m)	calc. $\hbar$ (Js)
10	1e	1	1/2	Mars	0.642	24070	227.92	27650	56044	4.3107 * 10^{35}
3	2e	1	0	Earth	5.972	29780	149.6	28435	492971	4.3107 * 10^{35}
3	1e	1	0	Venus	4.868	35020	108.21	45462	157195	4.3107 * 10^{35}
5	2e	0	1	Mercury	0.330	47360	57.91	58980	6333	4.3107 * 10^{35}

Note that spin radius R_s should correspond to a detectable discontinuity. By these results, this may be the inner inner core boundary or a dipole offset.

However, proper spin radius equivalent to the spin radius of outer planets can be calculated.

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From Q1.2 - Q1.5 follows that current mass of a planet is a result of conservation of momentum (and velocity) during collapse of the orbital (*non-localized*) maximum to a spin maximum:

$$m_{re}\, v_s\, r_a = m_{img}\, v_s\, r_s \tag{Q2.2}$$

With m_{re} equal to 7 * 10^{19} kg and with the assumption that r_a is, for all terrestrial planets, equal to current orbital radius, spin radius is:

$$r_s = \frac{m_{re}}{M} r_a$$

Here, spin radius should correspond to charge radius. However, obtained radii for Mercury and Mars are much larger then their current surface radii, indicating that either the collapse did not occur at r_a or there were additional collapses.

Table 9. Calculated spin radius for inner planets

n	conf.	planet	total mass M (10^{24} kg)	orbital radius r_a (10^6 km)	spin radius r_s (m)
10	1e	Mars	0.642	227.92	24851090
3	2e	Earth	5.972	149.6	1753428
3	1e	Venus	4.868	108.21	1556019
5	2e	Mercury	0.330	57.91	12283939

Interestingly, calculated spin radius of Mars is roughly equal to radius of Neptune. It is also roughly equal to orbital radius of Deimos, the outermost moon of Mars, which may be interpreted as evidence of Mars' primordial (ground state) charge radius and a source of quantization of Moon radii.
If that is indeed the case, remains of moon charges of Mercury might also be present around the 12k km orbit and small deviation between the obtained spin radius and the orbit of Deimos may be attributed to oscillation of radii or mass (real mass of 6.6 * 10^{19} kg gives the orbit of Deimos).
I believe current moons of Mars are remains of larger moons the gravitational maxima of which have collapsed into Mars in the process of planetary neurogenesis (hypothesis which will be presented later), thus, it is possible the original orbit was equal to obtained spin radius.
Collapse of moons in this process is simultaneous with the recession of a planet's magnetic field. Moons with a distinct gravitational maximum are thus entangled with the magnetic dipole of the planet.UPDATE 2022.03.07:

Indeed, recent research suggests that large satellites (moons) are required to sustain the magnetic fields of terrestrial planets[37]. If the obtained spin radius is the ground state radius, the excited radius [for terrestrial planets] is likely the ground radius divided by n.
For Mercury and Mars, this gives roughly the radius of Mercury (2x radius of Mars' core, 2x radius of Earth/Mercury inner core).
For Earth, this gives the inner inner core radius or possibly dipole offset maximum (the dipole offset orbital [radius] thus being the real charge radius, opposed to the induced one in the outer core).
Note that, core differentiation into molten outer and solid inner part should be associated with 2e configuration. Both Mercury and Earth are hypothesized to be in 2e configuration and both presently do have differentiated cores. Current data on Mars indicates its core is likely entirely liquid, again, consistent with hypothesized 1e configuration. The same should thus be true for Venus.

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However, even in 1e configuration, core splitting is expected in the early stage of planet development and may even periodically occur in adult form.
If Solar System maxima are oscillating between ^{10}C and ^{10}Be configuration, even with a change in scale [of a maximum], Mars must periodically exist in 2e configuration (acquiring one of Earth's maxima, while Earth acquires Venus' maximum).
Even if lifetime of a ^{10}Be configuration may be short, created temperature difference in the core should be sustainable over longer periods of time if the collapse of 2e configuration *induces* splitting of a 1e maximum into 2 quanta.
Since both Mars and Venus appear to have been habitable on surface some time ago, both must have been in such configuration. The switch likely occurs with the end of a 1st order Solar System cycle (4.25 Gy), but it likely also has precursors of shorter duration with the end of 2nd (≈26 My) and 3rd (1.512 My) order cycles.
There is a high possibility that Mars' surface (or at least part of it) becomes *habitable* for a short period of time with the end of each cycle, not only when these are synchronized with the end of a major (1st order) cycle.
In any case, as I am convinced the Solar System is at the end of a major cycle, I believe the magnetic field of Mars will be restored within a decade or a couple of decades at most, and, once it is stabilized, should persist for millions of years.
If 1e configuration can split into a 2e equivalent, two maxima of 2e configuration can certainly fuse into a 1e equivalent maximum. Generally, this happens when a planet reaches the adult stage (acquired real mass with its own gravity stimulates inflation of the inner core maximum), but the same effect can also be achieved with suspended animation (spin momentum), as demonstrated by Mercury.
Simultaneously with increasing habitability of Mars, one can thus expect decreasing habitability of Earth.

However, here the actual value of m_{re} is important and another interpretation is possible - the initial assumption of great symmetry may be wrong. While outer planets correspond to electrons of an atom, the inner planets correspond to parts extracted from the nucleus and these may not all be positrons and not even leptons (rather quarks). In that case, chosen m_{re}, while it gives good results for Venus and Earth, is not appropriate for Mercury and Mars - it should be smaller.

Assuming m_{re} smaller by the ratio of mass between Earth and Mercury, one obtains a charge radius for Mercury of 679 km and 1373 km for Mars, which seem to be appropriate.

There are different possible interpretations of m_{re}. It could be interpreted as the total mass of a naked particle (graviton of particular scale) before coupling (in CR, naked or non-localized particles have non-zero mass, although, if total mass is the sum of real and img mass - as defined in CR[38], the img component of mass in this case would be zero).

10.2. Quantization of radii and gravity

From:

$$\frac{1}{g}vr = nh_g$$

and:

$$v^2 = rg_s = r\frac{GM_\odot}{r^2} = \frac{GM_\odot}{r}$$

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follows:

$$r = n^2 \frac{g^2 {h_g}^2}{GM_\odot} = n^2 \frac{GM^2 {h_g}^2}{{r_s}^4 M_\odot} \tag{Q2.3}$$

While, from Q2.1 and Q2.2, orbital radius is:

$$r = \frac{1}{m_{re} v_{tot}} \left(\sqrt{l\,(l+1)} + s \right) \hbar = \frac{1}{m_{re} \left(\sqrt{\frac{GM_\odot}{r}} + \sqrt{\frac{GkM_\odot}{r}} \right)} \left(\sqrt{l\,(l+1)} + s \right) \hbar$$

$$r = \frac{1}{{m_{re}}^2 GM_\odot \left(1 + \sqrt{k}\right)^2} \left(\sqrt{l\,(l+1)} + s \right)^2 \hbar^2 \tag{Q2.4}$$

For outer planets:

$$\hbar = g_0 \, h_g \, m_{re} = 1.3310 * 10^{36}\, Js \tag{Q2.5}$$

Here, square root of k is another quantum momentum magnitude [sum], shown in Table 10. From Q2.3 and Q2.4 follows that surface gravity is quantized:

Table 10. Obtained k momentum for outer planets

n	configuration	l	s	planet	$\sqrt{k}$
5	1e	1	1/2	Neptune	$\frac{1}{2}$
5	1e	1	0	Uranus	$\sqrt{\frac{1}{2}\left(\frac{1}{2}+1\right)} - \frac{1}{2} = \frac{\sqrt{3}}{2} - \frac{1}{2}$
3	2e	1	0	Saturn	1
1	2e	0	1	Jupiter	$\sqrt{\frac{1}{2}\left(\frac{1}{2}+1\right)} = \frac{\sqrt{3}}{2}$

$$g = \frac{1}{n} \frac{\left(\sqrt{l\,(l+1)} + s \right)}{\left(1 + \sqrt{k}\right)} g_0$$

where g_0, equal to 43.43 m/s^2, is the quantum of gravity.

From Q2.3 and with total mass equal to:

$$M = m_{img} = m_{re} \frac{r_a}{r_s} = m_{re} \frac{r}{r_s}$$

follows that spin radius r_s is quantized too:

$$ {r_s}^6 = n^2 r \frac{G {m_{re}}^2 {h_g}^2}{M_\odot}$$

Combined with Q2.4 and Q2.5:

$$ {r_s}^3 = n \frac{\left(\sqrt{l\,(l+1)} + s \right)}{\left(1 + \sqrt{k}\right)} \frac{\hbar^2}{g_0 m_{re} M_\odot}$$

$$r_s = \left[n \frac{\left(\sqrt{l\,(l+1)} + s \right)}{\left(1 + \sqrt{k}\right)} \frac{g_0 m_{re} {h_g}^2}{M_\odot} \right]^{\frac{1}{3}}$$

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Note that the constant on the right is, for m_{re} = 7 * 10^{19} kg, equal to:

$$\frac{g_0 m_{re} {h_g}^2}{M_\odot} = 2.93050621 * 10^{20}\ m^3$$

apparently an integer multiple of the speed of light on U_1 scale (2.93 * 10^6 m/s).
For Neptune this gives spin (charge) radius equal to half of the current surface radius - as expected, like in case of Earth, real charge radius should be half of the mass radius of the maximum (for Earth, mass radius of the maximum is the inner core radius).
Note that dipole offset for Neptune is roughly half the radius, consistent with the result.
For m_{re} equal to 5.6 * 10^{20} kg, one gets the mass radius of the maximum (surface radius).
The result is similar for Uranus.
Note that the equation might not give accurate current spin radius for Jupiter and Saturn. Reason for this may be that the initial assumption of current radius being equal to collapse radius (r_a = r) is not valid, however, more likely explanation is oscillation of mass (and therefore, spin radius) - even if the Solar System is carbon-like, its negative and positive charge components are not necessarily all electrons and positrons.
Inflation of mass can be asymmetric due to lepton oscillation.
However, the result for Jupiter gives radius exactly two times the dipole offset of Saturn in surface radius relative units (2 x 0.03778 R = 0.07557 R), but roughly 2/3 the actual dipole offset of Jupiter (0.119 R). The value is also equal to dipole offset of Earth (0.076 R).
On the other hand, the result for Saturn gives radius 0.146 R (4 x 0.0365 R), closer to dipole offset of Jupiter.
Again, these results suggest the cause for deviation is oscillation.

For inner planets, the constants are different:

$$h_g = h_{g1} = 1.482496 * 10^{14}\ ms$$

$$\hbar = g_0\, h_g\, m_{re} = 4.5069360896 * 10^{35}\ Js$$

and possible quantization parameters, along with the calculated spin radius, are shown in Table 11. Note that the above parameters for Mars' orbital radius give a perihelion rather than a semi-major axis, suggesting that it (and generally, planets with large eccentricity) may be in a superposition of two quantum states.

Table 11. Possible quantization parameters and spin radii for inner planets

n	conf.	l	s	planet	$\sqrt{k}$	spin radius (m)
10	1e	1	1/2	Mars	$\sqrt{\frac{1}{2}\left(\frac{1}{2}+1\right)}+\frac{1}{2}=\frac{\sqrt{3}}{2}+\frac{1}{2}$	6477988
3	2e	1	0	Earth	1	4146215
3	1e	1	0	Venus	$\sqrt{\frac{1}{2}\left(\frac{1}{2}+1\right)}+\frac{1}{2}=\frac{\sqrt{3}}{2}+\frac{1}{2}$	3920325
5	2e	0	1	Mercury	$\sqrt{\frac{1}{2}\left(\frac{1}{2}+1\right)}+\frac{1}{2}=\frac{\sqrt{3}}{2}+\frac{1}{2}$	4140950

Results for spin radius are obviously wrong, most likely reason for this is the bad h_g constant as it is based on gravity at surface radius, which, for inner planets, is not defined as the radius of a gravitational maximum.

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However, correlation with dipole offsets is still present. Calculated spin radius of Earth/Mercury is almost exactly 10 times the experimentally obtained dipole offset of Mercury (414.7 km).

If the assumption of charge radius being 10 times lower than calculated spin radius for terrestrial planets is valid, somewhat larger current offset for Earth (484.7 km from centre) must be the result of oscillation (superposition) and faster rotation.

Consistent correlation of results with dipole offsets suggests the primary or primordial source of magnetic dipoles in planets is concentrated (collapsed) orbiting charge with a large spin momentum close to the dipole offset radius, rather than currents induced with Coriolis force in outer parts of differentiated cores.
In fact, deviation of a dipole offset from calculated value should, in some part, be due to induced currents rather than oscillation.
In that case, faster rotation rates and greater liquid mass would introduce greater deviation. This is consistent with obtained results, as Jupiter and Saturn do rotate much faster than Uranus and Neptune, while Earth rotates much faster than Mercury.
However, as calculated and experimentally obtained dipole offsets both seem to be multiples of ≈0.034-0.038 R, only deviation from integer multiples of that quantum may be attributed to induced currents, the rest is more likely due to [quantized] oscillation.

Using the radius of a gravitational maximum for Earth (1206115 m), one obtains the proper h_g constant for charge radius calculation of inner planets:

$$h_g = h_{g_1} = \frac{vr}{gn} = 5.419815085 * 10^{12}\, ms$$

v = Earth's orbital velocity = 29780 m/s
r = Earth's orbital radius = 149.6 * 10^9 m
g = gravity of the maximum = 274 m/s^2
n = 3

Results obtained using this constant are shown in Table 12. These are now much closer to dipole offsets. Difference should be attributed to oscillation.

Table 12. Possible quantization parameters and spin radii for inner planets, with corrected h_g

n	conf.	l	s	planet	$\sqrt{k}$	spin radius (m)
10	1e	1	1/2	Mars	$\sqrt{\frac{1}{2}\left(\frac{1}{2}+1\right)}+\frac{1}{2}=\frac{\sqrt{3}}{2}+\frac{1}{2}$	713566
3	2e	1	0	Earth	1	456716
3	1e	1	0	Venus	$\sqrt{\frac{1}{2}\left(\frac{1}{2}+1\right)}+\frac{1}{2}=\frac{\sqrt{3}}{2}+\frac{1}{2}$	431833
5	2e	0	1	Mercury	$\sqrt{\frac{1}{2}\left(\frac{1}{2}+1\right)}+\frac{1}{2}=\frac{\sqrt{3}}{2}+\frac{1}{2}$	456136

Models of the dipole location of Earth indeed show oscillation, in the last 10000 years it has oscillated from a maximum of 414.7 km (equal to a dipole offset of Mercury) in the western hemisphere to a maximum of 554.7 km in the eastern hemisphere[39].

Dipole offset in current models is thus a superposition (arithmetic mean) of these two maxima (484.7 km).

The agreement of 414.7 km maximum with the dipole offset of Mercury suggests that either:

- the influence of rotation on the offset is negligible,
- rotation stops once the maximum is reached,

 doi:10.20944/preprints202105.0488.v9

- induced currents are created at the expense of primary charge, effectively transferring the charge radius from inner core to outer core.

Possibly, this is the effect of conservation of momentum, where spin of the primary charge is reduced at the expense of core rotation.

10.3. Lepton oscillation model

In the previous chapter it was hypothesized that the discrepancy between the QM model of the atom and the Solar System can be resolved by lepton oscillation.

This can be solely mass oscillation, which requires external energy, or the oscillation of general force *flavor* which does not require much external energy as mass is inflated with the exchange of polarized (electro-magnetic) potential with a neutral gravitational potential (it does need stimulation though, most likely by resonance - synchronization).

However, while general force flavor has certainly been changed to [dominantly] neutral with a change in vertical energy level, difference in mass between the outer planets is too large compared to a difference in electro-magnetic energy to be explained by general force oscillation alone.

If the Solar System has been inflated, as hypothesized, from a smaller scale atom, then likely there was enough energy for a superposition of electron mass eigenstates.

Taking into account that these electrons are also neutralized, superposition becomes even more likely (charged leptons repel) due to lower energy requirements.

With oscillation and inflation taken into account, the fact that planets of the Solar System have different masses goes in favour of it being the atom, rather than against it.

However, the excess energy left after the vertical energy level increase (inflation) might not be the only source of superposition. Most energy in the vertical energy level change is spent on inflation - not flavor oscillation, so even without inflation, the flavor oscillation energy can be provided by the nucleus or absorption of properly scaled gravitational waves.

Atoms which are not under influence of strong external magnetic fields may be dominantly in neutral or oscillating configuration, regardless of scale - there is a lot of energy for mass oscillation in nucleons.
If neutrinos oscillate in flight they must be absorbing energy in space, but their flavor may instead be predetermined with oscillation of particles inside the atom. In fact, lepton oscillation [of electron scale particles] might be confined to atoms if discharge of outermost particles is synchronized with their mass flavor being in ground (lowest energy) state in a form of electron. There is no such requirement for neutrinos as their mass is much lower than that of the electron. Probability of discharge of masses greater than electron mass might be simply too low due to much greater gravitational attraction.

With no absolute constants allowed and implied oscillation of relative *constants*, oscillation in the energy of space is predicted by CR.

With no oscillation, in the Solar System, the inner planets would all be in positron equivalent states, while outer planets would be scaled electrons.

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Note that, with em force almost completely neutralized (especially for inner planets), due to equal energy of positrons and electrons there are no large differences between these particles, apart from anti-alignment of magnetic spins.
One might ask why and how are positrons created (extracted) here? The answer is in neutralization - when charged they balance the electrons and, most likely, they are, together with neutrinos (main dwarf planets), the result of β^+ decay of protons. However, due to charge neutralization, instead of being ejected from the nucleus, they remain bound to it.
The β^+ process implies that each positron ($1e^+$ terrestrial planet) or positron pair ($2e^+$ terrestrial planet) is entangled with a specific neutrino ($1\nu_e$ main dwarf planet) or a neutrino pair ($2\nu_e$ main dwarf planet) since the entangled pairs have been created at the same time, through the intermediate W^+ boson.
Note also, that, in order for the equation Q1.1 to remain valid, the excitation of Neptune must be equal to the [scaled] excitation of the nucleus (Sun).
Thus, for the Solar System atom, and perhaps generally, the oscillation is synchronized between the innermost and outermost parts of the atom, consistent with absorption of wave-like forms of energy.
The oscillation can thus explain the difference in masses between the planets, but the oscillation itself should be quantized.

10.3.1. The creation

Applying neutralization and lepton oscillation to the model of inflation (vertical energy level change), one can now reconstruct the history of the Solar System development.

With inflation, the [absolute] distance between particles is increasing. Assuming the system started in polarized state, neutralization will be decreasing [relative] distance between equally charged particles.

Note 1: The only reason for neutralization during inflation may be a difference in [relative] external magnetic field strengths between the two scales, with larger scale system being under influence of much weaker magnetic fields.

Note 2: If the inflation starts with an already neutral system, the end result is similar. In that case, large scale system is a relative clone of the small scale system, with no energy wasted on neutralization, only on inflation. However, any excess energy (beyond the discrete energy needed to change the vertical energy level) will result in cloning *imperfections* proportional to the excess energy.

Note 3: Only naked [gravitational] maxima are inflated, real mass is acquired during and after inflation from existing mass (asteroid) fields. These fields are generally created with deflation of other maxima in nova like explosions. Deaths (deflations) and births (inflations) of a particular scale are relatively synchronized.

Based on wave-like appliance of energy, the inflation may have proceeded in this order:

1. Nucleus started inflating.
2. Jupiter 2e configuration started inflating. Even though 2e composites may have been separated initially, large energy of this configuration enabled the fusion of 2 electrons. With the inflation of Jupiter, 2e positron configuration was inflating. However, this configuration did not have enough

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energy for fusion and the positrons were left separated enough to form Mars ($1e^+$) and Mercury embryo ($1e^+$) which may be referred to as Vulcan.

3. Saturn 2e configuration started inflating. This one had less energy that Jupiter 2e, but still enough for fusion, while the positrons again, did not - however, the energy was bigger than in the first positron pair, resulting in the creation of Venus ($1e^+$) and Gaia ($1e^+$, Earth embryo).
4. Another 2e configuration started inflating. This one had even less energy than Saturn 2e, and, this time, not enough for fusion, so 2e separated into Uranus (1e) and Neptune (1e). A [relatively] simultaneous $2e^+$ inflation resulted in fusion of $1e^+$ with Vulcan, creating Mercury, and fusion of the other $1e^+$ with Gaia, creating Earth.

Note that, on the *right* (outer) side, the energy of inflation is decreasing, while on the *left* (inner) it is increasing. This fluctuation is the result of an attempt to balance the *left* and *right* side of the system.
Note also, that, if the original (small scale) system was in an electric field, the system did have a left and right (or top and bottom) side, not only inner and outer orbits.

Comparing energies of planets, lepton oscillation and the [attempt of] energy balancing is obvious.

Assuming that scaled mass of a standard electron (0.511 MeV/c^2) is equal to 0.511 * 10^{24} kg, scaled muon (105.658 MeV/c^2) is 105.658 * 10^{24} kg, while scaled tau particle (1776.86 MeV/c^2) has a mass of 1776.86 * 10^{24} kg, rough correlation with masses of Mercury/Mars, Neptune/Uranus and Jupiter is obvious.

The tau/muon/electron mass ratios are present within the inner and outer planets:

$$\frac{\text{Venus} + \text{Earth}}{\text{Mars}} \approx \frac{\text{Venus} + \text{Earth}}{2\text{Mercury}} \approx \frac{\text{tau}}{\text{muon}}$$

$$\frac{\text{Neptune}}{\text{Earth}} \approx \frac{\text{Uranus}}{\text{Venus}} \approx \frac{\text{Jupiter}}{\text{Neptune}} \approx \frac{\text{tau}}{\text{muon}}$$

$$\frac{\text{Outer planets}}{\text{Inner planets}} \approx \frac{\text{Uranus} + \text{Neptune}}{\text{Mercury embryo} + \text{Mars}} \approx \frac{\text{muon}}{\text{electron}}$$

but also in relation to the Sun:

$$\frac{\text{Sun}}{\text{Saturn}} \approx \frac{\text{tau}}{\text{electron}}$$

which suggests that the whole system is in superposition of particles of different generations.

The grouping and correlation of Venus/Earth and Uranus/Neptune here is understandable, as the pairs share the same quantum shell.
Correlation of Uranus/Neptune with Mercury/Mars lies in the fact that Mars and Mercury [embryo] were the first pair created on the inner side, while Uranus and Neptune were the last to be created on the outer side - with increasing energy on the inner side and decreasing on the outer side, the ratio of Uranus+Neptune/Mercury+Mars becomes roughly equal to the ratio of mass of outer to inner planets. This gives mass of 0.198 * 10^{24} kg for the Mercury embryo ($1e^+$).
Comparing Venus ($1e^+$) and Earth ($2e^+$), the addition of another maximum doesn't impact the total mass significantly (as most energy comes from neutralization which is, at least roughly, invariant to number of particles occupying the state).

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If Mercury embryo mass was entirely core mass, total core mass of current Mercury should be equal to:

$$\frac{\text{Earth core}}{\text{Venus core}}(\text{Mercury embryo mass}) = \frac{0.325}{0.32}0.198 * 10^{24}\,kg = 0.2011 * 10^{24}\,kg$$

, 61% of its total mass (for Venus' core at 32% of total mass, Earth's core at 32.5% of total mass).

Evolving event horizon (c_n) model In this model, particles are entangled with different event horizons (still, mostly concentrated between inner and outer charges) impacting their relativistic energies differently.

In Table 13, standard particle candidates are shown for each planet. Rest masses are relative to the possible event horizon of creation, specified in parentheses. Note that original rest mass may be bigger or smaller than relativistic mass, depending on the conditions in the annihilation (creation) event.

Most likely particle candidates are marked green. Rest mass in Table 13 was calculated using proper relativistic factor (Omega factor):

Table 13. Standard particle candidates for planets (green = most likely)

planet	relativistic mass M [10^{24} kg] (v)	rest mass M_0 candidates [10^{24} kg] (c_{EH})	particle candidates (MeV/c^2)
Mercury	0.330 (47.4 km/s)	0.361 (19.34 km/s = Vesta orbit), 0.353 (16.76 km/s = Hygiea orbit), 0.383 (24.1 km/s = Mars orbit), 0.489 (35 km/s = Venus orbit)	? (0.198), positron (0.511)
Venus	4.868 (35.0 km/s)	5.67 (17.905 km/s = Ceres orbit), 5.545 (16.76 km/s = Hygiea orbit)	anti-down quark (≈4.8)
Earth	5.972 (29.8 km/s)	7.47 (17.905 km/s = Ceres orbit), 7.47 (17.89 km/s = Pallas orbit), 4.77 (-17.905 km/s = -Ceres orbit)	anti-down quark (≈4.8)
Mars	0.642 (24.1 km/s)	1.076 (19.34 km/s = Vesta orbit), 0.383 (-19.34 km/s = -Vesta orbit), 0.461 (-16.76 km/s = -Hygiea orbit), 0.539 (-13.1 km/s = -Jupiter orbit)	positron (0.511)
Jupiter	1898.19 (13.1 km/s)	1396 (-19.34 km/s = -Vesta orbit), 1293 (-17.905 km/s = -Ceres orbit), 1824 (-47.4 km/s = -Mercury orbit)	D^- meson (1869), tau (1776.86), anti-charm quark (≈1275)
Saturn	568.34 (9.7 km/s)	491.4 (-19.34 km/s = -Vesta orbit), 477.7 (-17.905 km/s = -Ceres orbit)	K^- meson (493.7)
Uranus	86.813 (6.8 km/s)	80.285 (-17.89 km/s = -Pallas orbit), 94.982 (16.76 km/s = Hygiea orbit)	muon (105.658), strange quark (≈95)
Neptune	102.413 (5.43 km/s)	96.5 (-16.76 km/s = -Hygiea orbit)	muon (105.658), strange quark (≈95)

$$M_0 = M\left[1 - \left(\frac{v^2}{{c_n}^2}\right)^s\right]^{-\frac{1}{2}q}$$

$$q = sgn(c_n) = \frac{c_n}{|c_n|}$$

$$s = sgn({c_n}^2 - v^2) = \frac{{c_n}^2 - v^2}{|{c_n}^2 - v^2|}$$

c_n <> 0

q = sidereal polarization of the reference frame

s = polarization of mass relative to the reference frame

where $c_n = c_{EH}$ is the *rest* velocity of the reference frame (event horizon [fossil]).

Note 1: The correlation suggests that inflation energy for these planets came individually from specific particles, with roughly equal kinetic energy. This is consistent with the hypothesized matter/anti-matter atom pair annihilation - with colliding positron/electron pairs producing the particles inflated into planets.
Such annihilation would likely occur within the gravitational maximum (event horizon) discontinuity, sending created matter and anti-matter in opposite directions, perpendicular to the maximum.
The central galactic black holes and dark matter maxima in inner/outer layers of galaxies are likely remnants of such maxima.

Note 2: Due to neutralization, there are no significant differences between planetary systems created from matter and anti-matter atoms, apart from mass distribution - if the Solar System is created from matter (a *matter* of convention), in an anti Solar System inner planets would have greater mass than outer planets. The reason for this is the asymmetry of space at the event horizon, where opposite charges are separated to opposite sides of the horizon. Note that this implies that horizons are, at the moment of collapse, between outer and inner planets where, after collapse, a neutrino (main dwarf planet) is formed. Note that creation of matter at event horizons resolves the missing anti-matter problem in physics - there is no anti-matter missing, there is asymmetry in mass acquisition of stable charges due to non-homogeneous energy of space, proton is anti-matter equivalent of the electron from a proper reference frame. Thus, all positively charged particles are anti-matter particles, while negatively charged particles are matter particles (or vice versa, in alternative convention).
Note also that an event horizon for electron/positron annihilation can be provided by the atom nucleus itself - with the incoming electron, a maximum is extracted (expanded) from the nucleus (and possibly from the electron too) together with positron charge. At the point of annihilation, maximum (or a maximum pair) collapses with energy distributed between the created neutrino(s) and two charged particles, with none of them having enough energy to overcome escape velocity.
Due to mass asymmetry the pair will not annihilate again and the external energy (photons) is required to decouple mass and charge, and return the system to original state.
Likely, all annihilation events require expansion of particle maxima and creation of a temporary event horizon pair even if one [of larger scale] is already present at the point of annihilation.

Note 3: In CR, not only the flavors are oscillating, but, neither the rest or inertial mass is constant. Deviation from average mass is greatest in bound systems where it depends on the energy level particle occupies in the system.

Note 4: Correlation of standard masses with planetary rest mass in reference frames of orbits of bound neutrinos (main dwarf planets) is overall very good, with lower confidence only in case of the participants of the first planetary creation event - Mars and Mercury (unless the standard particle equivalent is yet to be discovered).
For Mars, the horizon at Jupiter orbit is a better fit, while for Mercury, it is the Venus orbit.

Note 5: Correlation of the Solar System with standard scale particle generations, reveals the existence of *new* particles in the standard model of physics (which, obviously, should be scale invariant), for example, if one interprets Saturn as K^-, the Sun/Saturn mass equivalence with tau/electron reveals 2 additional standard particles:

$$\frac{\text{tau}}{\text{electron}} K^- = 1717.751\, GeV = 1.72\, TeV$$

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$$\frac{\text{muon}}{\text{electron}} K^- = 102.143\, GeV$$

or, with the assumption of *new* energy splitting, a completely new generation (based on Sun's relativistic mass):

$$\frac{\text{tau}}{\text{electron}} X^n = 3477.228 * 571.864\, MeV = 1988.500\, GeV = 1.9885\, TeV$$

$$\frac{\text{muon}}{\text{electron}} X^n = 206.768 * 571.864 = 118.243\, GeV$$

or, with Sun's proper rest mass:

$$\frac{\text{tau}}{\text{electron}} X^n = 3477.228 * 537.552\, MeV = 1869.190\, GeV = 1.8692\, TeV$$

$$\frac{\text{muon}}{\text{electron}} X^n = 206.768 * 537.552 = 111.149\, GeV$$

One of these may have been discovered[40] already[41].

Evidently, using most likely particle candidates on the hypothesized particle configuration, the electric charges are in balance, as shown in Table 14.

Table 14. Standard particle candidates for planets, with listed electric charges

planet	configuration	particle species (charge)	total charge
Mercury	2e	positron (1 e^+)	2 e^+
Venus	1e	anti-down quark (1/3 e^+)	1/3 e^+
Earth	2e	anti-down quark (1/3 e^+)	2/3 e^+
Mars	1e	positron (1 e^+)	1 e^+
Jupiter	2e	anti-charm quark (2/3 e^-)	4/3 e^-
Saturn	2e	K^- meson (1 e^-)	2 e^-
Uranus	1e	strange quark (1/3 e^-)	1/3 e^-
Neptune	1e	strange quark (1/3 e^-)	1/3 e^-

Note that the initial assumption that Mercury is in a 2e state, while Mars is in a 1e state seems to be wrong. Comparing masses and tables 13 and 14, it seems more likely for Mars to be in 2e state and Mercury in 1e instead. This would make inner and outer configuration symmetric relative to the asteroid belt, something that's expected for a system in equilibrium. It also implies somewhat different creation (inflation) scenario than proposed.

The configuration gives total $4e^+$ charge for inner planets and $4e^-$ for outer planets.

The fact that charge configuration agrees well with the hypothesis of 6 particles on each side (Carbon configuration) but the mass for the same particle species agrees well with 4 total particles on each side (Beryllium configuration) indicates that the original hypothesis of $^{10}C/^{10}Be$ oscillation is correct.

The fact that the sum of charges on each sides is equal to 4, further confirms the hypothesis.

Thus, the Solar System may be interpreted as a hybrid, a superposition of 2 large scale atoms, ^{10}C and ^{10}Be.

Is this hybridization unique to the inflation through annihilation of smaller scale atoms, or this is a normal state even in atoms of standard scale?

In CR, of course, the process is scale invariant and cannot be unique to one scale only, even if one cannot set up a proper reference frame to observe it.

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The stability of atoms is achieved through neutral energy provided by neutral cores.
It is thus likely that all atoms are oscillating between polarized and non-polarized states.

Consider the case of elementary hydrogen (^{1}H).
If 1e+ charge (ie. positron) is extracted from the nucleus to balance the electron, what prevents them from annihilating?
Obviously, between the two particles there must exist an event horizon [pair], which collapses in the interaction, forming a [bound] neutrino, but also emitting a gravitational wave of 2 maximum quanta, one of which is absorbed by the electron, the other by the positron - pushing them to stable orbits and preventing annihilation.
Note that both positron and electron are now [even more] entangled and form a *standing* wave.
If absorbed maxima are neutral they will increase masses of particles, decreasing charges (albeit in asymmetric manner relative to event horizon). This may be negligible but a probability exists the absorption will trigger charge [scale] collapse and mass [scale] inflation inverting the dominant nature of general force (em/gravity exchange) between the particles.

Note that, with charge extracted, proton core too becomes neutral.
It appears that [outer event horizons of] proton cores favour giving energy to electrons, while neutrons favour positrons (correlated with spin anti-alignment). Asymmetry in neutralization energy between bound positrons and electrons is thus caused in mass difference between protons and neutrons (note that magnetic fields of outer planets are much less subdued than those of inner planets).

If one interprets Neptune as the electron, Jupiter contains the mass of two down quarks, while Saturn mass has been increased with the equivalent of one up quark mass (note that charges were separated from mass before neutralization).
Assuming these masses came from protons (nucleus is scaled equally to Neptune), there are only 4 complete protons left in the nucleus. If now free up quarks [masses] couple with down quarks of a neutron, it will be converted to 2 protons. With 6 protons and 3 neutrons left, 3 more neutrons are needed to balance the core.
With a complete neutron (2 down quarks + 1 up quark) mass on the outer side, and with remaining proton quarks left in the core, it might seem that neutralization is quantized by neutron mass.
However, the fact that Neptune and Uranus are significantly neutralized suggests that neutralization energy is correlated with quantum states and is likely scaling with element mass.
In any case, gas planets should always be the most charged ones.
Note that, with imaginary mass being dark matter and with outer planets having significant excess of gravitational potential compared to inner planets, Solar System mirrors the galaxy.
The reason why outer planets and nearby masses are not rotating faster is due to collapse of orbital maxima into spin momenta with acquisition of real mass (where Keplerian velocity indicates real mass/graviton coupling at full capacity).
Spin coupling, in case of carbon, indicates that, as a whole system, ^{12}C is more stable than ^{13}C, while ^{13}C nucleus is, due to equal number of protons and neutrons, more stable than ^{12}C nucleus.

With an excess of protons, too much energy on the outer side can cause the ejection of bound positrons and neutrinos, converting protons to neutrons.

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With an excess of neutrons, too much energy on the inner side can be enough to fuse bound positrons with the nucleus [core], converting neutrons to protons.
Standard model In this model, planets are simply correlated with appropriate quarks/leptons of the atom.

As noted elsewhere, in CR, both quarks and leptons should oscillate in mass within atoms. In example, it should not be unusual for an electron to be in a tau mass eigenstate at time of inflation (although, on standard scale, excited electrons don't generally spend much time in that state compared to lower mass states).

The correlation is shown in Table 15. If outer particles have to be leptons, possible sums of outer charges are as shown in Table 16. Obviously all masses can be correlated with standard particles (deviation can be attributed to mass oscillation, relativistic energies and possibly non-equilibrium states at the moment of inflation). Mercury and particularly Saturn show somewhat stronger deviation (even if 2e state is assumed, in case of Saturn) suggesting these may be correlated with currently unknown particles (or pairs of unknown particles), however, it could also be a consequence of a *non-equilibrium* state at time of inflation, ie. a superposition of muon and tau states, in case of Saturn.

Table 15. Standard particle candidates for planets (p1, p2, p3, p4, p5 hypothetical)

planet	mass M [10^{24} kg]	particle candidates (MeV/c^2)
Mercury	0.330	1 x positron (0.511), 1 x p1 (≈0.34)
Venus	4.868	1 x anti-down quark (≈4.8)
Earth	5.972	1 x anti-down quark (≈4.8) + 1 x positron (0.511), 1 x anti-down quark (≈4.8) + 1 x up_{CR} quark (1.2)
Mars	0.642	1 x positron (0.511) + 1 x p1 (≈0.34), 2 x p1 (≈ 2 x 0.34), 1 x positron (0.511) + 1 x p2 (≈0.17)
Jupiter	1898.19	1 x tau (1776.86), 2 x p3 (≈ 2 x 1013)
Saturn	568.34	2 x muon (2 x 105.658), 2 x p4 (≈ 2 x 253.3), 1 x p5
Uranus	86.813	1 x muon (105.658)
Neptune	102.413	1 x muon (105.658)

Table 16. Sum of outer charge

configuration	charge sum [e]
1 x tau, 1 x p5, 1 x muon, 1 x muon	-4
1 x tau, 2 x muon (or 2 x p4), 1 x muon, 1 x muon	-5
2 x p3, 1 x p5, 1 x muon, 1 x muon	-5
2 x p3, 2 x muon (or 2 x p4), 1 x muon, 1 x muon	-6

Mass eigenstates are relatively discrete states and should be most likely. However, although transitions between mass eigenstates are relatively fast, one cannot assume that every particle was settled at a particular mass eigenstate at the moment of inflation.
Also, as noted before, rest masses are not absolute constants in CR and should be understood as average values. In example, electron rest mass of 0.511 MeV/c^2 can be a time averaged mass of a single electron and/or a statistical average over many electrons.

But are leptons required?

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I have shown in CR, how 2/3 of electron charge can be exchanged for mass, converting electron to a down quark[42] (1/3 e) - where most of the mass goes to a force carrier graviton, giving atomic range for the resulting gravity. If inner anti-down quarks here are a result of exchange of positron charge for mass and this had to be reflected in outer particles, perhaps Saturn and possibly Jupiter represent a pair of muons which have both exchanged charge for mass.

Generalizing the equation (1.4) from CR, the resulting mass after exchange is:

$$M = (n)^2 \frac{q}{4\pi\epsilon_0} \frac{m}{GC} \left[\frac{MeV}{c^2}\right]$$

M = mass of the particle after exchange
n = fraction of charge exchanged
q = initial charge
ϵ_0 = vacuum electric permittivity = 8.85418782 * 10^{-12} F/m
m = initial mass [MeV/c^2]
G = gravitational constant = 6.674 * 10^{-11} m^3/kgs^2
C = 1 MeV/c^2

This, for the exchange of 1/3 charge of a single muon (q = 1 e = 1.60217733 * 10^{-19} C, m = 105.658 MeV/c^2, n = 1/3) gives a 253.3 MeV/c^2 particle. In 2e configuration this would then yield a mass of ≈ 2 x 253.3 = 506.6 MeV/c^2, very close to Saturn's 568.34 MeV/c^2.

Similarly, 2/3 of muon charge exchanged for mass gives 1013 MeV/c^2, which in 2e configuration becomes ≈ 2026 MeV/c^2, very close to Jupiter's 1898 MeV/c^2.

Note that, CR equation (1.4) - where electron is the initial particle, gives 4.9 MeV/c^2 for a down (or anti-down) quark mass, which agrees even better with Venus' mass than the initially assumed 4.8 MeV/c^2.
The equation gives 1.2 MeV/c^2 for the 2/3 e particle (up_{CR}), which when paired with an anti-down quark gives 6 MeV/c^2, in agreement with Earth's mass. The up_{CR} particle may be the same particle as the up quark in the standard model, however, there it is usually assumed to have somewhat higher mass.

With these exchanges, total charge on the outer side is:

$$2 \times \left(-\frac{1}{3}\right) + 2 \times \left(-\frac{2}{3}\right) + (-1) + (-1) = -4$$

which, again, suggests that the Solar System is both, a carbon and a beryllium atom at the same time - there are 6 outer particles (as in carbon) but -4 total charge (as in beryllium).

Note that the process of exchange is reversible - a particle can exchange mass for charge as well. In example, it should be possible for an electron to acquire more charge - the question is though how much, and if any, of additional charge would result in a stable particle (in any case, per CR postulates, charges are not absolutely constant, 1 e charge is an average of oscillation of charge). However, regardless of stability, any particle can be vertically excited and relative instability on one scale can become relative stability on a larger scale.
One could then regard the electron too as a resulting particle of charge/mass exchange.
Interestingly, assuming the initial particle is a composite of 2 particles of equal mass and each having a charge of 3/4 e, giving a total of 3/2 e charge, and assuming the electron is the result

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of exchange of 1/3 of that charge for mass, per the equation above, the composite would have to have a mass of 0.142 MeV/c^2, so the constitutional particles would each have a mass of ≈ 0.071 MeV/c^2 - almost equal to the Moon's 0.073 MeV/c^2.

10.3.2. Evaluation of invariance

Correlation between planetary masses and standard particles revealed in the previous chapter is remarkable, not only because ratios of particle masses are equal on both scales, but numeric values seem to be equal between kilograms on one scale and electron volts on another - differing only in the order of magnitude.

This reveals interesting relation between electric charge and speed of *light*:

$$eV = m\frac{c^2}{e}$$

$$m = eVK$$

$$e = c^2K$$

where K on the Solar system scale (U_1) is 1 * 10^{18} Cs^2/m^2.

Since planetary masses are derived from GM products, integer value of K must be the consequence of dependence of the gravitational constant G on the speed of light c.

Both values, gravitational constant G and c, have been determined from standard scale (U_0) experiments, thus:

$$G = G_0$$

$$c = c_0$$

Mass M of a planet is then determined through gravitational interaction between two bodies, equalizing centripetal force with gravitational force:

$$\frac{mv^2}{r} = \frac{GMm}{r^2}$$

$$v^2 = \frac{GM}{r}$$

$$M = \frac{v^2r}{G}$$

$$\frac{v^2r}{G_0}\frac{1}{K} = m_0\frac{{c_0}^2}{e_0}$$

$$\frac{v^2r}{G_0}\frac{{c_1}^2}{e_1} = m_0\frac{{c_0}^2}{e_0}$$

where r is the distance [from centre] to the orbiting body [centre], and v is its orbital velocity, and, in case of planets, also the fossil of the *rest* velocity of the gravitational field line (orbital maximum) before the collapse into a spin (satellite) maximum.

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Planets orbiting at *rest* velocity are effectively at rest in the system. Since every gravitational maximum has its personal space/time - planetary orbitals are orbits of space/time within another space/time.

Equalizing centripetal force with electro-magnetic force:

$$\frac{mv^2}{r} = \frac{1}{4\pi\epsilon_0}\frac{e^2}{r^2} = \frac{\mu_0 c^2}{4\pi}\frac{e^2}{r^2} = 1 * 10^{-7} c^2 \frac{e^2}{r^2}$$

$$m = 1 * 10^{-7}\frac{c^2}{v^2}\frac{e^2}{r}$$

Now equalizing M (gravitational mass) and m (charge mass):

$$M = m$$

$$\frac{v^2 r}{G} = 1 * 10^{-7}\frac{c^2}{v^2}\frac{e^2}{r}$$

$$G = 1 * 10^{7}\frac{1}{c^2 {e_0}^2} {v_0}^4 {r_0}^2$$

10.4. ħ constant weakness

Obvious dependency on the order of mass magnitude makes ħ a weak "constant", but at the same time explains why planetary orbits appear discrete while the orbits of small satellites seem unlimited. Obviously all masses m > 0 must have a quantized momentum.

11. G relativity and equivalence with gravity

If gravity is quantized and total mass M derived from gravity does not reveal quantization of angular momentum, apart from ħ scale dependence (oscillation), alternative interpretation is a variable gravitational *constant* G.

It is then a property of a gravitational well (maximum) and it depends on its scale.

Orbital angular momentum (Bohr interpretation):

$$Mvr = n\hbar$$

multiplied with (surface) gravity is:

$$gMvr = gn\hbar$$

$$g = \frac{vr}{n\hbar} gM$$

Fixing g on the right side (ie. M = mass of Neptune, g_0 = gravity of Neptune), multiplying with R^2/R^2:

$$g = \frac{vr}{n\hbar} g_0 M \frac{R^2}{R^2}$$

Fixing R in the numerator (ie. R_0 = radius of Neptune) and equalizing with Newton gravity:

$$g = \frac{vr}{n\hbar} g_0 {R_0}^2 \frac{M}{R^2} = \frac{GM}{R^2}$$

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Gravitational *constant* is:

$$G = \frac{vr}{n\hbar} g_0 {R_0}^2$$

v = orbital velocity
r = orbital radius
R = radius of the planet (spin radius)

Here, v, r and n are variable. One might then consider $\hbar$ a relatively strong constant, but g_0 and R_0 are weak.

It has been shown that g_0 alternates between two values (one taking rotation into account and one without it). The following can be concluded:

- all planets have mutually entangled properties,
- past/future state of g_0/R_0 is fossilized (memorized) in rotation period,
- gravitational *constant* G of a gravitational well depends on its own place in a larger gravitational well.

Note that G of a planetary gravitational well is here derived form its orbital momentum in a larger well, rather than its spin momentum.

Planets are orbiting stars, but their bodies are also orbiting their souls (gravitational maxima). Mantle of a planet can be interpreted as a moon to its core, just like a moon can be interpreted as a collapsed gravitational maximum (event horizon) of a planet. In that system, mantle/moon is the planet and a planetary core is the star.

In case the planet is not fully developed (has active moons - in case of inner planets, or doesn't have active moons - in case of outer planets), mantle layers are [relative equivalents of] asteroid belts and moons are [relative equivalents of] the planets charged oppositely to the outer core of the planet.

Thus, there are gravitational *constants* relative to that system (note that every spin momentum is orbital momentum - even though the surface and the centre are entangled, propagation of changes is not instant = there are no absolute point particles).

Current value of the standard gravitational *constant* ($6.674 * 10^{-11}$ m^3/kgs^2) was commonly measured on Earth's surface and is relative to an absolute reference frame. In interpretations where G is not scale invariant, proper G for gravitational maxima of inner planets can be obtained from surface gravity and real mass (m):

$$g = \frac{\hbar_{mg}}{m} = \frac{GM}{R^2} \tag{G1.1}$$

Assuming speed of matter (real mass) is significantly lower than the Keplerian speed of the maximum (generally valid for matter of solid bodies):

$$m = \frac{2\pi^2 {r_s}^3}{G{T_{re}}^2} \tag{G1.2}$$

m = real mass of the body relative to [the scale of] its gravitational maximum
r_s = radius of the gravitational maximum
T_{re} = weighted average period of rotation of real mass
R = surface radius

from (G1.1) and (G1.2) follows:

$$\hbar_{mg} \frac{G{T_{re}}^2}{2\pi^2 {r_s}^3} = \frac{GM}{R^2}$$

$$M = \hbar_{mg} \frac{{T_{re}}^2 R^2}{2\pi^2 {r_s}^3}$$

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with M calculated, one can now obtain G through (G1.1):

$$G = \frac{gR^2}{M} = \frac{1}{\hbar_{mg}} \frac{g2\pi^2 {r_s}^3}{{T_{re}}^2} = \frac{1}{\hbar_{mg}} \frac{g{v_{re}}^2 r_s}{2}$$

Note that this can also be written as:

$$G = \frac{1}{2} \frac{v_{re} r_s}{\hbar_{mg}} g \frac{2\pi r_s}{T_{re}}$$

$$G = \frac{v_{re} r_s}{\hbar_m} \hbar_g g \frac{\pi r_s}{T_{re}} = \frac{v_{re} r_s}{\hbar_m} \frac{vR}{ng} g \frac{\pi r_s}{T_{re}}$$

$$G = \frac{v_{re} r_s}{\hbar_m} \frac{\pi R^2}{Tn} \frac{2\pi r_s}{T_{re}} = \frac{v_{re} r_s}{n\hbar_m} \frac{2\pi^2 r_s}{TT_{re}} R^2$$

substituting middle term for g_0:

$$g_0 = \frac{2\pi^2 r_s}{TT_{re}}$$

$$G = \frac{v_{re} r_s}{n\hbar_m} g_0 R^2$$

v_{re} = matter (real mass) rotation speed at the gravitational maximum r_s

This relation is now equivalent to the obtained relation for G from orbital momenta.

Note that for Earth, where r_s = 1206115 m (≈ inner core radius) and T = T_{re} = 24h = 86400 s:

$$g_0 = 0.00319 \frac{m}{s^2}$$

which would match exactly the gravity of the inner core [maximum] with mass M equal to previously calculated real mass of Earth (m = 6.95 * 10^{19} kg):

$$g_0 = \frac{Gm}{{r_s}^2} = 0.00319 \frac{m}{s^2}$$

With r_s and mass remaining constant, increase of g_0 must be the result of increase in gravitational *constant* G.

The value of the gravitational *constant* G for Earth's maximum, with g_0 = 274 m/s^2 (presumed primordial state):

$$G = \frac{g_0 {r_s}^2}{m} = 5.731534632 * 10^{-6} \frac{m^3}{kgs^2}$$

Note that I often write results with a lot of decimals - suggesting high precision, however, in a lot of cases this interpretation is wrong as variables in the equation commonly have varying precision and uncertainty. Thus, uncertainty of the result usually grows inversely proportionally to digit significance and least significant digits should not be taken seriously in a lot of cases. Considering the aim and nature of this paper, high precision is generally not vital so I often don't even bother to state uncertainties - as long as the most significant digits have high confidence.

Gravitational *constant* should not differ much between terrestrial planets. Therefore, solid real mass of these planets should have roughly equal period of rotation (T_m) to Earth's rotation period if the ratio of filled capacity to total capacity of the well is equal.

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Note that real mass relative to gravitational maximum can also be calculated from equations given in CR:

$$M = \frac{m_{re}}{\sqrt{1 - \frac{{v_{re}}^2}{{c_s}^2}}} + m_{img}$$

with:

$$M\sqrt{1 - \frac{{v_{re}}^2}{{c_s}^2}} \approx m_{img}$$

real mass is:

$$m = m_{re} = \left(1 - \sqrt{1 - \frac{{v_{re}}^2}{{c_s}^2}}\right) m_{img} = 6.95 * 10^{19}\, kg$$

c_s = Keplerian angular velocity of the gravitational maximum = 18178.98 m/s

m_{img} = M = 5.9723 * 10^{24} kg

From the perspective of a maximum, obtained real mass is the mass of all acquired matter (from our perspective, real mass = M = 5.9723 * 10^{24}) kg).

From our perspective, real mass relative to the maximum should probably be interpreted as a quantum of mass that would trigger maximum (graviton) collapse/expansion to another orbital energy level, or *ionization* of the system. The slower the rotation of real mass of a terrestrial planet compared to Keplerian velocity of the maximum, the less energy is needed for the transition.

The increasing relative retrograde motion of real mass can thus be interpreted as induction of pressure on the graviton.

Note that the *mirroring hypothesis* implies that ionization of an atom of standard matter includes ejection of negative charge outside of atom radius, while the corresponding (entangled, or mirrored) positive charge [orbit] collapses to nucleus.

11.1. Correlation with extinctions

As found previously in CR and here, changes in local (spin) energy level of a maximum (or graviton, in general) will fossilize the level as a discontinuity in the celestial body.

For Earth, the required quantum of energy (relativistic mass) for orbital energy level change (*ionization*) has been calculated in the previous chapter to be equal to 6.95 * 10^{19} kg.

Typical orbital excitation energy for standard Carbon electron at the scaled distance of Saturn (<70 * 10^{-12} m) is ≈50 eV. The same amount of energy should be required to change the energy level of mirrored positive charge (scaled Earth). From this, one can calculate roughly how much energy is needed for orbital excitation of Earth's graviton:

$$M_x = \frac{E_p}{E_e} M = 5.84 * 10^{20}\, kg$$

E_p = 50 eV

E_e = 0.511 MeV

M = 5.9723 * 10^{24} kg

The obtained value is 1 order of magnitude bigger than calculated previously. The reason for discrepancy is likely mass (vertical) oscillation. Assuming Earth is in a state of an anti-down

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quark equivalent (this will be confirmed later), the energy E_e in calculation should be roughly 10 times bigger. Assuming anti-down quark mass of 4.8 MeV/c^2, the energy needed becomes:

$$M_x = 6.22 * 10^{19}\, kg$$

This is now much closer to previously calculated 6.95 * 10^{19} kg.
The Earth should, however, by hypotheses in this paper, be a composition equivalent to coupling of two particles (2e state). This does not change excitation energy significantly, it is rather split into two levels. These levels are 64.5 eV and 47.9 eV for standard Carbon[43], and the excitation energy that would match the previously calculated value should be the superposition of these two.
Indeed, taking superposition into account, excitation energy becomes:

$$M_x = \frac{1}{2}\frac{E_{p_1} + E_{p_2}}{E_e} M = 6.99 * 10^{19}\, kg$$

E_{p_1} = 64.5 eV
E_{p_2} = 47.9 eV
E_e = 4.8 MeV

The energy now agrees well with the previously obtained value. Small difference is expectable due to oscillations of smaller scale.

This is a very interesting number considering asteroid impacts are correlated with major massive extinctions.

In example, estimates for the mass of the impactor responsible for the Chicxulub crater range from 1.0 * 10^{15} kg to 4.6 * 10^{17} kg[44].

To trigger a change in orbital energy level, required locally relativistic velocity of such impactor, assuming its rest mass is equal to 4 * 10^{17} kg, is:

$$v = \sqrt{\left(1 - \frac{m^2}{{m_{re}}^2}\right) {c_s}^2} = 18.17828\, \frac{km}{s}$$

m = impactor mass = 4 * 10^{17} kg
m_{re} = required relativistic mass = 6.95 * 10^{19} kg
c_s = Keplerian angular velocity of the maximum = 18178.98 m/s

Interestingly, this is within the range of typical velocities of Earth's orbit crossing asteroids (12.6 - 40.7 km/s[45]) and comets (16 - 73 km/s[45]). In fact, it seems quite likely that the Chicxulub impactor had the required energy to trigger the change.

However, this approach is flawed - apparently, most asteroids and comets would have enough energy to trigger the change regardless of rest mass. If asteroids and comets have accumulated relativistic energy, it must be the energy relative to Solar System space, not Earth's space.

Assuming the speed limit is the Keplerian velocity of the Sun's maximum:

$$c_s = \sqrt{\frac{GM_\odot}{R_\odot}} = 436.751\, \frac{km}{s}$$

G = 6.674 * 10^{-11} $m^3 kg^{-1} s^{-2}$
$M_\odot$ = 1.988500 * 10^{30} kg
$R_\odot$ = 695735 km

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required impact velocity becomes:

$$v = 436.744 \frac{km}{s}$$

This is the average velocity of the solar wind.

It should not be surprising that average velocity of the solar wind matches the Keplerian velocity of the Sun's maximum if the angular Keplerian momentum is converted to radial electro-magnetic momentum.

Now this raises a couple of interesting questions:

1. is it possible for a coronal mass ejection (CME) to accelerate the asteroid or a comet to required impact velocity?,
2. does CME itself represents accumulated relativistic energy in this case (ie. through implantation[46]), at least in part?,
3. is a rocky/icy impactor even required - perhaps the CME itself can produce the crater?
4. is mass the sole requirement for energy level changes?

The 3rd seems unlikely, especially if there is no temporary collapse of Earth's magnetic field. However, magnetic field reversals could be coupled with strong CME's, and research shows that CME's can produce significant land erosion and ejecta with no protective magnetic field present[47]. Geology can probably rule out this possibility due to a difference in end products between different impacts.

The CME would certainly accelerate an asteroid on its path away from the Sun. If massive impacts are correlated with energy level changes of large scale gravitons, it is possible that it is not solely the amount of energy that matters, but what kind of energy too - electro-magnetic or gravitational?

On standard scale the electro-magnetic energy of photons is the dominant energy triggering energy level changes, on the scale of planets, dominant energy should be gravitational.

However, both energies should be involved as electro-magnetic energy is not absolutely absent, it's certainly not negligible in case of Earth. On the other hand, one type of energy can be converted to the other at time of impact.

Energy level changes of Earth's graviton mass radius and charge radius might not be well synchronized relative to standard scale. Thus, collapse of the magnetic field (collapse of charge energy level) could precede the inflation of a graviton mass radius.

Evidence suggests there may have been multiple impactors at different locations at the time of the Cretaceous-Paleogene (K-Pg) boundary formation. A potential impact crater significantly larger than Chicxulub formed at the same time has been identified[48], suggesting significantly bigger impact energy.

However, the Earth is still active (alive) - Earth's maximum (graviton) is likely still present within Earth. If there was no *ionization*, were there local (spin) energy level changes?

Assuming energy requirement scales with orbital radii, the required energy for local changes can be calculated:

$$M_{x-1} = \frac{R}{r} M_x = 5.6 * 10^{14}\, kg$$

R = r_{x-1} = Earth's graviton radius = 1206115 m
r = Earth's orbital radius = 149.6 * 10^9 m
M_x = 6.95 * 10^{19} kg

The Chicxulub impactor apparently had the required energy for such changes.

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If similar energies are involved in all major massive extinctions, discontinuities within the Earth should be correlated with major extinctions. This is indeed confirmed in another chapter (*Earth as a living organ(ism) > Future development, neurogenesis > Correlation with mantle layers*).

There are potential impactors of similar size crossing Earth's orbit, ie. 1866 Sisyphus.

However, there are multiple energy levels and energy difference between some could be lower than calculated M_{x-1}.

As changes in energy levels are correlated with Earth's formation and evolution, the energy requirements are probably generally decreasing with time.

Note that energy levels have orders. So far two orders have been calculated, but the 3rd order too could have a significant impact on the planet, assuming equal scaling:

$$M_{x-2} = \frac{r_{x-2}}{R} M_{x-1} = \frac{R}{r} M_{x-1} = \frac{R^2}{r^2} M_x = 4.51 * 10^9\, kg$$

Apparently, we are currently experiencing a major massive extinction on Earth. If these are relatively synchronized with impacts, perhaps one should not be surprised if the 99942 Apophis asteroid (with estimated mass of 4 * 10^{10} kg[49]) is accelerated and deflected toward Earth at its close approach in 2029.

Given the fact that universes are self-similar, why assume that evolution of a planet is not similarly scripted as is the embryonic development of a human being?
Feeling of free will does not imply one has free will. In CR, everything is relative. Therefore, even anthropogenic triggers of global changes should be entangled with code execution at some level.

It might not be the CME that is coupled with such impactors, rather a large scale graviton ejected from the Sun. This could make coupling much easier. If the graviton is ejected as a wave and has energy similar to, or compatible with, that of the asteroid, it will likely collapse and couple with the asteroid at the encounter. The graviton will impart momentum on the asteroid, affecting its orbit.

Note that this orbital deflection does not have to be synchronized with the impact, it could occur years before. The coupling itself could be hard to observe. Travelling (inflating) as a wave the graviton may be unnoticeable (it can be interpreted as inflating sphere surface made of diluted dark matter), although its emission might be synchronized with CME. What will happen at time of coupling with the asteroid depends on energy ratios. In any case, the shape, spin and orbital momentum of the body can all be affected.
If graviton collapse is isotropic from the asteroid reference frame and perpendicular to its orbital velocity the effect on the asteroid orbit will be small. However the total mass is likely to double, affecting gravitational acceleration. The collapse cannot be absolutely perpendicular (the angle depends on wave frequency, distance from the source and amount of mass dragging with collapse) and the two effects combined could affect the orbit enough to put the body on a collision course with Earth.
Note that, at time of impact, the graviton should decouple from the asteroid and either couple with some mantle layer and/or stimulate energy level change of the existing graviton already coupled with Earth.

It cannot be excluded that the Moon too has a role in these events. Moon graviton collapse followed by wave-like inflation, asteroid coupling and Earth absorption is an alternative interpretation.

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It is possible that one (ie. the Moon) is involved in electro-magnetic energy level changes, other (ie. the Sun) in gravitational.

11.2. Evidence for a constant change of G

The amount of variability in G will depend on the context. Large variability is expected when G is taken relatively to a particular discrete vertical energy level, assuming no change in units.

However, even when G is considered invariant (whether on a particular scale or across different scales) it should not be considered absolutely invariant across all of space and time. In equilibrium conditions it should generally oscillate around some mean value (which itself may change or oscillate over space/time) - the only question is the magnitude of changes, which, however, in equilibrium, may be relatively small within a particular scale.

According to CR, gravity commonly exchanges with electro-magnetic force. Therefore, G should generally increase at the expense of the Coulomb constant, although changes in space/time cannot be instant and some phase shift at distance will exist.

In a bound configuration such as a Solar System, change in G of local space will be reflected in (or synchronized with) changes of orbital momentum.

Taking mass and distance into account, major influence on G on Earth is the interaction with the Sun (multiple orders of magnitude larger than the Moon and planets).

The G constant should thus oscillate, with the 1st order oscillation due to Earth's elliptical orbit of the Sun.

In the 6p4n (6 *protons*, 4 *neutrons*) configuration of the Solar System, the existence of a perihelion and aphelion in the Earth's orbit should be reflected in two discontinuities of the Sun, at 2/3 R and 1/2 R.

This is based on the hypothesis of initial inflation where discontinuities in the Sun represent fossils of initial radii of gravitons of terrestrial planets. The Earth is entangled with two discontinuities (which may be due to 2e configuration, although this is not a requirement) which also represent local energy levels.

With a change in distance from the Sun, spin velocity of the Earth's maximum is changing relative to the rest frame of the two discontinuities - its radius is expanding and contracting, directly affecting the local G constant.

Mean change of G due to perihelion is thus:

$$\Delta G_p = \frac{1}{2}\left(\frac{\sqrt{1-\frac{v^2}{{c_{1.1}}^2}}}{\sqrt{1-\frac{{v_p}^2}{{c_{1.1}}^2}}} + \frac{\sqrt{1-\frac{v^2}{{c_{1.2}}^2}}}{\sqrt{1-\frac{{v_p}^2}{{c_{1.2}}^2}}}\right) = 1.0002446$$

Change of G due to aphelion:

$$\Delta G_a = \frac{1}{2}\left(\frac{\sqrt{1-\frac{{v_a}^2}{{c_{1.1}}^2}}}{\sqrt{1-\frac{v^2}{{c_{1.1}}^2}}} + \frac{\sqrt{1-\frac{{v_a}^2}{{c_{1.2}}^2}}}{\sqrt{1-\frac{v^2}{{c_{1.2}}^2}}}\right) = 1.0002354$$

Giving the total:

$$\Delta G = \frac{1}{2}(\Delta G_p + \Delta G_a) = 1.00024$$

v = orbital velocity of Earth at semi-major axis = 29784.485 m/s
v_p = orbital velocity of Earth at perihelion = 30037.537 m/s
v_a = orbital velocity of Earth at aphelion = 29538.694 m/s

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$c_{1.2}$ = space (Keplerian) angular velocity of the 1/2 R Sun discontinuity = 151.266563 * 10^3 m/s
$c_{1.1}$ = space (Keplerian) angular velocity of the 2/3 R Sun discontinuity = 230.556106 * 10^3 m/s

Velocities $c_{1.1}$ and $c_{1.2}$ have been calculated in the *Quantization of the Sun* chapter.

For a mean G of 6.673899 * 10^{-11} m^3/kgs^2 and ΔG = 1.00024, the amplitude of oscillation is 1.60173576 * 10^{-14} m^3/kgs^2.

Measurements of G on Earth indeed show sinusoidal oscillation, although in previous analysis it has been correlated with the 5.9y (5.899±0.062 y) period oscillation component of Earth's length of day (LOD)[50].

However, calculated amplitude of yearly oscillation (1.60173576 * 10^{-14} m^3/kgs^2) agrees very well with the amplitude obtained from measurements (1.619±0.103 * 10^{-14} m^3/kgs^2).

Figure 10 shows yearly oscillation (blue) superimposed on the 5.9 y oscillation from previous analysis (black). Red crosses are previously measured values of G, plotted with uncertainties (horizontal and vertical).

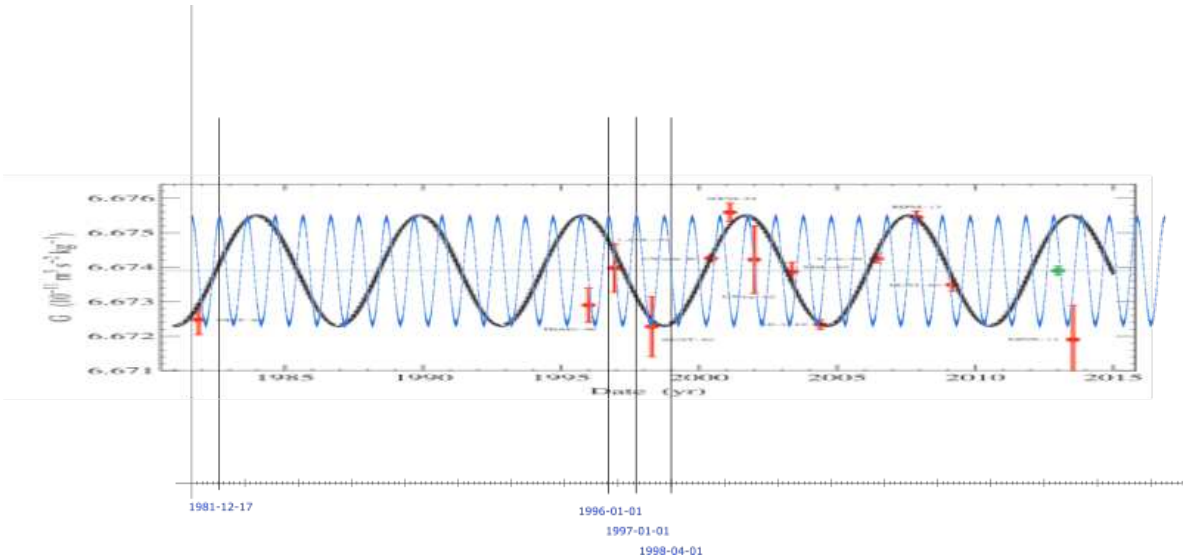

Figure 10. Oscillation of the gravitational constant

Yearly oscillation is obviously a better fit, but when linked to orbits of the Earth around the Sun (orbital data taken from NASA Horizons On-Line Ephemeris System[51]) a phase shift of ≈0.6167 y (golden ratio?) is required to match Figure 10 (without the shift the correlation is less convincing with all measurements taken into account).

Interestingly, as shown on Figure 11, with the influence of the Sun removed, leaving only planetary gravitational interactions, best fit requires no phase shift.

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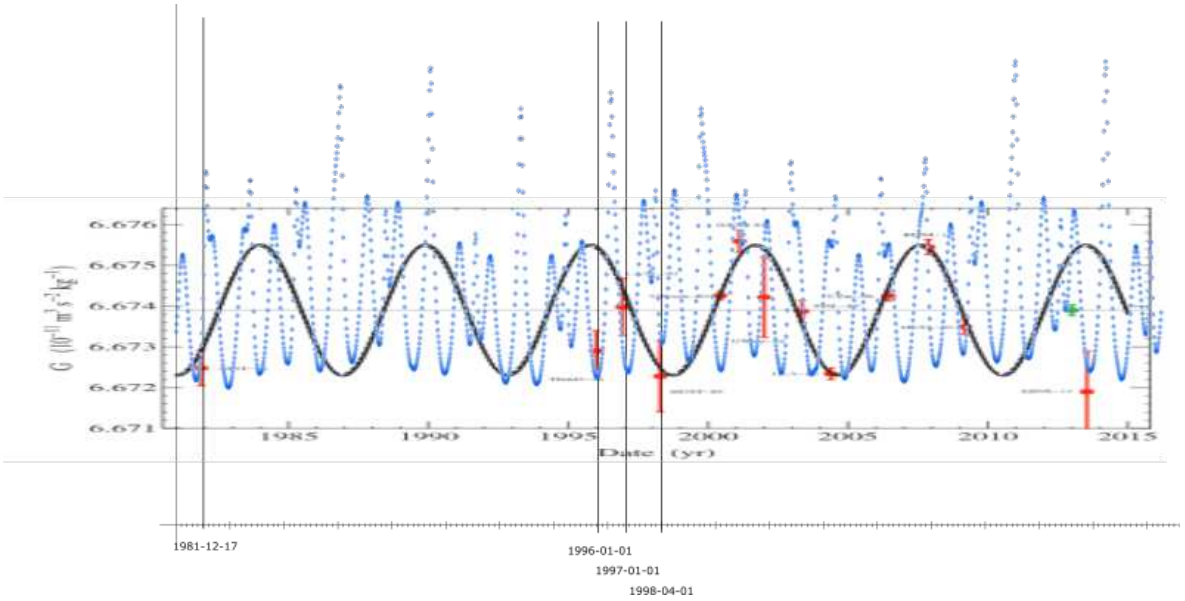

Figure 11. Oscillation of the gravitational constant

The 5.9 y period oscillation in LOD is equal to a solar orbit in 2:1 resonance with Jupiter and a 5:1 resonance with Saturn. If Mars (assumed to be in 1e configuration) is entangled with 1e of Jupiter, the Earth (2e configuration) may be entangled with the remaining 1e of Jupiter and 1e of Saturn, instead of being entangled with 2e of Saturn.
The resonant orbital (outer edge of the main asteroid belt) must be the event horizon (which should currently be in a collapsed form - similar to larger horizons collapsed into dwarf planets) of such entanglements.
This is (or rather, a memory of - due to neutralization of EM force) a magnetic spin entanglement between particles (notice the anti-alignment of magnetic fields between Earth and Jupiter/Saturn), and thus should have a signature in geomagnetic field.

11.3. Physical manifestation

CR predicts (implies) oscillation of constants but may generally not offer physical interpretation as these can be diverse. However, relatively physical interpretation must exist. In case of fields the source should be mass oscillation of carrier particles. Here, it would be the mass oscillation of quanta of space (gravitons).

Obviously, one can keep the gravitational constant fixed and assume it is the mass (M) of the source of gravity that oscillates. However, this creates illusion because both have to oscillate and the two oscillations cannot be absolutely synchronized (only in cases of absolute equivalence, which in this case would be G = M, there would be no illusion).

The Earth is most strongly entangled with the Sun (at least gravitationally) but this entanglement oscillates between two energy levels (which can also be interpreted as a relative superposition of the two). This is correlated with changes in Earth's orbital velocity/distance which are proportional to changes in radius of the Earth's gravitational maximum (large scale graviton). Oscillation of this radius is proportional to orbital oscillation of constituent quanta of local space resulting in oscillation

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in density of space at particular distance from the Earth's centre (which can be interpreted as mass oscillation of constituent gravitons). When this is unaccounted for it will be measured as oscillation of G.

12. Quantization of surface radii

Here are, somewhat empirically determined, equations for quantization of surface radii in the Solar System - may not be applicable to planetary systems in general (with no modification).

Neutral equatorial radius for outer planets:

$$R = \frac{K_2}{r^2} M \frac{1}{2^{(2-p)}} \left[\left(\frac{1}{10^1} \right)^{(4-N)} 3^{(3-p)} \frac{1}{n^{(p-1)}} \right]^{(s-1)}$$

Neutral equatorial radius for inner planets:

$$R = \frac{r^2}{K_1} \frac{1}{M} n^{(1-p)} 2^{(N-1)} \left[2^{(4-n)} \frac{1}{3^{(1-p)}} \right]^{(s-1)}$$

Since both r and M (gravity) are quantized, it follows that R is quantized too by the K constant - other factors (n, p, s, N) are integers.

The above may be understood as the invariant component of the radius during the cycle. Current radius includes a small correction due to oscillation in electric polarization (charge), value of which evolves weakly during the cycle state.

Current equatorial radius for outer planets:

$$R = \frac{K_2}{r^2} M \frac{1}{2^{(2-p)}} \frac{1}{10^{(3-N)}} \left(\frac{3^2}{10^1} \right)^{(2-K_\varphi)} K_\varphi \left[\frac{1}{n^{(p-1)}} \right]^{(s-1)}$$

$$K_\varphi = 10^{-\left[\sin\left(180^\circ - \Delta_\varphi\right)^{(p \bmod 2)} \cos\left(180^\circ - \Delta_\varphi\right)^{(1-p \bmod 2)} \right]}$$

$$\Delta_\varphi = \varphi_0 - \varphi_1$$

Current equatorial radius for inner planets:

$$R = \frac{r^2}{K_1} \frac{1}{M} n^{(1-p)} (2 + K_\varphi) \left[2^{(2-p)} 10^0 \left(\frac{10^0}{3^2} \right)^{-K_\varphi} \right]^{(s-1)}$$

$$K_\varphi = 10^0 \cos\left(180^\circ - \Delta_\varphi\right)^{(p \bmod 2)} \sin\left(180^\circ - \Delta_\varphi\right)^{(1-p \bmod 2)}$$

$$\Delta_\varphi = \varphi_0 - \varphi_1$$

K_2 = 4885811.341 m^3/kg
K_1 = 2.385039177 * 10^{-9} m/kg
M = total mass
r = orbital radius
N = shell number
s = number of particles in a sub-shell

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p = state of quantization
n = shell energy level
Δ_ϕ = angle between spin momenta of a particle pair occupying the shell (in case of a single particle - induced pair by splitting of the maximum)

Calculated radii for the state 6p4n are shown in Table 17, along with measured radii (rightmost column).

Table 17. Calculated neutral and current radii, compared to measured R

N	n	planet	M (kg)	r (10^6 km)	s	p	Δ_ϕ (°)	neutral R (km)	current R (km)	R (km)
2	5	Neptune	$1.02413 * 10^{26}$	4495.06	1	2	36.7084	24764	24764	24764
2	5	Uranus	$8.6813 * 10^{25}$	2872.46	1	1	233.1511	25703	25559	25559
2	3	Saturn	$5.6834 * 10^{26}$	1433.53	2	1	0.2	60806	60268	60268
1	1	Jupiter	$1.89819 * 10^{27}$	778.57	2	1	-0.847	68848	71492	71492
2	5	Mercury	$3.3011 * 10^{23}$	57.91	2	2	172.3047	2555.7	2439.7	2439.7
2	3	Venus	$4.8675 * 10^{24}$	108.21	1	0	0	6051.8	6051.8	6051.8
2	3	Earth	$5.9723 * 10^{24}$	149.60	2	1	90.3135	6284.72	6378.14	6378.14
1	10	Mars	$6.4171 * 10^{23}$	227.92	1	2	-91.9957	3394.1	3396.2	3396.2

Note the quantization of Δ_ϕ. For inner planets, it is quantized by 90° (any deviation may be due to higher order oscillation).

For outer planets, the quantum is reduced to 1/5 of this value, 18°, suggesting, perhaps that the equation for outer planets should be modified, or, instability in radii entanglement, assuming it exists.

Thus, to obtain 90° quantization, one only needs to multiply Δ_ϕ (quantized by 18°) with 5, revealing how it may be entangled with that of the inner planets, as shown in Table 18. Note that s above is interpreted as the number of particles in a sub-shell (Mercury, Earth, Jupiter and Saturn are in 2e states, Venus, Mars, Uranus and Neptune in 1e states).

Table 18. Correlation of outer and inner planets, in case of anti-aligned and aligned entanglements

planet	*normalized* Δ_ϕ (°)	entanglement (anti-aligned)	entanglement (aligned)
Neptune	(5 * 36) % 360 = 180	Venus	Mercury
Uranus	(5 * 234) % 360 = 90	Mars	Earth
Saturn	(5 * 0) % 360 = 0	Mercury	Venus
Jupiter	(5 * 0) % 360 = 0	Mercury	Venus

Interestingly then, the anti-aligned entanglement seems to correspond to entanglement between equal states, while aligned radii entanglement corresponds to entanglement between different states.

12.1. Radius of the Sun and its correlation with proton radius

Original composition of the Sun is probably 6 protons + 4 neutrons. However, 6 positrons worth of charge (inner planets) have been removed to balance the electrons (outer planets).

This makes the Sun neutral:

$$6 \times (-\frac{1}{3}e + 2 \times \frac{2}{3}e) + 4 \times (2 \times -\frac{1}{3}e + \frac{2}{3}e) - 6e = 0$$

The fractional charges above imply QM standard model interpretation, where proton consists of 1 down quark (-1/3 e charge) and 2 up quarks (+2/3 e charge), while neutron consists of 2 down quarks and 1 up quark.

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The Sun still consists of both positive and negative charges but their spin effects on radius cancel out. The radius is thus:

$$R = R_2 + R_1$$

$$R_2 = \frac{K_2}{{r_2}^2} M_2 \frac{1}{2^{(2-p_2)}} \left[\left(\frac{1}{10^1} \right)^{(4-N_2)} 3^{(3-p_2)} \frac{1}{{n_2}^{(p_2-1)}} \right]^{(s_2-1)}$$

$$R_1 = \frac{{r_1}^2}{K_1} \frac{1}{M_1} {n_1}^{(1-p_1)} 2^{(N_1-1)} \left[2^{(4-n_1)} \frac{1}{3^{(1-p_1)}} \right]^{(s_1-1)}$$

where R_2 is the sum radius of negative quarks and R_1 is the sum radius of positive quarks.

As shown in Figure 12, without 6 +e charges, the Sun is a sum neutron consisting of 6 layers, 4 layers containing pairs of negative [down equivalent] quarks and 2 layers (inner and outer core) containing pairs of positive [up equivalent] quarks. Due to condensation, this is the equivalent of a single neutron so 8 negative quarks can be grouped into a single sub-shell as 2 negative quarks, while 4 positive quarks can be grouped into another sub-shell as a single positive quark (8/4 = 2/1).

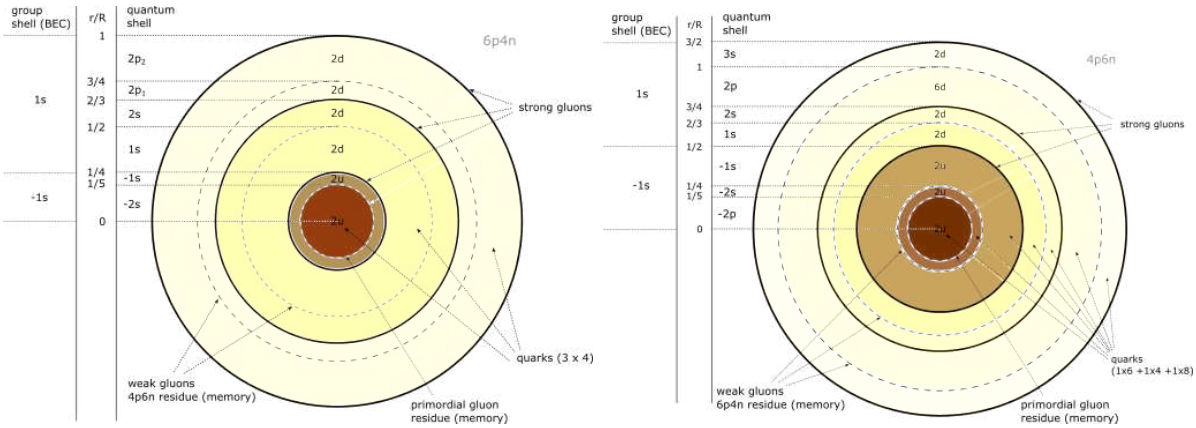

Figure 12. Sun partitioning in: a) 6p4n state b) 4p6n state (R = radius in 6p4n state)

Thus, the parameter $s_2 = 2$, while $s_1 = 1$.

The energy of these two sub-shells must be equal, so $M_2 = M_1 = M$.

For equal impact on radii, this must be satisfied:

$$\frac{K_2}{{r_2}^2} M_2 = \frac{{r_1}^2}{K_1} \frac{1}{M_1}$$

Since $M_2 = M_1 = M$:

$$\frac{K_2}{{r_2}^2} M = \frac{{r_1}^2}{K_1} \frac{1}{M} = \sqrt{\frac{K_2}{K_1}} \frac{r_1}{r_2}$$

$$R = \sqrt{\frac{K_2}{K_1}} \frac{r_1}{r_2} \left[\frac{1}{2^{(2-p_2)}} \left(\frac{1}{10^1} \right)^{(4-N_2)} 3^{(3-p_2)} \frac{1}{{n_2}^{(p_2-1)}} + {n_1}^{(1-p_1)} 2^{(N_1-1)} \right]$$

Here p_1 corresponds to number of major (strong) gluons, p_2 to weak gluons, N continues increasing from Mercury (2) so $N_1 = 3$ and $N_2 = 4$:

$$p_2 = 2,\ N_2 = 4,\ n_2 = 3^2 = 9$$

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$$p_1 = 3,\ N_1 = 3,\ n_1 = 3$$

Sun radius then becomes:

$$R = \sqrt{\frac{K_2}{K_1}}\frac{r_1}{r_2}\left[\frac{1}{3} + \left(\frac{2}{3}\right)^2\right]$$

Here, ratio r_1/r_2 is equal to the ratio of orbital radii of the outermost electron (Neptune) and the outermost positron (Mars).

This gives R = 694271.2405 km.

Radius of the sum U_1 scale proton can be obtained by raising the quark factors of R to the power of 2. This is due to the fact that the removal of a negative down quark reduces the negative radius 9 (3^2) times, while the addition of a positive up quark reduces the positive radius 3/2 times. Distance between charges increases (due to greater difference between them) so total radius is decreased by the sum of these factors.

$$R_{p_1} = \sqrt{\frac{K_2}{K_1}}\frac{r_1}{r_2}\left[\frac{1}{3} + \left(\frac{2}{3}\right)^2\right]\left[\left(\frac{1}{3}\right)^2 + \frac{2}{3}\right] = \sqrt{\frac{K_2}{K_1}}\frac{r_1}{r_2}\left[\frac{1}{3} + \left(\frac{2}{3}\right)^2\right]^2$$

Radius of a standard proton (U_0 scale) can now be obtained through this equation:

$$\frac{R_{p_1}}{r_1} = \frac{N * R_p}{r_{U_0}}$$

Where r_1 is the Solar System charge radius (Neptune's orbit), N is the number of nucleons in the Solar System, R_p is the standard proton radius and r_{U_0} is the standard Carbon-10 (Carbon-12) charge radius.

Using Sun radius R obtained above, this gives:

$$R_p = R_{p_0} = \frac{1}{10}\frac{R}{r_1}\left[\left(\frac{1}{3}\right)^2 + \frac{2}{3}\right] r_{U0} = 0.840905616 * 10^{-15}\, m$$

12.2. Δ_ϕ validation

Dominant magnetic field in outer planets may be generated by positive charge, in inner planets by negative.

In any case, calculated Δ_ϕ, as interpreted here, should represent the angle between magnetic dipoles, at least in equilibrium. There are a couple of unknowns though. Is this the primordial angle and is it conserved? In any case, the assumption is that the primordial magnetic field was much stronger and it is then when it could affect planet's radius significantly.

12.2.1. Mercury

Δ_ϕ obtained for Mercury (roughly 180°) corresponds to ↓↑ spin configuration. This is generally consistent with a low strength magnetic field.

12.2.2. Venus

Δ_ϕ for Venus (0°) suggests a relatively strong magnetic field. Currently, however, except for the induced one by the interaction of the solar wind with Venus' ionosphere, Venus does not have a strong internally generated magnetic field of its own. The are a couple of explanations for this state:

- it is a result of advanced stage in exchange of electro-magnetic potential for gravitational potential,
- Venus is in a transition between two states (magnetic reversal).

Both may be true. In any case, its magnetic field may be confined inside the planet.

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12.2.3. Earth

Earth's magnetic dipole is not axial, revealing a primal quadrupole configuration, as expected with 2e configuration. Considering the movement of north and south dip poles and attributing it to imminent collapse, in the primal configuration two major (inner and outer) dipoles may have been separated by 90°, equal to calculated Δ_ϕ.

This configuration may have been fossilized in the inner core anisotropy, as shown on Figure 13.

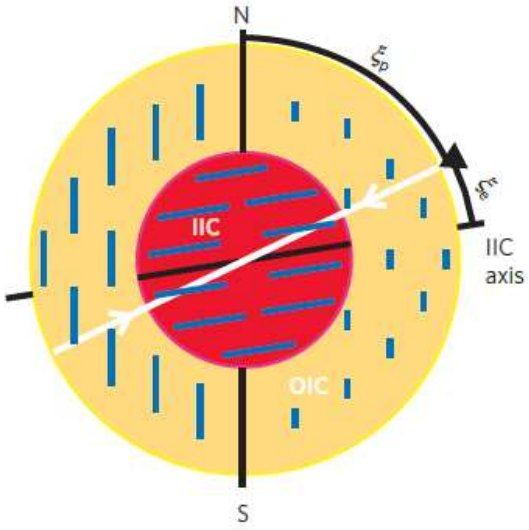

Figure 13. Equatorial anisotropy of the Earth's inner core[52]

12.2.4. Mars

Obtained Δ_ϕ shows primal dipole configuration of Mars mirroring the Earth's. The configuration may be verified once the magnetic field of Mars is restored to full capacity.

12.2.5. Jupiter

Δ_ϕ (0°) is consistent with ↑↑ configuration and may be consistent with observation, as shown on Figure 14, on the left.

Another possibility is a Δ_ϕ of 109°, which is obtained by setting N = 2 for Jupiter (instead of N = 1, see Table 17), shown on Figure 14 on the right.

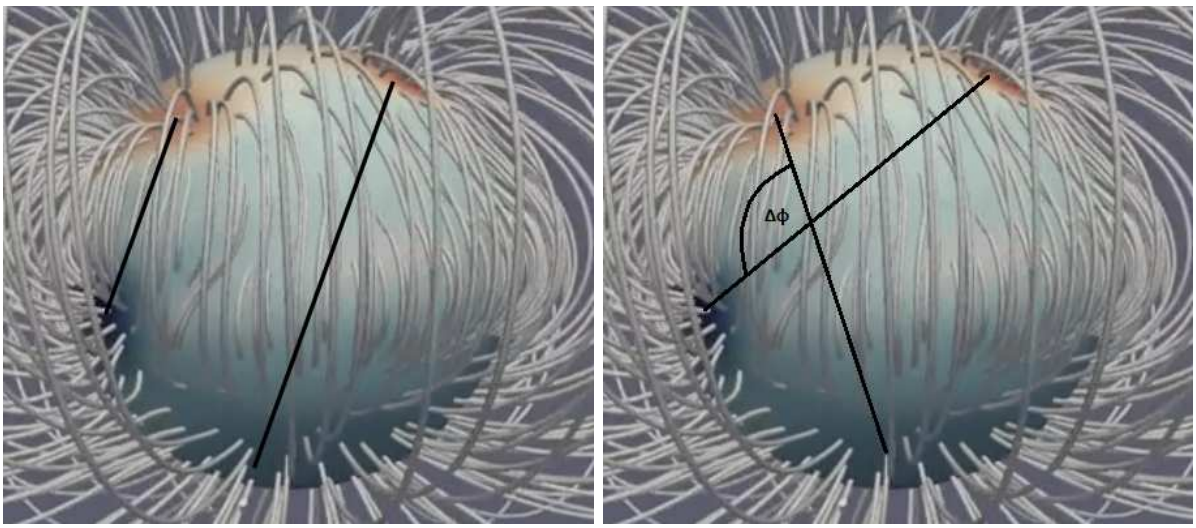

Figure 14. Magnetic field of Jupiter[53], left) Δ_ϕ=0°, right) Δ_ϕ=109° (N=2)

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12.2.6. Saturn

Saturn's dipole field is aligned with the rotation axis and highly axisymmetric, while quadrupole and higher components are significantly weaker.

This is consistent with ↑↑ configuration suggested by Δ_ϕ (0°).

12.2.7. Uranus

Dipole centre has a significant offset from the centre of the planet. Assuming primal core-dipole entanglement, Δ_ϕ may be interpreted as the angle between the equator and dipole rotated by such angle that the [shortest] distance from dipole centre to equator (x) is equal to distance from planet surface to the intersection of the rotated axis and axis translated to centre, as shown on Figure 15.

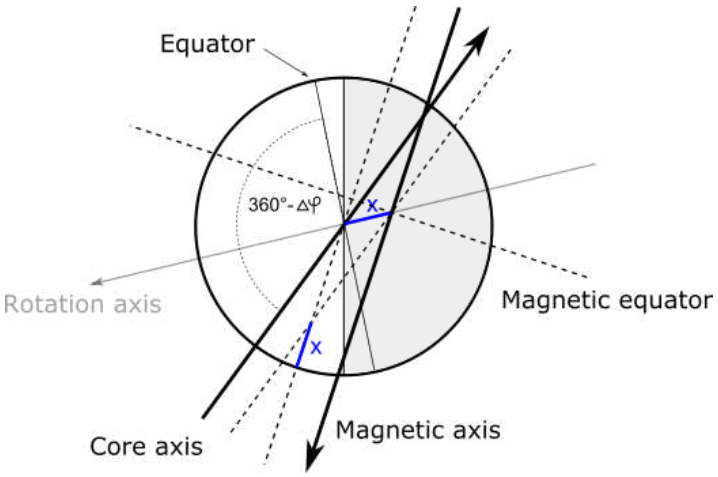

Figure 15. Uranus' magnetic field model

With an 58.6° tilt of the dipole from rotational axis and no inclination, the offset = x = 0.38192 R.

With an inclination of the dipole from rotational axis equal to 1.82°, the offset is equal to 0.353 R, in agreement with NASA/GSFC-O_3 model[54].

12.2.8. Neptune

Similar to Uranus, the dipole has a significant offset from the centre. Using the same method as in case of Uranus, one obtains the dipole shown on Figure 16.

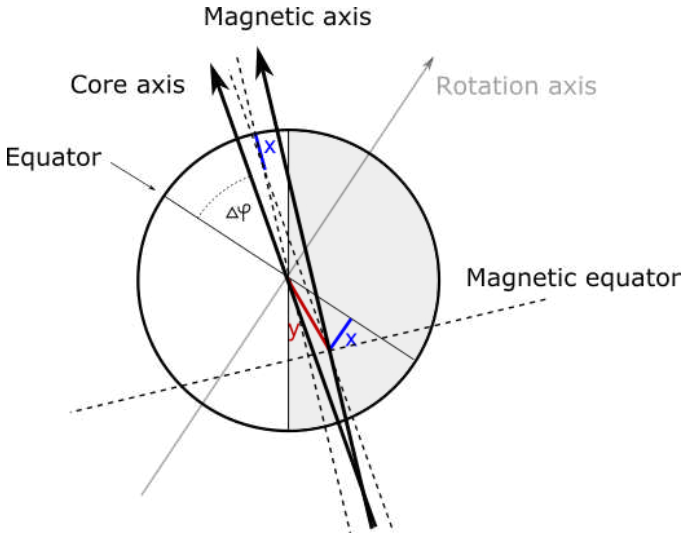

Figure 16. Neptune's magnetic field model

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With an 46.9° tilt of the dipole from rotational axis, with no inclination, the offset is equal to 0.12193 R.

With an inclination of 63.2716°, the offset = y = 0.485 R (x = 0.244967695 R), equal to NASA/GSFC-O_8 model[55] offset.

13. Earth, as a particle

For positive bodies (terrestrial planets), gravity should generally increase with depth, down to the inner gravitational maximum.

For Earth, gravity of this maximum is hypothesized to be equal to the surface maximum of the Sun (274 m/s^2) when it is localized - not split into multiple quanta of smaller gravity.

Interestingly, for Earth's maximum, radius where gravity becomes equal to 274 m/s^2 is equal to inner core radius. This is not a coincidence.

In that case, gravity down to the maximum:

$$gvr = nh$$

$$gr^2 = n\,T\frac{h}{2\pi}$$

$$gr^2 = n\,T\,\hbar,$$

$$g = n\,T\frac{\hbar}{r^2},$$

where T is the rotation period at radius r. In equilibrium, T at surface for a solid body is:

$$T = T_0,$$

while real radius of the planet is:

$$R = R_0$$

If nT is const.:

$$g = \frac{\hbar_{mg}}{m}\frac{R^2}{r^2}$$

For Earth:

$$T = 24\,h = 86400\,s$$

$$R_0 = const. = 6307105\,m$$

Down to the inner core radius r_c:

$$n = n_s = 1$$

$$g = 86400\frac{\hbar}{r^2} = \frac{GM}{r^2}$$

G = gravitational constant = 6.674 * 10^{-11} m^3/kgs^2
M = total gravitational mass of Earth = 5.9723 * 10^{24} kg
$\hbar = \hbar_1$ = 4.613325255 * 10^9 m^3/s^3

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Below r_c (1206115 m) gravity becomes:

$$g = n^2 \frac{1}{T} \frac{1}{\hbar_2} r^2$$

At r_c (event horizon):

$$n\,T \frac{\hbar_1}{r^2} = n^2 \frac{1}{T} \frac{1}{\hbar_2} r^2, \rightarrow \hbar_2 = 6.144878706 * 10^4\, ms$$

At the event horizon gravity is independent of period and radius:

$$g = \sqrt{\frac{\hbar_1}{\hbar_2}}$$

Below r_c the space-time gradient inverts and gravity is decreasing until it reaches minimum, afterwards possibly increasing again to next maximum, continuing the oscillation.

Note that, although used here, correlation of rotation periods of real mass with gravity is not generally appropriate.
Note also that radii of large scale gravitons (gravitational maxima) should oscillate and, once real mass is acquired, a phase shift will exist between a graviton radius and radius of condensed mass associated it. Also, a difference in radii is expected with a presence of multiple real gravitons. Concentration of mass will also depend on graviton angular momentum. Thus, current somewhat larger inner core radius (≈1220 km) of Earth is not surprising.
Inner inner core has also been detected, with a radius of ≈650 km[56], about 50 km larger than the radius of the corresponding hypothesized graviton in Table 19.
Note however that this (or any) discontinuity does not necessarily imply a presence of a real graviton, it may rather represent an energy level that has been occupied at some point by the real graviton (one that may be currently at the inner core discontinuity).

Table 19. Gravity of [naked] Earth

n	discontinuity	radius (m)	gravity (m/s^2)
1	crust surface	6371000	9.82
1	crust surface *perihelion*	6357000	9.86
1	real surface	6307105	10.02
1	outer core	3282185	37
1	transition zone (induced charge)	1705704	137
1	g. maximum = inner core radius = r_c	1206115	274
1	transition zone	852852	137
2?	inner inner core	603058	274?

13.1. Gravity with acquired matter

A gravitational maximum (soul) will effectively curve space around it. In case of shielding interpretation, acquired matter will not affect the overall curvature of that space as long as gravity of the maximum is greater than gravity of acquired matter.

However, clumping or condensation of matter (non-homogeneous system) can produce measurable effects.

In, addition, core maximum may split into multiple maxima (which may even further collapse to form orbiting spin momenta).

 doi:10.20944/preprints202105.0488.v9

Note that, in that case, gravity at core discontinuity is not equal to [primordial] 274 m/s^2, rather quantized into multiple maxima of lower gravity at different radii.
However, even in that case the gravity of the core (or major) graviton is probably higher than that of the other maxima. Assuming energy is conserved in the process of splitting and that it is localized below Earth's surface radius, gravity at the surface will remain the same as it was before splitting.

Regardless of interpretation (shielding or no shielding), during Earth's development and evolution, the graviton has likely been oscillating between different energy levels, accumulating mass at different radii from the centre, leaving behind discontinuities.

Each layer of the mantle is then a relatively independent body, just as terrestrial planets orbiting the Sun are independent bodies. This is a consequence of *enforcement* of self-similarity. It should thus not be surprising that primordial (or naked) Earth's core gravity is equal to Sun's surface gravity - the Earth is relatively mirroring the Solar System nucleus (up to Mars).

Distribution of gravity inside Earth is thus likely relatively wavelike, being cancelled at least at some discontinuities (even if currently not globally), albeit with overall increasing density toward the core. This enables Earth's mantle to have layers where pressures and temperatures are suitable for complex ecosystems.

Note that vacuum present between layers is an ideal heat insulator (at least regarding conduction and convection). Layer surfaces should thus, at least in places, contain hydrospheres and even atmospheres above them with decaying density with distance from the surface. I suspect, however, that there are many magma carrying tubes (*blood* vessels) crossing layers and branching into smaller tubes and capillaries within them.
Top mantle layers (upper 1000 km) are thus relatively insulated from the core heat which is only periodically transferred in bulk from the core to the surface (or surfaces) at times of major extinctions, probably stimulated by impacts (note that impact-stimulated volcanism has been hypothesized before[57]). Previous research has already shown that mantle plumes rising from the core do exist and are indeed a major mechanism of core heat transfer[58] rather than mantle convection/conduction.

14. Earth, as a living organ(ism)

Earth is definitely showing signs of a self-regulated living organism on surface, at least between major extinctions. But even disruptions of that self-regulation can be explained either as a regular component of embryonic development process or as a presence of a disease. These interpretations are not mutually exclusive - both can be simultaneously valid, at least in some cases.

While it may be hard to identify the equivalent of genetic coding in such a large scale organism, it shouldn't be discarded as a possibility due to lack of imagination, especially when there's sound logic behind its existence and evidence in its favour.

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Definition of life in CR allows for development of life with no dominant genetic code in the body. In extremely introverted forms of life development of the constitutional biome (including cells) may not be a result of interpretation of physical genetic code (ie. DNA), rather interpretation of code existing on a smaller scale (ie. mental).

In all living beings known to man, life is not limited to outer skin surface - in fact, life there is generally least diverse and complex. Higher diversity and complexity on skin surface is generally limited to short periods during embryonic development. The fact that no complex life has been detected on a surface of any planet but Earth goes in favour of this hypothesis.

Existing models of Earth's interior are mainly based on assumptions on planetary formation that do not involve soul/body coupling and which are certainly not backed by abundant and solid evidence. They are also based on data from seismic profiling which has limited resolution and is prone to interpretation bias[59].

Bias exists in definition of life itself in modern science - apparently there is no solid consensus on required constitution of a living being. But even if there would be one, in current *climate*, it would hardly *allow* for Earth to be alive.

However, assuming extroversion and introversion of life can go to extremes, then everything would have to be alive, only differing in the ratio of mental to physical interaction (or amount of life in these domains or dimensions of reality).

With CR, relativity of life is implied - amount of life should depend on a reference frame, so Earth too should be alive.

The entire Solar System is then also an individual organism, and, relative to that system, Sun and planets may be interpreted as organs (physically relatively passive, or extremely introverted, symbiotic organisms).

Obeying the principle of self-similarity, each living organ has an active core, replicating the role of the Sun in the Solar System to localized space-time.

These are, obviously, all extremely introverted organisms. For that reason, creatures of extroverted nature accustomed to absolutism may not recognize them as living beings, however, lack of complexity in physical momenta is simply replaced with complexity in mental momenta - which is reflected in momenta of smaller scale life-forms (or quanta of consciousness) residing inside their bodies. One of these life-forms are humans, who are, relative to Earth, likely its [precursor] neural proteins.

Deeper understanding of organisms of planetary scale (or larger) requires understanding of [discrete] scale-invariance of physical laws. One cannot expect that time for these beings (or communication between their constituent parts - ie. neuron equivalents) flows at the same rate as for organisms of smaller scale (ie. humans), nor that their tissue should look like our tissue (discrete states of invariance imply a difference).

14.1. Rough internal structure

With no apparent complex, stochastic or conscious large scale extroverted physical interactions (apart from electro-magnetic absorption and emission which may be interpreted as communication) present in planets, planets must be extremely introverted life-forms. In such organisms there's simply no need for limbs and large scale complexity in organismal structure, it is the smaller constituent quanta of these structures that can be complex. And the behaviour of most will be complex (or relatively stochastic) if these are correlated with high introverted intelligence or consciousness of the being.

Most expressed organ of an organism such as Earth then must be the brain, likely organized into layers with possibly minimally expressed gyrification (although that may depend on the stage of development).

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Gyrification of tissue may be present in standard complex life only due to presence of organs required for extroverted interaction (eyes, nose, ears, mouth, body from the neck down).

Even so, it has to have other organs [or organ equivalents] necessary for the function of that brain.

Most likely blood arteries are underground tubes, with blood being the flowing magma and water (nutrients).

Proper interpretation of lava solidification is thus coagulation of blood.

Its blood veins are underground tubes filled with oil (compressed dead carbon matter).

Note that, unlike human blood, Earth's arteries do not carry dissolved oxygen while its veins do not carry dissolved carbon dioxide (at least not in high concentrations near surface).
Rather, they carry bound oxygen and carbon, which are then used as fuel to produce molecular oxygen and carbon dioxide where needed.
It is possible, however, that within the mantle, arteries and veins do carry significant amounts of dissolved gases.

Complex life and networks of interconnected diversity are not limited to surface (epidermis). In fact, surface is likely just a breeding ground for cultivation of precursor neuron cells and proteins of a planet. Most complex life is thus resident within mantle layers where it is protected and not so vulnerable to external influence.

The core of a planet has the role of a heart and geyser eruptions may provide one way to probe the heart rate when the surface is active.

Note that, with all ice melted, the fraction of Earth's surface covered by water would be about 75%. Human brain is also about 75% water. But that's not where the correlation ends. In example, the salty ocean is a large scale equivalent of the salty water present in the brain - cerebrospinal fluid (CSF).

14.2. Age, lifespan and the 3rd order period

The lifetime of Earth is quantized and can be calculated through its frequency of existence.

$$\Delta T_E = n\frac{1}{f_x} = n\,T_x$$

For n = 2840, and determined T_x of the 3rd order general oscillation of the Solar System equal to 1.512 * 10^6 years:

$$\Delta T_E = nT_x = 4.29408 * 10^9 years$$

But this should not be interpreted as lifespan of Earth, rather lifespan of the Solar System. I hypothesize that the Earth's lifespan is equal to T_x (3rd order period of the Solar System oscillation).

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Lifetime may be interpreted as the age of the body, while lifespan is the average interval a particular soul is coupled with that body (or, average duration of coupling between particular species of souls and bodies).
I hypothesize that lifetime and lifespan are generally different at or near discrete scales of invariance (postulated in CR), converging to equality with distance from these scales.
Lifetime and lifespan should thus be different for relatively elementary particles of particular scale, such as planets. In these creatures, with expiration of lifespan, the body is generally reused by another soul (gravitational maximum). Lifetime for planets will thus be generally larger than lifespan.

There are at least 3 ways to calculate the 3rd order period of existence cycle T_x [and thus, Earth's lifespan], all giving the same result:

14.2.1. Decay rate of ^{10}Be

Current Solar System state may be ^{10}C or a superposition of ^{10}C and ^{10}Be. In any case, entanglement exists between the Solar System and standard ^{10}Be. I propose that half-life of ^{10}Be is equal to the 3rd order period of the Solar System oscillation (in one interpretation, the half-life has been fossilized as the 3rd order period).

Several measurements of ^{10}Be half-life have been performed.

In example, in 1987. it was measured to be 1.51±0.06 * 10^6 years[60].

In 2009. it was measured to be 1.388±0.018 * 10^6 years[61].

Even though half-life of U_0 elements should be consistent during the existence cycle of U_1, it likely changes during the transition between cycles - T_x should be understood as the mean value.

For that reason, I do not consider the value from 2009. as the average value through the lifetime of the Solar System. It will be shown later that this value is 1.512 * 10^6 years.

14.2.2. Heart rate

The average heart rate of Earth can be calculated from the global average period between geyser eruptions:

$$\langle T_g \rangle_T = 6.6\, hours$$

Note that Earth is in a superposition of quantum states and our [energy] scale is too low to disturb that superposition.
The fact that we can measure these rates [and anything else in the Solar System of similar scale], with high precision without disturbing the system, shows that, while uncertainties in measurement are fundamental, the size of uncertainty is a measurement problem arising from inadequate scale of observational energy, a relative quantity (Planck's *constant*, $\hbar$, as a dimensional *constant* between entangled properties, must be a relative, not absolute *constant*).
Note that this also shows the nature of superposition - as postulated by CR, a system cannot be in multiple states at the same time unless these are separated in space, and cannot be in multiple states at the same space unless they are separated in time.

For Earth heart rate = my rest heart rate (76 bpm) scaled:

$$1 \text{ Earth scale minute} = 76 * 6.6 = 495\, hours = 20.625\, days$$

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Given the number of heartbeats $EH_{3/3}(1 * 10^9, 4 * 10^9) = 2 * 10^9$ and scale invariance of heartbeats, the period is:

$$T_x = 2 * 10^9 * 6.6 = 1.32 * 10^{10} h = 1.51 * 10^6 \, years$$

This number of heartbeats with a heart rate of 76 bpm corresponds to a human lifespan of 50 years. This, I consider as the global average human lifespan over the course of evolution on Earth's surface (or at least, during the last 1.512 million years).

With such number of heart beats[62] (between incarnations), the Earth would belong to, not only mammalian species, but relative homo species.

Note, however, that Earth's heart rate may change, it may only be relatively equivalent to human heart rate at this stage of development.

The 3rd order cycle of the Solar System ($1.512 * 10^6$ years) can thus be interpreted as evidence of inter-scales evolutionary entanglement - a man is in its path of evolution between the standard scale carbon atom and the Solar System (relative large scale carbon atom equivalent).

To species accustomed to the concept of birth and extroverted nature it might appear that Earth never fully develops.

This is most certainly not the case - life past the embryonic form for us always results in a change of environment, but this is only due to inadequacy of the uterus to ensure the continuity of progressive evolution, one which includes growth of the physical form.

Once extroverted intelligence evolves into, relatively more energy efficient, introverted intelligence, there is no need for physical growth or reason for most of conventional physical organs.

Spherical form may thus be interpreted as a pinnacle of evolution, rather than an undeveloped form of life, even though it externally manifests itself as a *mere* particle, or, a piece of rock. If a man should regard any cosmic phenomena as a deity, it should certainly be Earth, as it would be the one closest to us. A god with whom we are strongly entangled and thus evolutionary depend on. A god who can take and give, and thus be real.

14.2.3. Speed of time

Space-time may be represented by two dimensions, one positively polarized (space), one negative (time), relative to a neutral one (event horizon in between).

These 3 dimensions are spatially separated and quantized, but they are entangled and may orbit the same body, such that orbital velocity of the event horizon is:

$$v_{EH} = (v_S - v_T) * C,$$

where v_S and v_T are orbital velocities of space and time dimensions, respectively. 3rd order space for Earth is 1-dimensional - the Earth is an inflated quantum of space/time orbiting the Sun. Dimensions of [3rd order] space and time of Earth have been further separated during inflation, but they remain entangled. Assuming that space dimension is [at] Earth's orbital radius, the time dimension should be somewhere in the higher orbit.

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Time dimension velocity is quantized by v_S:

$$v_T(n) = \{(n+j)+(n-i) \pm [(n+j)*(n-i)]^{-1}\}^{-i} * \{(n+j) \pm [(n+j)*(n-i)^2]^{-1}\}^{-j} * v_S(n)$$

$$n, i, j \in \mathbb{Z}$$

$$i = n - C_1\,,\ j = C_2 - n\,,\ i + j = C_2 - C_1$$

$$C_1, C_2 \in \mathbb{N}$$

The values in square brackets, depending on the sign, give maximum and minimum values of v_T during the cycle state. The average (mean) v_T:

$$v_T(n)_{AVG} = [(n+j)+(n-i)]^{-i} * [(n+j)]^{-j} * v_S(n) = (2n+j-i)^{-i} * (n+j)^{-j} * v_S(n)$$

$$v_T(n)_{AVG} = (C_1 + C_2)^{C_1 - n} * (C_2)^{n - C_2} * v_S(n)$$

For inner planets, in state 6p4n:

$$C_1 = 2\,,\ C_2 = 3$$

$$v_T(n) = [5 + (3*2)^{-1}]^{-i} * [3 + (3*4)^{-1}]^{-j} * v_S(n) = (5 + 6^{-1})^{-i} * (3 + 12^{-1})^{-j} * v_S(n)$$

$$i = n - 2\,,\ j = 3 - n\,,\ i + j = 1$$

$$v_T(n) \approx \frac{1}{v_n} * v_S(n)\,,\ v_n = v_{n-1} + 2^{n-2}\,,\ v_0 = \left(\frac{2}{3}\right)^{-1} = \left(\frac{N}{P}\right)^{-1}$$

Solar System may also be observed as a hydrogen-like atom, where space, time and event horizon dimensions have been split into 4 component vectors (levels).

The event horizon velocity (derived from v_S and v_T), given the orbital energy level vectors for inner (n_1), outer (n_2) planets and the oscillatory vector k:

$$\boldsymbol{n}_1 = \begin{bmatrix} 5 \\ 3 \\ 3 \\ 10 \end{bmatrix}\,,\ \boldsymbol{n}_2 = \begin{bmatrix} 1 \\ 3 \\ 5 \\ 5 \end{bmatrix}\,,\ \boldsymbol{k} = \begin{bmatrix} 0 \\ 3^1 \\ 3^2 \\ 5^2 \end{bmatrix}$$

$$\boldsymbol{v}_{EH} = (\boldsymbol{v}_S - \boldsymbol{v}_T) * \left(\frac{\boldsymbol{n}_1 + \boldsymbol{k} \oplus \boldsymbol{n}_2}{10^1} + \frac{\boldsymbol{k}}{10^2}\right),$$

where $\oplus$ is the sign operator:

$$\boldsymbol{a} \oplus \boldsymbol{b} = \begin{bmatrix} -1^{a_1+1} * b_1 \\ -1^{a_2+1} * b_2 \\ -1^{a_3+1} * b_3 \\ -1^{a_4+1} * b_4 \end{bmatrix}$$

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Note that the ratio of sums of elements of n_2 and n_1 is:

$$\frac{\sum n_2}{\sum n_1} = \frac{14}{21} = \frac{2}{3} = \frac{N}{P} = \frac{4}{6}$$

where N is the number of neutrons, while P is the number of protons of the Solar System, assuming a ^{10}C state (6p4n).

The event horizon velocity (from v_S only):

$$v_{EH_0}(n) = \frac{r_S(n)}{r_{Mars}} v_S(n) = \frac{1}{r_{Mars}} \sqrt{GM * r_S(n)}$$

$$c_{EH} = 1 \frac{km}{s}$$

$$v_{EH}(n) = v_{EH_0}(n) + (-1)^{(\delta_{jn,2})} \left[1 + 2^{(1-\delta_{j,i+1})} - (ij+1) 3^{(-2^{\delta_{j,i+1}})^{\frac{1}{2}}} \right] c_{EH},$$

where $\delta_{a,b}$ is the Kronecker delta function. Table 20 shows space velocities for inner planets and calculated velocities of time and event horizon dimensions along with their correlation with bodies of the Solar System.

Table 20. Orbital velocities of time and event horizon dimensions

n	Planet	i	j	v_S (km/s)	v_T km/s (entanglement)	σ_T (current value)	v_{EH_0} (entanglement) km/s	σ_{EH_0} (neutron correction)	v_{EH} (entanglement) km/s
4	Mercury	2	-1	47.36	5.47 (Neptune)	$-2^2 * 10^{-2}$ = -0.04	12.033 (Jupiter)	+4.73	16.77 (Hygiea)
3	Venus	1	0	35.02	6.78 (Uranus)	$+2^1 * 10^{-2}$ = +0.02	16.63 (Hygiea)	+1.275	17.9 (Ceres)
2	Earth	0	1	29.78	9.66 (Saturn)	$+2^1 * 10^{-2}$ = +0.02	19.55 (Vesta)	-1.66	17.88 (Pallas)
1	Mars	-1	2	24.07	13.08 (Jupiter)	$-2^1 * 10^{-2}$ = -0.02	24.07 (Mars)	-4.73	19.34 (Vesta)

Evidently, the speed of time dimension decreases as the speed of space increases and orbits are quantized and entangled (as predicted by CR):

$$\frac{v_S}{v_T} = \sqrt{\frac{r_T}{r_S}} \approx (C_1 + C_2)^{n-C_1} * C_2^{C_2-n}$$

Orbital velocity of Earth's space is 29.78 km/s. Average velocity of the event horizon for Earth is 2/3 of this velocity, while the average velocity of time dimension is 1/3 of this velocity:

$$v_{EH_{AVG}} = \frac{2}{3} 29.78 = 19.85333' \, km/s$$

$$v_{T_{AVG}} = c_{t_1} = \frac{1}{3} 29.78 = 9.92666' \, km/s$$

Orbital radius of the time dimension is the space dimension of Saturn - Earth's time dimension is entangled with the space dimension of Saturn (time dimension of Saturn is entangled with Earth space dimension).

Average event horizon is entangled with the current orbit of Vesta, the dwarf planet.

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Deviation of $v_{T_{AVG}}$ from current Saturn orbit is equal to deviation of $v_{EH_{AVG}}$ from current Vesta:

$$v_{Vesta} = \frac{v_{Saturn}}{v_{T_{AVG}}} * v_{EH_{AVG}} = 3 * \frac{9.68}{29.78} * \frac{2}{3} 29.78 = 9.68 * 2 = 19.36\, km/s$$

Speed of time for human bodies (c_{t_0}) is equal to standard speed of light c, given the average life expectancy of 50 years (2*10^9 heartbeats with 76 bpm heart rate), the 3rd order period of Earth's existence cycle is:

$$T_x = \frac{c_{t_0}}{c_{t_1}} * 50\, years = 3 * \frac{2.99792458 * 10^8}{29.78 * 10^3} * 50\, years = 1.51 * 10^6\, years$$

14.3. Body mass

If Earth is a living organism, predicting real mass of Earth in the same way as it is done with other organisms should give the result of the same order of magnitude (it likely won't be of equal value as Earth is evolving, gaining and losing mass in the process).

Assuming that Earth is a relative mammal, given the 3rd order existence half-life (period) T_x of 1.512 * 10^6 years, mass can be calculated from empirical relationship between mass and lifespan of mammalian species.

$$\left(\frac{m_E}{m}\right)^{\frac{1}{4}} * T_{x_M} = T_x$$

Given human adult mass m of 84 kg and lifespan T_{x_M} of 50 years, mass of earth m_E is:

$$m_E = m\left(\frac{T_x}{T_{x_M}}\right)^4$$

$$m_E = 7 * 10^{19} kg$$

Not equal to total mass of Earth, but a very interesting result. It is equal to previously calculated Earth mass using non-invariant G, and also a quantum of energy required for orbital excitation of Earth's graviton.

> Note that the value of ${T_x}^4$, 5.2 * 10^{24} is roughly the value of the total gravitational mass of Earth (M = 5.9723 * 10^{24}).

The same mass is obtained using the CR equation for real mass:

$$m_E = m_{re} = \left(1 - \sqrt{1 - \frac{{v_{re}}^2}{{c_s}^2}}\right) m_{img}$$

where

$$v_{re} = \frac{2\pi r_{re}}{T_{re}} = \frac{2\pi r_s}{T_{re}}$$

$$c_s = \sqrt{\frac{G m_{img}}{r_s}} \approx \sqrt{\frac{GM}{r_s}}$$

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Using T_{re} = 23.9*60*60 = 86040 s, G = G_0 = 6.673899 * 10^{-11} m^3/kgs^2, r_s = 1206115 m, $m_{img} \approx$ M = 5.9723 * 10^{24} kg:

$$m_E = 7 * 10^{19}\, kg$$

The results suggest the equation relating mass and lifespan is incomplete.
Earth's mass is apparently bigger. There is 10^{18} kg in surface oceans alone, 10^{22} kg in the crust, 10^{23} kg in the inner core and more in the mantle (based on density inferred from seismic profiles), however, these values are relative to the gravitational constant of the standard (U_0) scale G_0 (6.674 * 10^{-11} m^3/kgs^2).
As stated before, proper relativistic (effective) mass of Earth on U_1 scale is relative to G_1 (5.731534632 * 10^{-6} m^3/kgs^2).
Proper, relativistic, equation for relationship between mass and lifespan is thus:

$$G_1 m_E = G_0 m \left(\frac{T_x}{T_{x_M}} \right)^4 \tag{M1.1}$$

Various results can now be obtained, depending on the value of variables, as shown in Table 21.
Note, however, that obtained mass can also be interpreted as current imaginary mass, rather than real mass (in that case, real mass = 5.9723 * 10^{24} kg - 7 * 10^{19} kg $\approx$ 5.9723 * 10^{24} kg).

Table 21. Relative Earth mass

n	G_1 [m^3/kgs^2]	G_0 [m^3/kgs^2]	T_x	m_E(n) [kg]
1	5.731534632 * 10^{-6}	6.674 * 10^{-11}	25.82 My	6.9543 * 10^{19}
2	6.674 * 10^{-11}	6.674 * 10^{-11}	1.512 My	7.0244 * 10^{19}
3	6.674 * 10^{-11}	6.674 * 10^{-11}	25.82 My	5.9723 * 10^{24}
4	6.674 * 10^{-11}	5.731534632 * 10^{-6}	1.512 My	7.1816 * 10^{22}
5	6.674 * 10^{-11}	5.731534632 * 10^{-6}	25.82 My	5.1290 * 10^{29}
6	6.674 * 10^{-11}	6.674 * 10^{-11}	19.3 s	1.8802 * 10^{-30}
7	4.9000394 * 10^{-2}	6.674 * 10^{-11}	4.25 Gy	5.9723 * 10^{24}

Here, m_E(1) is the proper relativistic mass of Earth calculated with 2nd order T_x, m_E(2) is the proper relativistic mass calculated using 3rd order T_x. Third mass, m_E(3), is the mass of Earth relative to standard scale (m_{E_0}) calculated using 2nd order T_x.
Masses m_E(4) and m_E(5) could be considered as *inverse* (or *anti*) masses of Earth relative to its [past] event horizon (inner core maximum).
Note that m_E(4) is [roughly?] equal to 2/3 of the mass of the Earth's inner core, while m_E(5) is roughly 1/4 of the Sun's mass.
Note also the presence of multiple periods in the cycling of Earth's [maximum] existence, 1.512 My and 25.82 My. While the shorter period could be considered as a fossil of the Solar System U_0 half-life ($^{10}Be_0$), this entanglement cannot be lost completely and some time compression at the end of 1.512 My cycles can also be expected.
While the periods of 2nd and 3rd order represent the half-life of Earth's gravitational maximum quanta, these do not represent the lifespan of Earth.
At the end of these cycles, major maximum, effectively, only temporarily collapses (partially, in time and space), proportionally to the cycle period. If the maximum is interpreted as a soul, which I am convinced is the correct interpretation, such collapse is, effectively, a temporary loss of consciousness.
I have previously hypothesized that the Solar System is a product of annihilation and inflation of ^{10}C and ^{10}Be atoms of smaller scale, thus, entanglement with ^{10}C can also be expected,

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although the collapse and the induced time (evolution) compression should be negligible due to short half-life (19.3 s) of ^{10}C.
Note that Earth is in 2e configuration, and with T_x of 19.3 s, mass of Earth [$m_E(6)$] becomes roughly equal to the mass of 2 standard electrons (or positrons).
If $m_E(4)$ and $m_E(5)$ are correlated with Earth's inner core and Sun mass, the data suggests asymmetry between mass and *inverse* mass, growing with period T_x.
The solution is the inflation of T_x and/or G.
With G_0 [roughly] equal to 2.222 * 10^{-5} m^3/kgs^2, $m_E(5)$ becomes equal to the mass of the Sun, while for G_0 [roughly] equal to 1.9561 * 10^{-5}, $m_E(4)$ becomes equal to to the proper relativistic mass of the Sun.
The same can be obtained with T_x equal to 36.23 My and 2.06 My, respectively.
With a period of 555619.11 years, $m_E(4)$ becomes equal to inner core mass (assuming that mass is 1.1 * 10^{23} kg).
Interestingly, for T_x equal to the 1st order period (4.25 Gy), the result of equation M1.1, rounded to 2 decimals, is equal to speed of *light* on U_1 scale (2.93 * 10^6 m/s) multiplied by 10^{17}.
Note also that the ratio between $G_1(7)$ and $G_1(1)$ is roughly equal to the ratio between $G_1(1)$ and $G_0(1)$ divided by 10:

$$G_1(7) \approx \frac{1}{10}\frac{G_1(1)}{G_0(1)}G_1(1)$$

which is consistent with association of different G's to different vertical energy levels and therefore to scale (period) of general oscillation.
If $G_0(1)$ would, as hypothesized previously, *belong* to U_0 scale, G1(1) should be associated with U_1 scale and G1(7) with U_2 scale.
If one assumes that:

$$G_1(7) = \frac{1}{10}\frac{G_1(1)}{G_0(1)}G_1(1)$$

one obtains a T_x of the 1st order of 4.254788 Gy (4.254788 * 10^9 years).

14.4. Future development, neurogenesis

Here I hypothesize that cultivation of life on the surface of a planet is a cultivation of precursor neuron cells and proteins (relative to the planet) which are, at the point of differentiation transferred to planet's [brain] mantle layers. Similar to accelerated (time compressed) evolution during human embryo-genesis, I hypothesize that effective time compression occurs during planetary evolution too - with the end of each cycle of general oscillation of the Solar System (Earth) and with amount of compression being inversely proportional to cycle order.

The points of differentiation and migration in neurogenesis are major mass extinction events (although limited transfer might occur in smaller extinctions too), which are thus only relative extinctions - life is not completely extinct, it undergoes rapid evolution and migrates away to mantle where it continues evolution.

I hypothesize that Earth's brain has, like human brain, 6 major layers, and that complete formation of these layers requires 6 major mass extinctions during Phanerozoic.

At this point, there is no doubt that we are amidst an major extinction event, a 6th one.

Being part of neurogenesis, extinction events must be programmed at some level and, at least roughly, periodic.

Extinction events have relative triggers. While in the past these may have been impactors and volcanism, current extinction seems to have an anthropogenic trigger.

 doi:10.20944/preprints202105.0488.v9

Thus, one might conclude that current extinction is not part of neurogenesis, rather a part of unlimited cancer growth. However, tumors in humans are known to *induce* neurogenesis (it is one mechanism enabling migration - metastasis).

I find the induction questionable though - humans are not consciously triggering neurogenesis on Earth, it is thus more plausible for neurogenesis to be a reaction of the immune system to inhibit cancer growth. Extinctions coupled with neurogenesis go in favour of such hypothesis. In case of cancer in humans though, and at least during adult neurogenesis in humans, the immune system seems to fail to cure or exterminate the cancerous cells in most cases (in case of humans who are cancerous themselves for Earth, I believe).

The immune system of Earth though, should be more advanced, and I believe cancerous homo.beta[63] will be subdued.

> Homo.beta refers to species of humans currently inhabiting the Earth's surface, self-proclaimed homo sapiens. For various reasons, I consider the title homo sapiens premature for this species, so I have reserved it for an evolved form of human.

Judging by past major extinctions, and correlating with human neurogenesis, these events should be expected with the advancement of planetary neurogenesis:

- increasing rate of volcanism and earthquakes (due to gyrification/formation of brain tissue, incl. fragmentation/cracking of the crust and flooding of the surface, curing cancer?),
- asteroid/cometary impacts (providing energy, acting as specific event triggers - ie. graviton energy level changes, tissue formation with volcanism, curing cancer?),
- water level changes (melting of polar ice to enable migration, flooding of surface with interior water, curing cancer?),
- ocean pH reaching minimum (possibly triggering migration, curing cancer?).

Migration of cells and proteins from surface to mantle layers requires tunnels connecting these regions. Most likely, these tunnels exist on specific places and are recreated or reopened at time of migration. A likely place for such tunnel opening on surface is the south pole, but may exist on north pole of a planet too.

> One fact going in favour of this hypothesis is that during all previous major extinctions there were periods when poles were free from ice. Although, one could argue that, during Phanerozoic, world was more often without polar ice caps, than with.

Cells and proteins are transferred with the flow of cerebrospinal fluid (CSF) - a salty ocean. In humans, CSF has a pH of 7.33, and, since pH is scale invariant the pH of Earth's CSF should be roughly equal. The current acidification of Earth's oceans will, therefore, probably continue until pH drops to this value, when migration should follow. Afterwards, new surface water may be delivered by asteroid impacts, but it is also possible that some or most of it returns from the mantle.

Based on correlation with atmospheric CO_2, climate models predict the hypothesized pH minimum in year 2300 AD for an atmospheric concentration of CO_2 of 1900 ppmv[64] (all fossil-fuel sources burned).

> Note that the pH minimum (7.33 as hypothesized), associated with CSF, must have been reached before on Earth during mass *extinction* events. The research confirms this, ie. for Permo-Triassic[65].

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The cited work shows a [relatively] rapid drop in pH to a minimum, followed by rapid increase and slow progress toward stabilization. Two models were developed for CO_2/pH concentration (low- and high- CO_2, with a difference in pH minimum between the two being less than 0.2), in high-CO_2 model, the pH minimum is 7.35, very close to predicted 7.33 minimum. The work, however, favours the low-CO_2 model, so it cannot be excluded that Earth's CSF pH is somewhat higher (less acidic) than human.
In any case, the existence of a pH minimum and its value strongly support the theory of neurogenesis.

A precursor of 6 mantle layers has likely been created in events during Precambrian era, while population with neuron cells and final formation is occurring in Phanerozoic.

There have been 5 major *extinctions* in Phanerozoic, thus the next event should populate top layers and complete the formation of the final layer (I):

Formed layers of Earth's brain are shown on Figure 17. Comparing with other layers, it seems evident that layer I is yet to be completed - green line shows possible seismic velocities after formation.

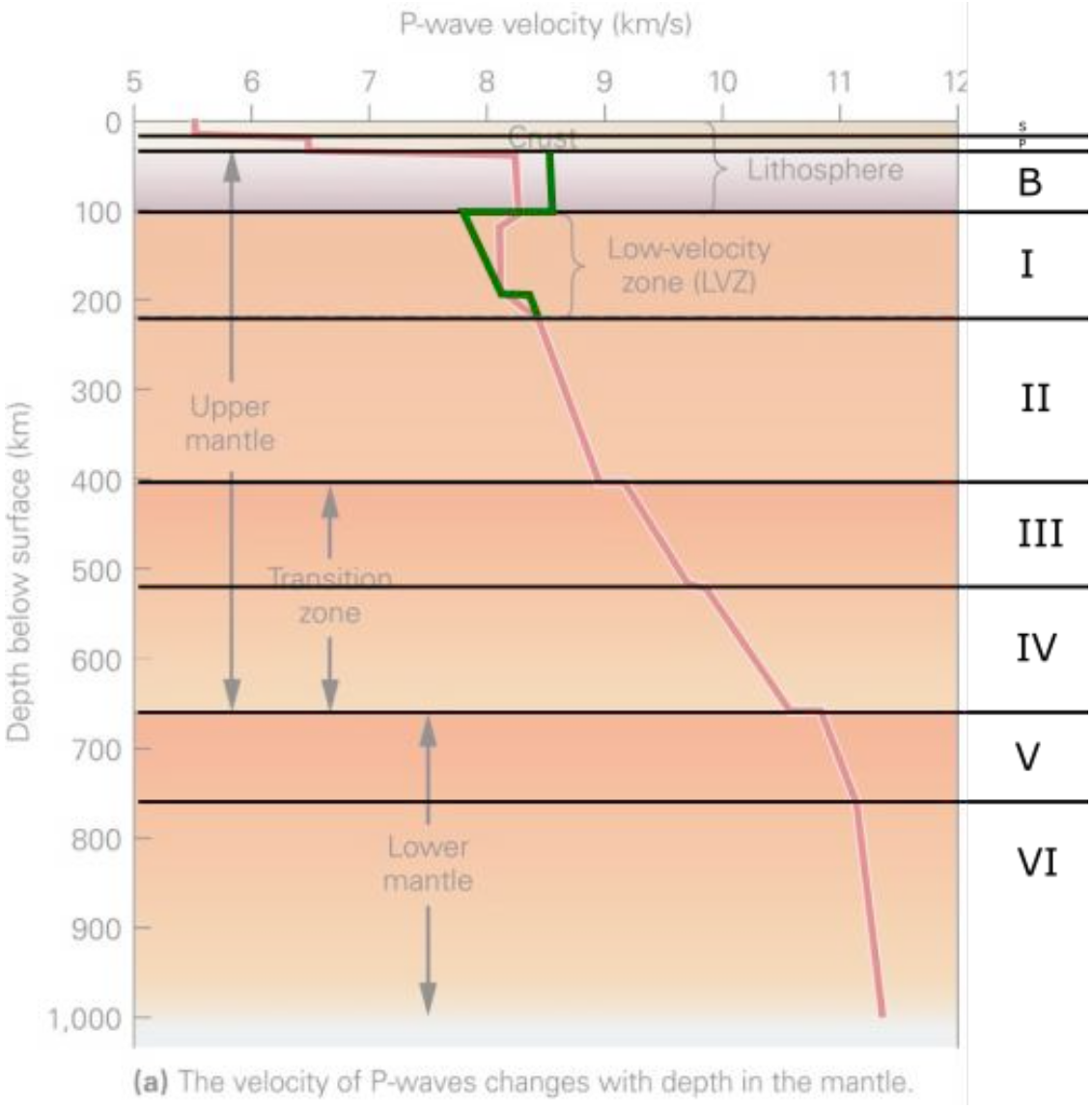

Figure 17. Layers of Earth's brain, superimposed on seismic velocities[66]

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Energy from the Sun provides incubation energy used for the maintenance of the Earth's surface ecosystem and weak evolution, but additional energy is needed for the formation of brain layers of homo.omega.

> Here, homo.omega is a species of life Earth belongs to.

This energy is delivered through asteroid (also could be interpreted as food) and possibly cometary (water/organic compounds) impacts.

Year 2300 AD for the event is very conservative though, as it is based on linear extrapolation, does not include rising water temperatures and reaction of the biosphere.

Acidification of water at these events must be, in large part, driven by injections of gases (ie. sulfur dioxide) through oceanic ridges and vents which would introduce significant departure from linear correlation of pH with atmospheric CO_2.

Mathematical analysis of past perturbations of Earth's carbon cycle [67] also predicts sooner triggering of the 6th major extinction event, before year 2100[68] (based on most likely future emission scenarios, the critical mass of oceanic carbon uptake calculated by the study author will be reached before year 2066).

From Figure 18 and more recent models [70], it is evident that CO_2 concentration has a decreasing trend (expected due to increased energy from the Sun = less greenhouse gases needed to maintain the temperature).

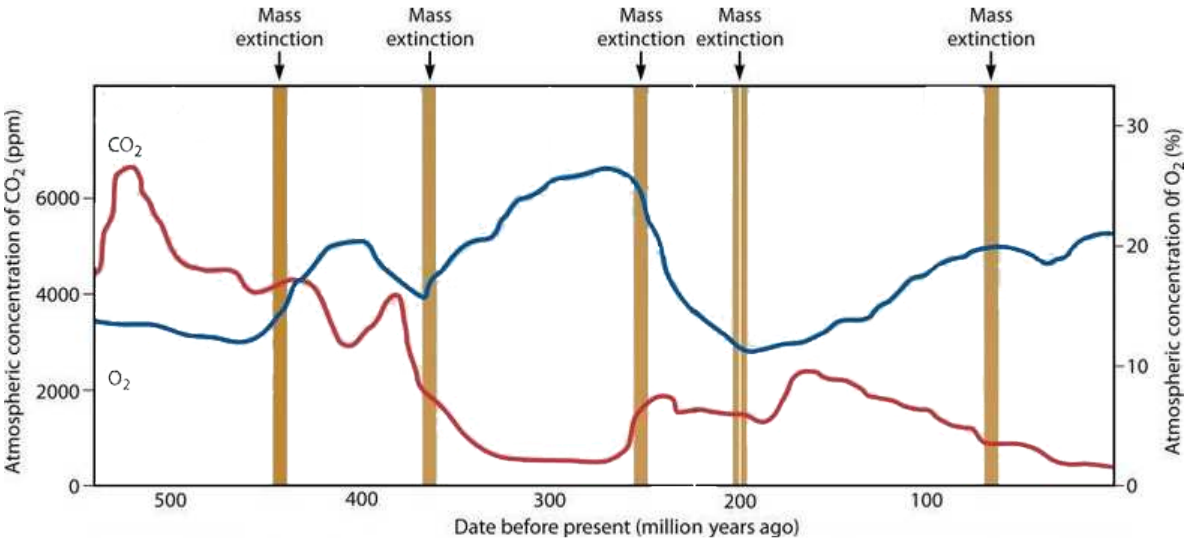

Figure 18. The history of atmospheric CO_2 concentration[69]

Everything in nature oscillates (and fluctuates) so this decrease in amplitude should not be linear either, however some periodicity in extinctions must be present.

Statistically significant periodicity of extinctions[71] (at least in the last 250 million years) has been noted before - 26, and more recently, 27 million years between extinctions[72]. In any case, due to differences in extinction strength, multiple harmonics (or energy splitting of a single oscillator) are possible.

Using available data, one can construct models for atmospheric CO_2 concentration synchronized with the oceanic pH minimum of a particular major extinction, as shown in Table 22.

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Table 22. CO_2 pH minimum marker models

year [mya]	a) CO_2 [ppm]	b) CO_2 [ppm]	c) CO_2 [ppm]	d) CO_2 [ppm]	e) CO_2 [ppm]
444	3800	200	2000	3800	2000
370	1000	2000	1000	1800	1200
252	800	900	800	800	800
201	1800	1800	1800	1800	600
66	250	250	250	300	500
0	450	700	750	800	450

Models are constructed in such a way to simulate oscillation of CO_2 markers and compression of the amplitude with time, but they are also quantized - each marker is a multiple of 50 ppm CO_2 quantum.

Some of the models are shown in Figure 19, blue dots are major extinction events, red triangles are minor extinction events (the curve does not necessarily follow actual CO_2 levels between the extinctions, it is only used to illustrate oscillation of markers).

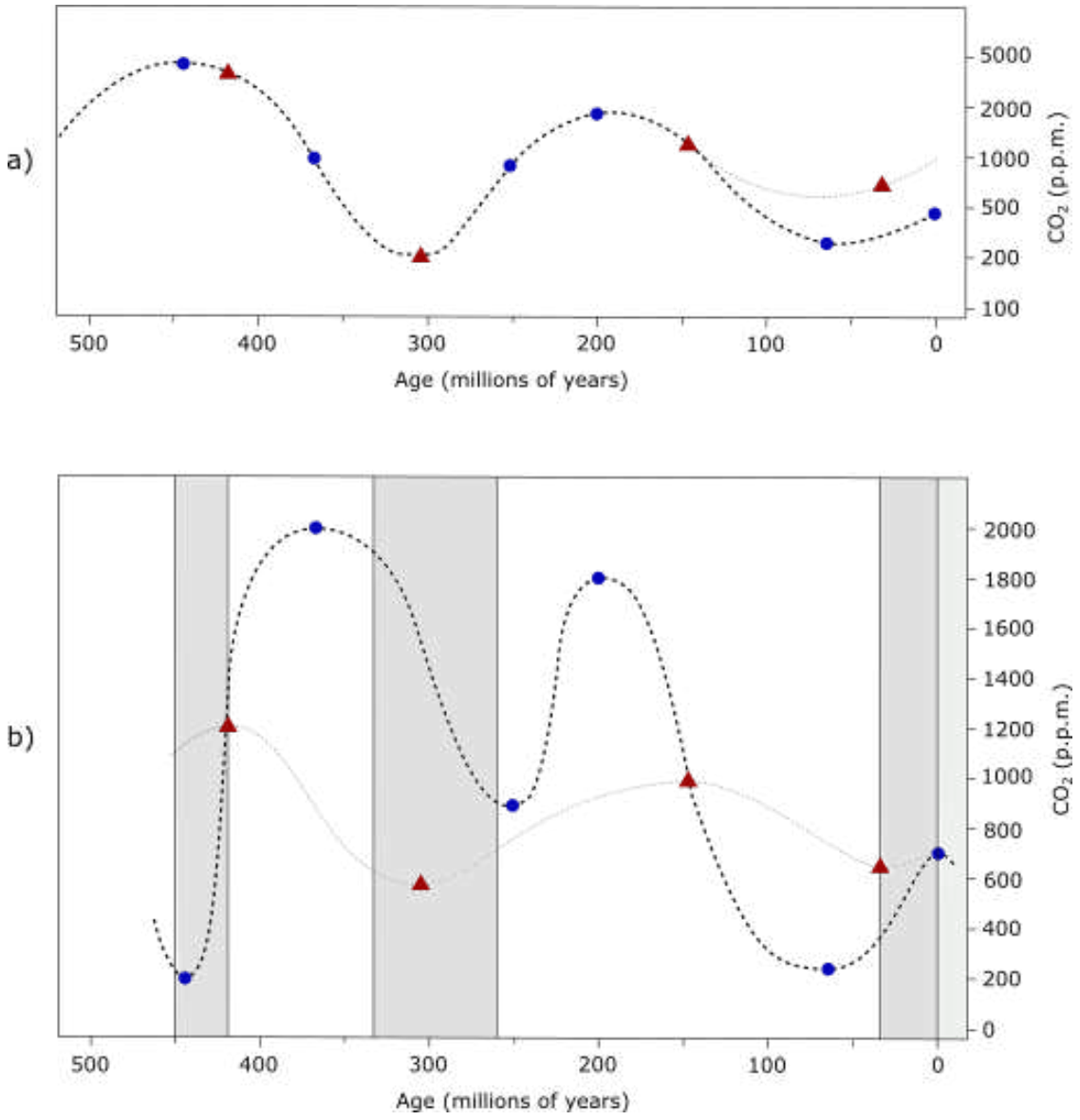

Figure 19. CO_2 pH minimum marker models a) and b) (blue dots = major extinction events, red = minor extinction events, on b) grey = icehouse periods, white = greenhouse periods)

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From these models, grouping of extinctions (suggesting oscillation of frequency) becomes more apparent. Major extinctions can be grouped into pairs separated by 126.5 (±8.5) million years, while paired extinctions are separated by roughly half that distance - 62.5 (±11.5) million years. Minor extinctions (420, 305, 145 and 34 mya) may be grouped in the same way - pairs separated by 160 million years, 113 (±2) million years separation of paired extinctions.

Model a) is the product of energy level splitting of a single oscillator, while b) is the product of 2 harmonic oscillators - one high energy (major) and one low energy (minor).

Points on the curve should not be interpreted as maximum atmospheric CO_2 levels across the boundary, simply the points of migration or pH minimums.

While these particular models may be speculative, all Phanerozoic CO_2 models show decreasing CO_2 over time (this should be more evident when comparing boundaries of major extinction events) and recent research shows that maximum atmospheric CO_2 across the K-Pg boundary (last major extinction) was 875 ppm[73].

Thus, the maximum atmospheric CO_2 concentration during current *extinction* should be lower than 875 ppm, probably not higher than 800 ppm and likely lower than 800 ppm (suggesting that a larger part of acidification will not be sourced in dissolved atmospheric CO_2).

Recent history of CO_2 concentration is shown in Figure 20. Assuming that CO_2 has been, during that history, correlated with rate of evolution, one can extrapolate the relation for accelerated evolution of the current *extinction*.

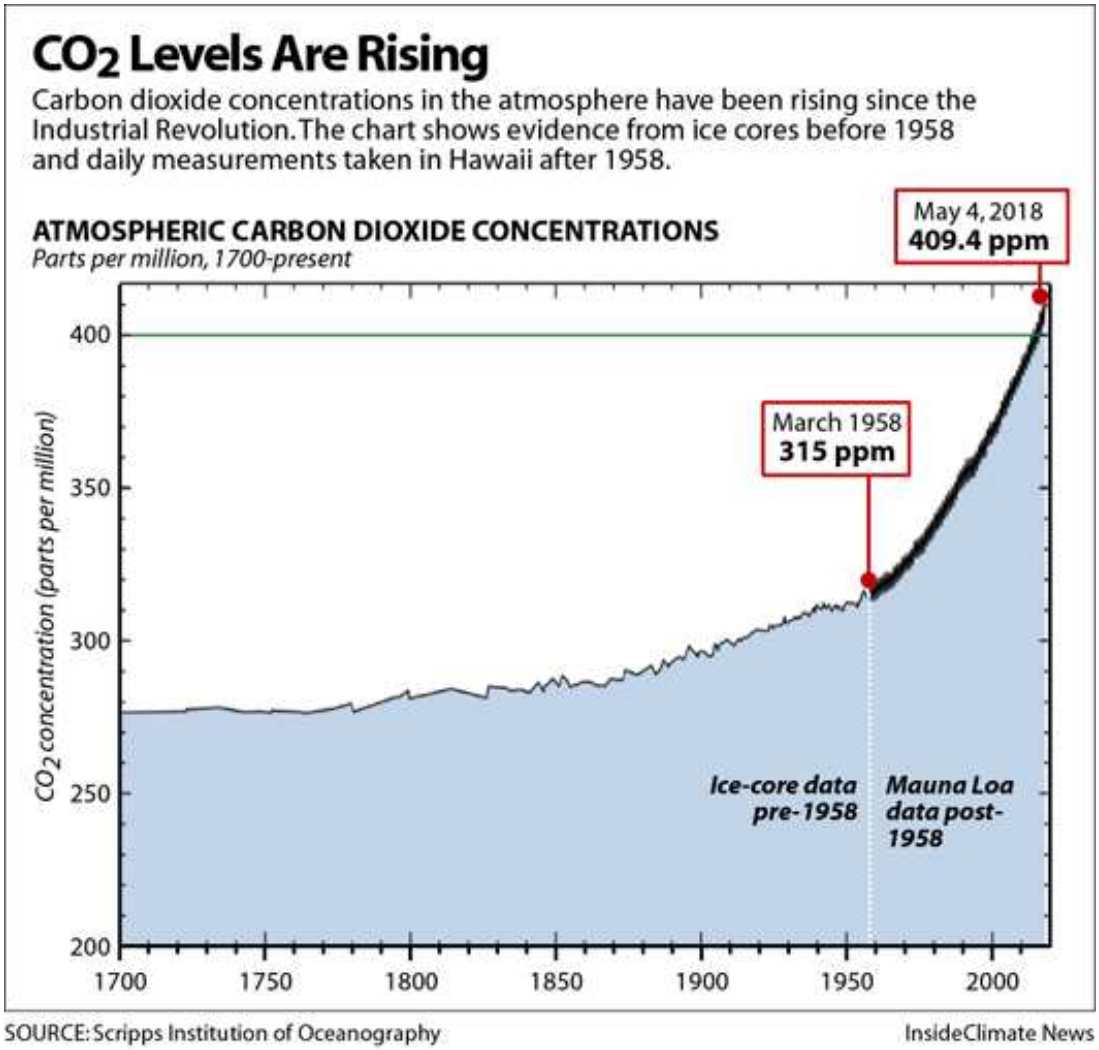

Figure 20. Recent history of CO_2 concentration[74]

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Development and evolution of organisms is generally strongly correlated with temperature. It should not be surprising then that increasing CO_2 (which is synchronized with increasing temperature) is correlated with the increase in rate of evolution on Earth's surface.

Extrapolating from Figure 20, from year 1850 onward:

$$CO_2 = 300 * \left(\frac{6}{5} * 2^{45x^2}\right)^x \text{ ppmv} \tag{C1.1}$$

$$x = \frac{T - 1905}{10 * 55} = \frac{T - 1905}{550}$$

which, for the concentration of 800 ppmv gives year T = 2075.

Note that the equation roughly corresponds to IPCC RCP8.5 (Representative Concentration Pathway 8.5) scenario. Both predict equal CO_2 for year 2100, however, RCP8.5 predicts 800 ppm to be reached sooner - in year 2066.
RCP8.5 is considered a worst-case scenario and, at this point, still may be considered unlikely. However, while replacement of coal and oil with other energy sources may eventually reduce human CO_2 emissions, it is not reducing human impact on nature, which is generally not directly proportional to CO_2 emissions, rather to energy (resources) consumption, which is growing as usual.
If the impact threshold is reached (*point of no return*), human emissions are completely irrelevant and positive feedback mechanisms will produce climate consistent with the RCP8.5 scenario.
Humanity may be [very] slowly abandoning the *business* of CO_2 emissions, but, as proper cancer, it has not abandoned the unsustainable infinite growth policy.
Climate is a part of an eco-system, it evolves with the eco-system, and one cannot expect that disruption of eco-systems won't impact climate. Mass extinctions are always synchronized with climate disruptions.

While humans may eventually reduce their CO_2 emissions significantly, the rate of evolution should keep accelerating according to equation and, regardless of atmospheric CO_2 (which may still be increasing even with 0 human emissions), the required pH minimum will eventually be reached.

Asteroid impacts, previously correlated with Earth's graviton energy level changes, should start before the migration, increasing in frequency and energy afterwards. Although required energy for changes may be lower than in previous major extinctions, it should still be significant.

Lower requirement for energy from asteroids, natural earthquakes and volcanism, if real, may be due to presence of effective anthropogenic equivalents (ie. wars, nuclear detonations, drilling, etc.).

Assuming interval between impacts is quantized proportionally to a 50 ppm CO_2 increase (representing a quantum of energy), given the C1.1 equation, one can calculate years of impact and correlated these with possible impactors, as shown in Table 23. Evidently, there are *good* candidates among extinction causing asteroids in NEO (near Earth orbit) for calculated dates.

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Table 23. Calculated impact dates and possible impactors (2nd order = lower energy)

model	CO_2 [ppm]	year of impact	associated impactor (diameter)	impactor closest approaches	2nd order impactor (diameter)
a), e)	450	2029	99942 Apophis (≈375 m)	2029, 2065	
b)	700	2066	99942 Apophis (≈375 m)	2029, 2065	
c)	750	2071	1866 Sisyphus (≈7 km)	2058, 2071	2000 SG_{344} (37 m)
d)	800	2075	162173 Ryugu (≈1 km)	2076	

Fission of extinction pulses is possible (multiple impacts, ie. one in 2029 and other in 2066) and may be interpreted as splitting of energy levels (breaking of Apophis - homo induced?), which has probably happened in previous extinctions.

Note 1: According to current models based on Newtonian or GR mechanics, none of these asteroids is on a collision course with Earth in near future. However, these models do not predict periodic existence/extinction pulses coupling with a collapse and inflation of gravitational maxima.
As argued before (see, for example, chapters 8 *The cycles* and 12.1 *Correlation with extinctions*), there are good reasons to believe that courses of asteroids are altered at times of extinctions.
If these impacts are *genetically coded* at some level, as hypothesized, they should not be questionable, it is only the source and method of delivery that may be unknown prior to the event.
Note 2: Interestingly, there was an *impact* event on Earth at the time when 400 ppm CO_2 was reached (Chelyabinsk meteor, ≈ 20 m diameter, 2013.), agreeing with hypothesized 50 ppm quantization and suggesting that, not only are intervals between impacts quantized, but that impacts could be expected with every 50 ppm of CO_2 increase.
However, if the events are generally correlated with the average ppm value given by the C1.1 equation, which gives year 2015 for 400 ppm, the 400 pm in year 2013 should be understood as deviation due to inherent uncertainty.
Assuming probability of correlation of these events with CO_2 significantly increases once CO_2 rises above background levels, the first event should have occurred at 300 ppm - the beginning of industrial revolution. Indeed, one such event has occurred at 300 ppm - Tunguska, 1908. Note that the Chelyabinsk meteor is the largest known body entering Earth's atmosphere since the Tunguska meteor.
The equation gives year 1992 for 350 ppm. No meteors of comparable impact energy were recorded in or around 1992., probably eliminating significant direct impacts on land area. If such event did occur, it has likely occurred over the ocean (or island), triggering large waves and possibly earthquakes. Interestingly, an 7.2+ magnitude earthquake and tsunami wave did occur offshore in Nicaragua - in 1992. This earthquake is notable for tsunami wave being unusually large (9.9 m high) for the strength of the earthquake (belonging to a group of rare *tsunami earthquakes*).
I do not believe, however, that the impact caused the earthquake. This was likely the effect of synchronization of events (*synchronicity*) - the tsunami was caused by the earthquake but it was amplified by the impact. The Earth is a living being and it would not be surprising it reacts to incoming bolides and impactors (just like humans do) to some degree.
I have witnessed such synchronization myself - on 2019.03.07 I have observed a larger meteor burning up in the atmosphere exactly at the time of earthquake in Hungary, its trajectory was toward the epicentre. It is even possible that Earth reacts to every possible impactor, although the reaction may be proportional to impactor energy and thus usually negligible.

 doi:10.20944/preprints202105.0488.v9

Also interesting about the Nicaragua event is that it occurred at the time of my birthday (September 1st, local time) producing an obvious signal [75] for me. I interpret this as a confirmation that the meteor was involved in this event, although I am aware many could have a problem with such interpretation.
At the point of writing of this paper, such sign[al]s are still considered meaningless by modern science (they are treated as mere coincidence). However, with CR the phenomena becomes not only real, but a [relatively] special form of synchronization and a driver of evolution with exponentially increasing significance near the end of an existence cycle.
Thus, if one doesn't believe in signals of synchronicity (I didn't before I started experiencing them) I suggest one to study all my work, particularly the work referenced above.
I must admit, however, that my interpretation of the signal could be wrong.
Note that Nicaragua, Chelyabinsk and Tunguska impact sites on the world map can be connected with a straight line - a correlation suggesting that next impact may also occur somewhere along this line (even the Chicxulub, Yucatan crater is close).
Although there were no sightings of large meteors over land, a smaller magnitude impact was recorded on land area in 1992 - the *Peekskill* meteorite. It was recorded one month after the Nicaragua event and is notable for hitting a car in urban area (possibly a fragment of a larger body that fell elsewhere?).
Also interesting, and symbolic, is the fact that the last visit of the Halley's comet to the inner Solar System occurred at the time when 350 ppm CO_2 was first reached - in 1986., and the next time it will be close to Earth is 2061. - exactly at 650 ppm (calculated using the C1.1 equation).
It is currently hypothesized that Tunguska event was caused by a large body which eventually escaped Earth's atmosphere - it can thus be interpreted as a warning.
Given the fact that neither the Chelyabinsk nor hypothesized Nicaragua meteor did not directly impact land, it appears these too were warnings.
However, I do not interpret these as warnings, I believe one purpose of the atmosphere is to disintegrate incoming bodies to protect life during weak evolution. Thus, much larger bodies and impacts should be expected only as events synchronized with strong evolution.
These *recent* events may thus be interpreted as signals of things to come. After these 3 *misses*, I believe next will be impacts.
Note that Newton calculated year 2060 as the first possible year of the Day of Judgment (but what I interpret as the beginning of *the end* of surface world), although he revised this year later to 2016 by the suggestion of others. His final decision to revise the year was, however, based on a signal. As he was doing calculations, large earthquake occurred which he later interpreted as a signal that the year 2060 is wrong. This earthquake was a signal, but he misinterpreted its meaning - large and frequent earthquakes are to be expected at the end. Newton also calculated the end cannot come after year 2344[76].
The year 2016 is not there without a meaning for me too, it is the year of my soul *rebirth* (change of energy level) occurring at the age of 35 of the incarnation[77].
Note 3: Interestingly, at time of the Chelyabinsk event, Apophis asteroid was in close approach. Considering that the composition of Chelyabinsk meteor seems to match the composition of Apophis surface (LL chondrite) a probability exists that the meteor broke off of Apophis and is thus a part of impactor energy splitting.
Note 4: All above confirms that the initially chosen 50 ppm quantum was good. I cannot attribute this to blind luck. The coherence of signals with my thoughts has been only growing ever since I've started experiencing them. Even prior to the models, based on *intuition*, I have *felt* years 2029 and 2066 as probable impact dates, and I wasn't even aware of Apophis at the time.

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For me, the outcome of models and equations is often a confirmation of a signal rather than the other way around.
However, I will rarely mention signals [or use them as evidence] in my works, as I believe most of people do not sense or recognize them yet and even I could still misinterpret the signal. That is one of the reasons I use common logic, equations and models to explain, analyse and predict phenomena. This, I consider necessary to fine-tune the coherence and signal interpretation.
Note 5: The equation C1.1 is one variant of a universal equation for a pulse of strong evolution. That 800 ppm as the CO_2 marker maximum was a good prediction can be confirmed with another variant (inverse) of the equation, one correlated with half-lives of elements:

$$T_{1/2} = 2C_1 - \frac{C_1}{CO_2(T_1)} * CO_2 = 2C_1 - \frac{C_1}{CO_2(T_1)} * 300 * \left(\frac{6}{5} * 2^{45x^2}\right)^x \qquad \text{(C1.2)}$$

$$x = \frac{T - 1905}{10 * 55} = \frac{T - 1905}{550}$$

where $C_1 = T_{1/2}(T_1)$ is the half-life of the element measured at time T_1. The equation gives half-life of 0 at, or near, T = 2075, which is the year when $CO_2(T)$ is equal to 800 ppm. Just like in case of CO_2 I do not expect for half-lives to follow the equation continuously (ie. half-life might appear constant and then get reduced significantly in an instant). Generally, changes in decay rates should require sudden changes in properties of space.
One exception to this, in the Solar System, might be the half-life of ^{10}Be, due to vertical entanglement with the U_1 system. Solar System (scale U_1) cycles through ^{10}(C-B-Be) and I would expect a continuous precursor enrichment in 10B at a lower scale (U_0) before the state change of U_1.
For ^{10}Be, incorporating the value from the most recent measurements (T_1 = 2010, $T_{1/2}(2010) = 1.387 * 10^6$ y), the half-life equation is:

$$T_{1/2} = 2 * 1.387 * 10^6 - \frac{1.387 * 10^6}{385.915461731} * 300 * \left(\frac{6}{5} * 2^{45x^2}\right)^x$$

and it gives values in good agreement with previous measurements, as shown in Table 24.

Table 24. Calculation and measurements[78] of ^{10}Be half-life

year	calculated [10^6 years]	sample	measured [10^6 years]
1947	1.665		1.7 ±0.4 * †
1947 (2)	1.665		1.6 ±0.2 * †
1972	1.608		1.5 ±0.3
1975	1.597		1.48 ±0.15
1986	1.550	NIST-4325	1.34 ±0.07
1987	1.545	ORNL-MASTER	1.51 ±0.06 †
1993	1.513	NIST-4325	1.53 ±5% (1.53 ±0.07) †
1993 (2)	1.513	ICN	1.48 ±5% (1.48 ±0.06) †
2007	1.413	ICN	1.36 ±0.07
2010	1.387		1.388 ±0.018
2010 (2)	1.387		1.386 ±0.016

* the value is not the initially published value, but the result of reanalysis/correction in 1972.,
† these values are discarded by scientific community, citing potential systematic errors (based on the presumption of absolute constancy of decay rates).

All measurements agree well with calculated values, except for 1986 - if there were no flaws in measurement, this may be attributed to deviation due to cycling (similar to yearly fluctuation of

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CO_2). Note, however, that measurement 1993 was done on the same SRM (Standard Reference Material) sample and discrepancy suggests one of these measurements is wrong.
If indeed the half-life of ^{10}Be is decreasing as hypothesized, modern science has been effectively doing cherry-picking here - discarding results which do not agree well, or are in discrepancy, with latest measurements.
Given the current precision of measurements, a new measurement at this point in time which would agree with the calculation would be in discrepancy with measurements from 2010. and would thus confirm the hypothesis of continuous decrease of ^{10}Be half-life prior to the *extinction* event.
Note that this effect on decay rates is temporary and significant only at the end of a cycle of general oscillation up to the 3rd order.
Note also that decay rates may not be changing directly (affecting half-life) rather effectively (CR requires effective oscillation in particle decay, but these changes will not always be reflected in half-life of the element) - ie. through spallation reactions.
Note 6: In the previous note it was assumed that half-life decreases fast and the equation allows it to eventually drop to zero (although, the compression of time implies that this state lasts 0 time - thus, effectively, half-life never becomes 0).
Another possibility, although unlikely, is that half-life cannot ever reach zero, even for 0 time. In that case, the equation might have this form:

$$T_{1/2} = C_1 * CO_2(T_1) * \frac{1}{CO_2} = C_1 * CO_2(T_1) * \left[300 * \left(\frac{6}{5} * 2^{45x^2}\right)^x\right]^{-1}$$

This yields, for T_1 = 1987 (C_1 = 1.512 * 10^6 y, $CO_2(T_1)$ = 341.83707500861), results in Table 25.

Table 25. Calculation and measurements of ^{10}Be half-life

year	calculated [10^6 years]	sample	measured [10^6 years]
1947	1.676 ±0.044		1.7 ±0.4 * †
1947 (2)	1.676 ±0.044		1.6 ±0.2 * †
1972	1.593 ±0.044		1.5 ±0.3
1975	1.579 ±0.044		1.48 ±0.15
1986	1.518 ±0.044	NIST-4325	1.34 ±0.07
1987	1.512 ±0.044	ORNL-MASTER	1.51 ±0.06 †
1993	1.473 ±0.044	NIST-4325	1.53 ±5% (1.53 ±0.07) †
1993 (2)	1.473 ±0.044	ICN	1.48 ±5% (1.48 ±0.06) †
2007	1.365 ±0.044	ICN	1.36 ±0.07
2010	1.339 ±0.044		1.388 ±0.018
2010 (2)	1.339 ±0.044		1.386 ±0.016

where uncertainty in calculation is the scaled variation of CO_2 (10 ppm).

Such pulses might not only be plausible but necessary - first pulse would include asteroid impact(s) (possibly triggering additional ocean acidification and formation of the layer in the mantle), the other would provide new water/life, either by comets or asteroids. A third pulse in between might also be needed to trigger the (now acidified - CSF) ocean sink and, relatively, sterilize the surface (as noted before, all this is probably synchronized with magnetic field collapse, allowing surface sterilization by UV/gamma radiation).

It might seem that new water this time is not needed - as formation of mantle layers should be complete with this *extinction* (corresponding to Carbon nature of the Solar System) there is no need for cultivation of new progenitor cells on surface. However, it probably does happen as it would provide additional radiation protection and provide support for whatever life remains on, or near, surface.

 doi:10.20944/preprints202105.0488.v9

Note that, if this is the last embryonic neurogenesis event of Earth, a collapse of Moon's gravitational maximum probably should be expected. Remains of the Moon could then be the source of eventual impacts of *cometary* nature (dust/water/ice).

This is evident on Mars - as layers below the surface formed, magnetic field receded leaving the surface sterilized. Delivered water froze and is now covered with dust. Thus, one can only expect to find residual and resilient bacteria within the crust of Mars.

Similar happened on Venus except water evaporated due to high surface temperature.

Nothing in nature is linear (although this approximation may be suitable during stages of weak evolution) and in these extreme events one can expect significant departures from linear relations (by multiple orders of magnitude) between phenomena.

Since these events are coupled with gravitational stresses of the Solar System one can expect temporary but significant increase in alpha and neutrino radiation (radiation flux induced by temporary collapse of a gravitational well associated with a large scale graviton - strongly affecting half-lives of isotopes).

One interpretation of changes in decay rates could be [inverse] time dilation due to scale change of gravitational maxima, but what are the mechanics?
If this collapse is synchronized with the collapse of the magnetic field, increased incidence of cosmic rays will increase decays of elements but this is limited to surface and should not be interpreted as real, rather effective and limited, change in decay rates.
However, a mechanism for real changes does exist. Gravitational maximum of Earth must be entangled with *static* graviton neutrinos that form its space. Spin/scale change of a gravitational maximum will thus be synchronized with spin/scale changes of these neutrinos. In equilibrium, when the gravitational well is full, these neutrinos are [most of the time] bound to standard atoms contained in [or bound to] the gravitational well of the maximum. Obviously, disturbance of these neutrinos (decoupling from atoms) will destabilize the atoms (ie. causing annihilation of positive and negative charge) and induce decays.
Also note that these changes are synchronized with orbital changes of large scale maxima in the Solar System - which, like the decay rates, are accelerated during the pulse but return to *normal* after the pulse.
Due to dependence of density of graviton neutrinos to distance from gravity source (density generally inversely proportional to distance squared), it is possible that even orbital changes in eccentric planetary orbitals are synchronized with changes in decay rates, with some phase shift (in that case, graviton neutrinos directly affected are the *static* graviton neutrinos of the Sun's space). However, there is no spin/scale inversion in this case and there will likely exist a threshold eccentricity required to produce significant effects (this can be experimentally verified with satellites in eccentric orbit).
In fact, this may have been detected already [79], and can also be correlated with oscillation of fundamental constants, such as G (as presented already).
Due to universal synchronization and restoration of previous equilibrium states it is hard to detect strong pulses. In fact, astronomical and geological observations, generally, will not reveal any deviation from constancy of decay rates. However, probably all records of cataclysmic changes should be interpreted as fossils of this *elementary* destabilization.
Thus, with such nature of changes (rapid excursions), the principle of uniformitarianism will inevitably seem, but cannot be, valid.

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Note also that most of emitted radiation will be lost to space for the same reason - temporary collapse of gravitational/electro-magnetic well, thus solving the problem of missing radiogenic Helium[80]. Due to conservation of momentum, significant loss of heavier atmospheric particles is not expected due to well loss, but can occur during the short exposure to solar wind.

The assumption of absolutely constant decay rates will not only produce incorrect ages but can result in misplacement of events on a geological timescale. Thus, inconsistencies in certain geological records can serve as indirect evidence to disruptions in decay rates.

Consider the neutrino pulse on Figure 21 - under the assumption of constant decay rates, 3 different fossil records A, B, C may give following results:

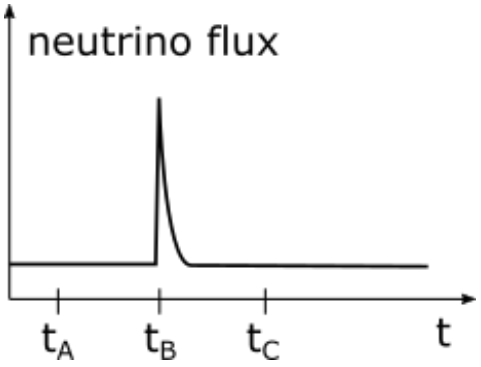

Figure 21. Neutrino pulse due to decay rate increase

- assuming non-isotropic space-time perturbation, such that fossil record A decay is not affected by the event at t_B, the event at t_B (associated with fossil record B) might appear to have happened before the event at t_A (associated with fossil record A)
- in case decay rates of both A and B are affected, the distance of t_A and t_B to t_C will be increased (time interval expansion)

Neutrino flux can also be decreased indicating shortening (rather than expansion) of time intervals, although in this context the increase of the flux is expected.

Due to accumulation, duration of fossilized events would apparently increase with time so older events would seem longer in duration compared to more recent events. This is exactly the case with current fossil evidence of past carbon cycle disruptions.

In such case, the current rate of CO_2 injection is not different from those in previous major extinctions (the fact that it is anthropogenic makes no difference).

If one assumes that the average period between extinctions is equal to the 2nd order oscillation period of the Solar System, in case of ideal synchronization, it is quantized by the 3rd order period of existence (T_x = 1.512 * 10^6 years). In such case, assuming the period must be roughly 26 or 27 million years, the proper period is:

$$T_d = \left\lfloor \frac{26 * 10^6}{1.512 * 10^6} \right\rfloor 1.512 * 10^6 = \left\lfloor \frac{27 * 10^6}{1.512 * 10^6} \right\rfloor 1.512 * 10^6 = 25.704 * 10^6 \, years$$

This is in agreement with previously determined periodicity of impact cratering (25.8±0.6 * 10^6 years)[72].

One can now assume that the CO_2 injection within the Cretaceous-Paleogene (K-Pg) boundary (66.5 - 65.5 mya) is equal to current injection (currently dominantly anthropogenic) and that increase of decay rate (effective compression of time, causing boundary to be significantly overestimated in

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duration) is induced within the boundary - with the start of boundary corresponding to t_A and end to t_C on Figure 21.

Assuming CO_2 increased from 780 ppmv to 1440 ppmv (ΔCO_2 = 660 ppmv) in period 66.5 mya - 65.5 mya (Δt_i = 1 million years)[81], compression of time Δt_c with each major extinction is:

$$\Delta t_c = \Delta t_i - \Delta t_{ai} = 1 * 10^6 - 234 = 999766\, years$$

where Δt_{ai} is the period of 660 ppmv of anthropogenic CO_2 increase since year 1850 (assuming this is the start of the new boundary), calculated using (C1.1).

Such compression of time is easily achievable using C1.2. In example, for ^{10}Be:

$$T_{1/2} = 2 * 1.512 * 10^6 - \frac{1.512 * 10^6}{341.83707500861} * 300 * \left(\frac{6}{5} * 2^{45x^2}\right)^x$$

Half-life of ^{10}Be decreasing by the above equation, reaches required time compression in year 2065, on day 66 of the year. Source code:(Figure: getage.php +)

However, year 1850 as the start of the boundary is not convincing and recent research shows CO_2 injection of 250 ppm, not 660 ppm, within the K-Pg boundary, though this does not affect compression (Δt_c) significantly (it makes it larger for a couple of decades at most).

Most likely start of a new boundary (end of Holocene) is year 2065 or 2066, which, with an increase of 250 ppm, gives year 2084 as the end, the same as in the previous assumption (1850 + 234 = 2084).

Number of 3rd order cycles of existence since Cretaceous-Paleogene extinction event (66 mya):

$$n = \left\lfloor \frac{t_{KPg}}{T_x} \right\rfloor = \left\lfloor \frac{66 * 10^6}{1.512 * 10^6} \right\rfloor = 43$$

Gravitational collapses during strong evolution pulses with a period of T_x years (3rd order period) may last only Δt_{n_x} = 19.3 seconds, but collapses during stronger evolution pulses occurring with a period of T_d years (2nd order) last longer (possibly 7 days).

With each extinction, gravitational collapse of the Sun releases the pressure from condensed energy beyond the surface event horizon and the Sun effectively starts expanding.

The expansion reaches the orbit of Mars before the gravitational well is restored, so, assuming expansion at the speed of light, time of increased decay radiation is:

$$\Delta t_{n_d} = \frac{r_M}{c} = \frac{227.92 * 10^9}{2.99792458 * 10^8} = 760.259\, s = 12.671\, m$$

where r_M is the distance of Mars to Sun.

Now one can calculate time compression with each cycle (pulse) of existence Δt_{c_x} and each extinction Δt_{c_d}:

$$\Delta t_c = \Delta t_{c_d} + \Delta t_{c_x}$$

$$\frac{\Delta t_{c_d}}{\Delta t_{c_x}} = \frac{\Delta t_{n_d}}{\Delta t_{n_x}}$$

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$$\Delta t_{c_x} = \Delta t_c \frac{1}{\frac{\Delta t_{n_d}}{\Delta t_{n_x}} + 1} = 24751.794\, years$$

$$\Delta t_{c_d} = \Delta t_c - \Delta t_{c_x} = 975014.206\, years$$

Age of Earth is thus overestimated by:

$$\sigma_{T_E} = \left\lfloor \frac{\Delta T_{E_{img}}}{T_d} \right\rfloor \Delta t_{c_d} + \left\lfloor \frac{\Delta T_{E_{img}}}{T_x} \right\rfloor \Delta t_{c_x} = 245907386\, years$$

giving the real age of Earth:

$$\Delta T_E = \Delta T_{E_{img}} - \sigma_{T_E} = 4.29409 \pm 0.05 * 10^9\, years$$

where $\Delta T_{E_{img}}$ = 4.54±0.05 * 10^9 years.

If one assumes that T_d is the equivalent of 1 day of human embryo development, Earth is at the week 25 (GW25) of gestation period (right at the beginning, in case of corrected age).

The GW25 marks the end of embryonic neurogenesis in humans and thus agrees with the suggestion of final major extinction.

The current carbon cycle disruption (6th major extinction) will thus not span thousands (10000) of years as predicted by the assumption of constant decay, but at most 234 years - starting from year 1850 (10000 years of already passed Holocene extinction may be regarded as a precursor to the major event starting at year 1850).

$$1850 + 234 = 2084$$

Note that this year corresponds to 950 ppm, as predicted by (C1.1).

14.4.1. Magnetic field collapse

As noted before, the 6th major extinction will likely include a decline of the Earth's magnetic field, either as a temporary excursion (partial or global collapse), part of a complete reversal, or even a longer-lasting or permanent retreat. The Earth's magnetic field is currently declining at an accelerated rate, which, when coupled with the rapid movement of magnetic poles, indeed suggests imminent collapse. The previously determined correlation of the 4th order period of general oscillation of the Solar System with past excursions (see chapter 8 *The cycles*) also suggests that, at least, a magnetic excursion is near.

If that is so, when will the collapse, partial or not, occur?

With no further acceleration of the decline the collapse would occur sometime beyond year 2100. However, such scenario is unlikely - additional acceleration is expected for a collapse.

The collapse should also be relatively synchronized with other impactful events, which, as I hypothesize, are correlated with the rate of evolution - which is currently correlated with the rate of atmospheric CO_2 increase. With the assumption of events occurring with every 50 ppm increase of CO_2, per the equation C1.1, one obtains the following years:

- 2029, 2040, 2048, 2055, 2061, 2066, ...

Thus, the magnetic collapse should not occur before year 2029 (or, 450 ppm CO_2) and most likely not after year 2066. I find it likely to occur sometime around 2048, however, it full collapse is imminent, it may be preceded by multiple partial and/or temporary collapses, perhaps even with first one occurring 2030±1.

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14.4.2. Sea level changes

Neurogenesis requires transfer of differentiated progenitor cells to subterranean world, into designated mantle layers. Therefore, a passageway must exist somewhere, connecting the surface with underground tunnels leading to such places - unless one is created when needed, which I find unlikely.

Scaling the largest neuron cells to Earth size, such passageway must have a radius of at least ≈ 250 meters to allow sequential cell transfer. However, parallel transfer of multiple cells is certainly more plausible - a radius on the order of 10^4 m.

Thus, the only location where this could remain hidden (protected) and isolated when unused is Antarctica. Ice melting is required to expose this location but likely also to rise the sea level in order to pick up the proteins and cells on land area.

Rise in atmospheric greenhouse gases is unlikely to produce adequate rise in temperature required to melt all ice in the predicted short time-frame. Thus, different mechanisms should be responsible to induce significant breaking and melting of ice sheets. In addition to greenhouse gases, volcanism/geothermal sources are likely. Melting can also be accelerated by asteroids, but also by alien species from the deep.

> Note that, although predicted as such, migration of life from the surface to mantle layers does not necessarily imply transfer of living individuals (depending on transfer mechanism, it may not even be possible to survive it). What may be required is only for DNA to survive.

14.4.3. Analysis of past extinctions

Here, past extinctions are analysed for periodicity, with incorporated corrections by previously calculated time compression due to pulses of decay rate changes.

Periodicity is obtained using circular spectral analysis [83] of a couple of datasets, which all give similar results.

Data is grouped into energy levels corresponding to the extinction magnitude (5 - major extinctions, 4 - minor extinctions, 3 - other extinctions, 2 and 1 - potential extinctions).

The method In the circular model of periodicity a time line is *wrapped* around a circle, the circumference of which represents a trial period. For each occurrence, a unit vector from the origin is calculated. If periodic, the series will tend to form a cluster at one point on the circumference when the correct trial period is used. Here, angular location relative to 0° (present) gives the phase (t_0).

Ages of individual events (t_i) are transformed to angles (a_i, b_i) for each trial period P:

$$a_i = \sin\left(\frac{2\pi}{P} t_i\right)$$

$$b_i = \cos\left(\frac{2\pi}{P} t_i\right)$$

$$S = \frac{1}{N} \sum_{i=1}^{N} a_i$$

$$C = \frac{1}{N} \sum_{i=1}^{N} b_i$$

$$R = \sqrt{S^2 + C^2}$$

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where R is a mean vector magnitude (normalized measure of goodness of fit). The phase shift (t_0) is calculated as follows:

$$t_0 = \frac{P}{2\pi}\tan^{-1}\left(\frac{S}{C}\right) \qquad (\text{for } C > 0)$$

$$t_0 = \frac{P}{2} + \frac{P}{2\pi}\tan^{-1}\left(\frac{S}{C}\right) \qquad (\text{for } C < 0)$$

Dataset 1 Extinction events in dataset 1, grouped into energy levels and calculated corrected ages for these events, respectively, are shown in Table 26.

Table 26. Extinction events dataset 1, sources: *[72], a[84], b[85], c[86], d[87], e[88], f[89], g[90], h[91]

energy level	extinction events [mya]	extinction events (t_i), age corrected [mya]
5	66*, 201.3*, 252.2*, 365, 445	61.986, 190.208, 238.316, 345.385, 421.148
4	37.8*, 145*, 260[a], 305[b], 420[c]	36.206, 136.774, 245.993, 288.3, 397.519
3	11.6*, 93.9*, 182.7*, 230[d], 270, 424[e], 428[f], 488[g], 502	11.402, 88.465, 172.88, 217.463, 255.844, 401.469, 404.42, 461.48, 475.257
2	117[h], 168.3*	111.194, 159.702

Maximal R was obtained for a period P = 25.92 My (million years), with a phase of 9.355 My.

On the left, Figure 22 shows extinctions plotted against the obtained periodicity (dashed grey line), solid colored circles are extinction events with corrected ages, empty circles are extinctions with non-corrected ages. On the right, Figure 22 shows the result of circular spectral analysis.

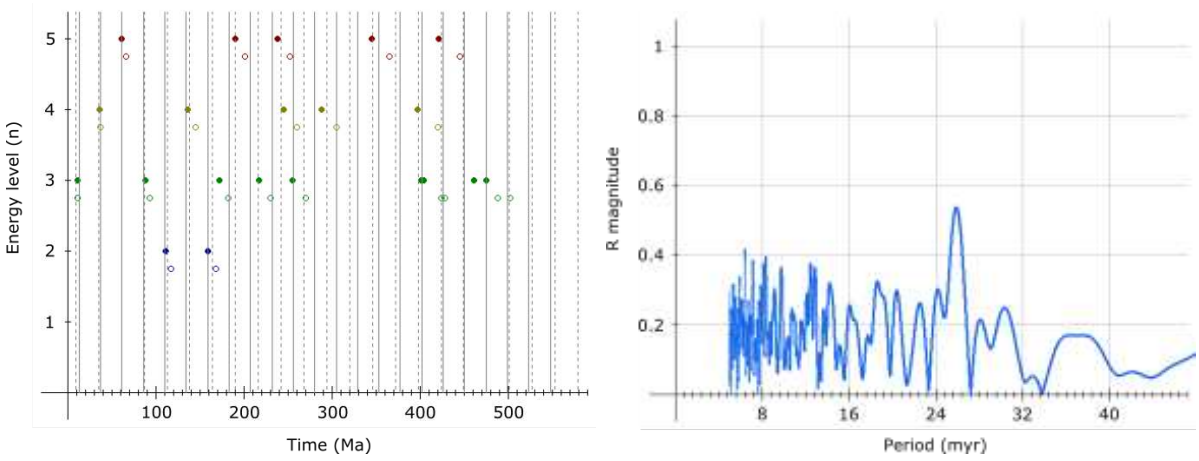

Figure 22. Extinctions (left), spectral analysis (right)

Dataset 2 Here, a larger dataset from a single source was used. Maximal R reveals a period P = 26 My, with a phase of 8.617 My.

Table 27. Extinction events dataset 2, source: Gradstein2016[92]

energy level	extinction events [mya]	extinction events (t_i), age corrected [mya]
5	66, 201.4, 251.9, 372.2, 445.2	61.986, 190.308, 238.041, 352.461, 421.348
4	37.8, 145, 259.8, 306.7, 419.2	36.206, 136.774, 245.793, 289.975, 396.744
3	11.6, 93.9, 183.7, 228.5, 272.3, 423, 427.4, 485.4, 500.5	11.402, 88.465, 173.88, 215.987, 257.12, 400.469, 403.82, 458.929, 473.782
2	113.1, 168.3	107.344, 159.702

Extinctions and the result of spectral analysis are shown in Figure 23.

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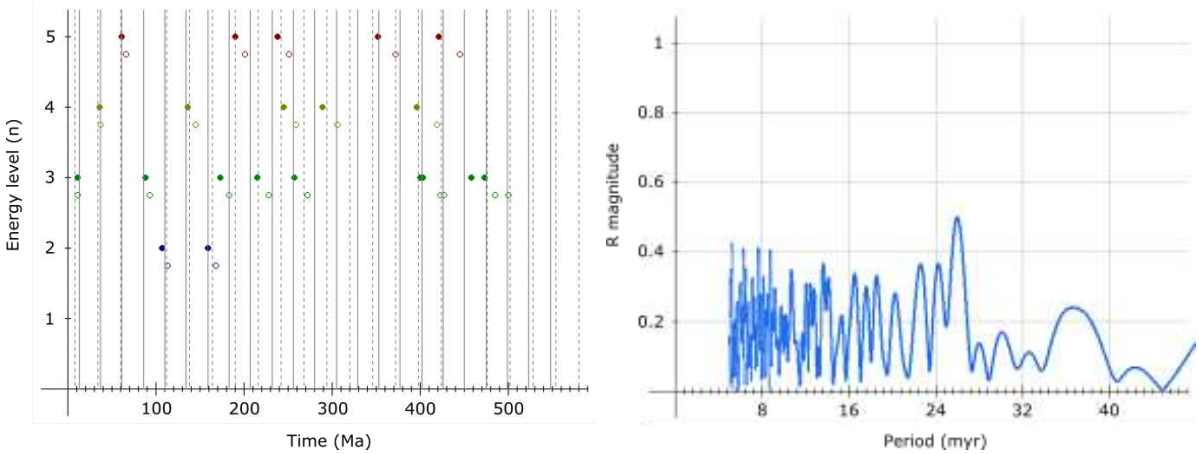

Figure 23. Extinctions (left), spectral analysis (right)

Dataset 3 Previous datasets do not take into account possible splitting of energy levels. Here, an even larger dataset is presented which shows possible energy splitting and how this, when not accounted for, causes lower confidence in calculated P.

Table 28. Extinction events dataset 3, source: Gradstein2016[92]

energy level	extinction events [mya]	extinction events (t_i), age corrected [mya]
5	66, 201.4, 251.9, 372.2, 445.2	61.986, 190.308, 238.041, 352.461, 421.348
4	37.8, 145, 259.8, 306.7, 419.2, 514	36.206, 136.774, 245.793, 289.975, 396.744, 486.084
3	11.6, 93.9, 183.7, 228.5, 272.3, 423, 427.4, 485.4, 500.5, 541	11.402, 88.465, 173.88, 215.987, 257.12, 400.469, 403.82, 458.929, 473.782, 511.664
2	113.1, 168.3, 330.9	107.344, 159.702, 312.804
1	295, 346.7, 393.3, 467.3	279.448, 328.357, 372.239, 442.101

Here, for R = 0.413, obtained P = 22.493 My, phase 15.603 My.

Dataset 4 Here I hypothesize that deviations from P are the result of energy splitting into smaller events which when grouped properly would fit on P intervals.

The dataset is the same as dataset 3, except the hypothesized splittings (circled extinction pairs in Figure 24) have been grouped into a single event, simply by using arithmetic mean age of the pair.

Table 29. Extinction events dataset 4

energy level	extinction events [mya]	extinction events (t_i), age corrected [mya]
5	66, 201.4, (251.9+259.8)/2 = 255.9, 372.2, 445.2	61.986, 190.308, 241.967, 352.461, 421.348
4	37.8, 145, 306.7, (419.2+423)/2 = 421.1, (514+541)/2 = 527.5	36.206, 136.774, 289.975, 398.619, 499.361
3	11.6, 93.9, (183.7+168.3)/2 = 176, 228.5, (272.3+295)/2 = 283.7, 427.4, (485.4+467.3)/2 = 476.4, 500.5	11.402, 88.465, 166.304, 215.987, 268.346, 403.82, 451.053, 473.782
2	113.1, (330.9+346.7)/2 = 339	107.344, 320.78
1	393.3	372.239

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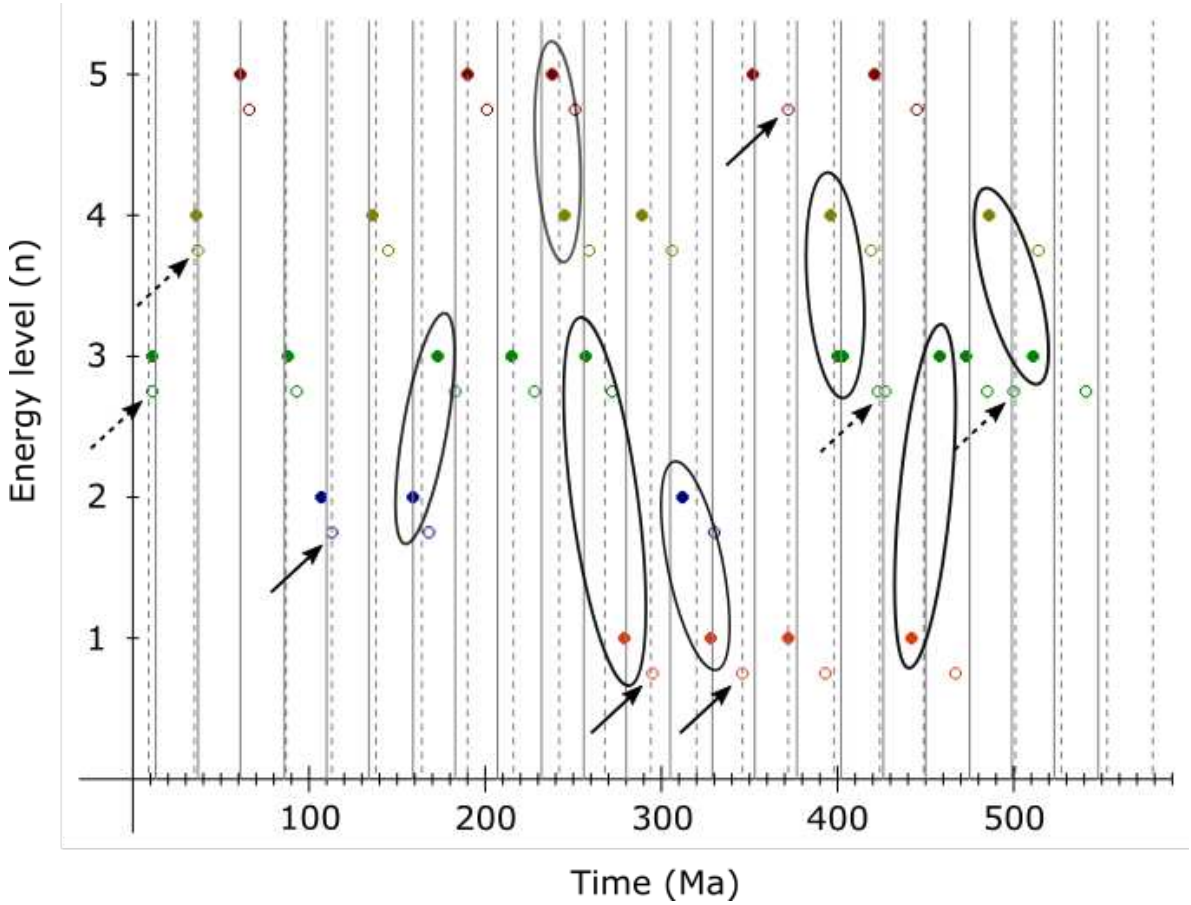

Figure 24. Extinctions

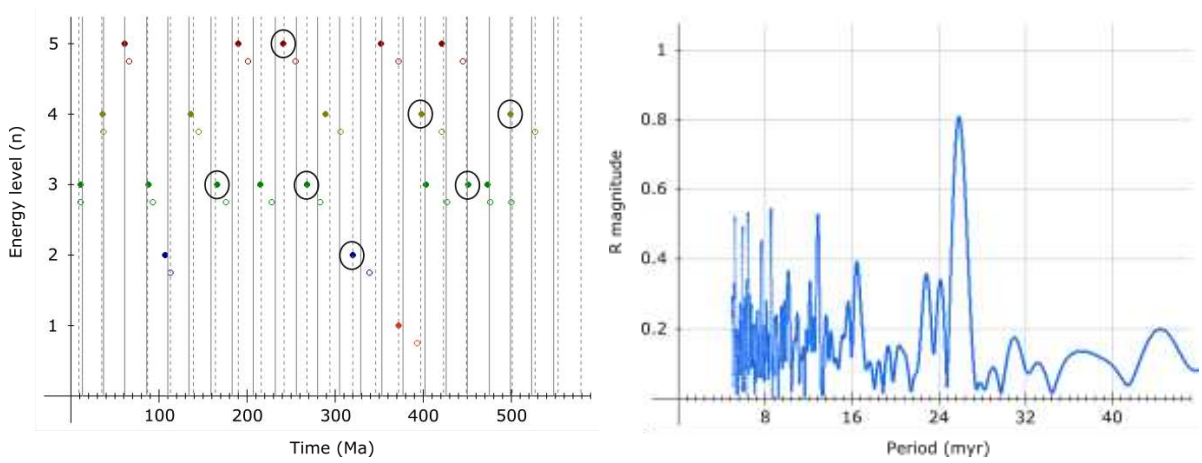

Figure 25. Extinctions (left), spectral analysis (right)

The R peaks at 0.807, corresponding to P = 25.89 My, very close to one obtained from dataset 1. Phase is 9.55 My.

Dataset 5 Here dataset 4 is modified with the assumption that splitting occurs in all events, thus, in addition to previously grouped events, the remaining non-grouped events have been grouped with adjacent boundaries.

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Table 30. Extinction events dataset 5

energy level	extinction events [mya]	extinction events (t_i), age corrected [mya]
5	(61.6+66)/2 = 63.8, (199.4+201.4)/2 = 200.4, (251.9+259.8)/2 = 255.9, (372.2+382.7)/2 = 377.5, (443.8+445.2)/2 = 444.5	60.81, 189.333, 241.967, 356.687, 420.648
4	(33.9+38)/2 = 36, (139.4+145)/2 = 142.2, (306.7+314.6)/2 = 310.7, (419.2+423)/2 = 421.1, (514+541)/2 = 527.5	34.431, 134.998, 293.926, 398.619, 499.361
3	(11.6+13.8)/2 = 12.7, (89.8+93.9)/2 = 91.9, (183.7+168.3)/2 = 176, (228.5+237)/2 = 232.8, (272.3+295)/2 = 283.7, (427.4+430.5)/2 = 429, (485.4+467.3)/2 = 476.4, (497+500.5)/2 = 498.8	12.502, 86.49, 166.304, 220.213, 268.346, 405.395, 451.053, 472.107
2	(113.1+126.3)/2 = 119.7, (330.9+346.7)/2 = 339	112.87, 320.58
1	(387.7+393.3)/2 = 390.5	369.489

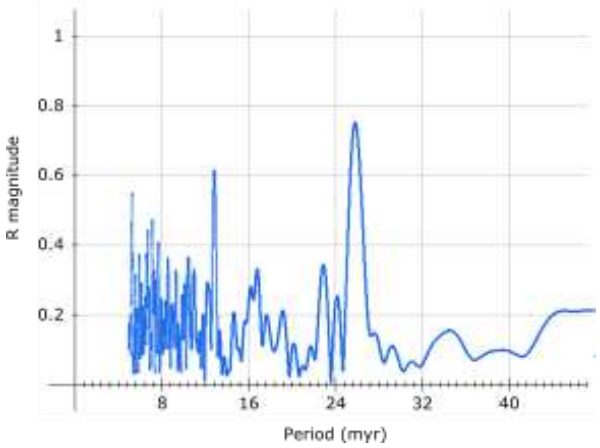

Figure 26. Dataset 5, spectral analysis

The R peaks at 0.75, corresponding to P = 25.84 My. Phase for this P is 9.78 My, however, here another peak at 12.875 My (R = 0.61) reveals a likely harmonic.

Dataset 6 Here, dataset contains only highest energy (major and minor) extinctions, from dataset 1. This dataset gives highest R maximum (0.837), a period P = 25.74 My, with a phase of 9.689 My.

Table 31. Extinction events dataset 6

energy level	extinction events [mya]	extinction events (t_i), age corrected [mya]
5	66, 201.3, 252.2, 365, 445	61.986, 190.208, 238.316, 345.385, 421.148
4	37.8, 145, 260, 305, 420	36.206, 136.774, 245.993, 288.3, 397.519

Confidence Note that equal weight was assumed for all extinctions in a particular dataset. Different weights can affect the confidence in the result (less if they are all harmonics). But even with that taken into account, there is high confidence in P ≈ 25.74 My - 25.89 My.

The result with highest confidence (25.74 My) is also the closest to calculated ideal quantization by the 3rd order period ($1.512 * 10^6$ My) - 25.704 My, further increasing confidence in such periodicity.

Note that the *burning* cycle of the Sun's core is calculated (in the "Quantization of the Sun" chapter[#]) to be equal to 25.746608 My, confirming the signal.

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Neurogenesis in standard lifeforms on Earth during embryonic development does imply certain periodicity in the formation of brain layers and neuron migration.

High energy impact cratering and extinctions (migrations) in planetary neurogenesis should be no exception.

In fact, with such periodicity and the last high energy extinction 37.8 My in the past, next one is overdue, roughly by the phase shift.

Note that such delay of extinction may have some benefits due to more evolved precursor neurons at time of differentiation, although with the cost of increased probability of cancer development.
Also note that neurogenesis implies correlation of many processes. Therefore, calculated periodicity should not be limited to mass extinctions, rather present in plethora of other phenomena affecting the planet - volcanism, magnetic reversals, seafloor spreading, orogenic events, etc.
Indeed, such periodicities has been found in previous analyses [93].

Thus, imminent major extinction as calculated using models based on C1.1 equation should not be surprising.

Supplement Here is the code used to calculate correct ages of extinction events, perform the analysis and generate images.(Figure: getext.php +)

14.4.4. Correlation with mantle layers

Grouping and correlation of extinction events with the formation of brain [mantle] layers also indicates that another major mass extinction should be near, at least in geological terms.

This correlation is shown on Figure 27 - time between major extinction events of Phanerozoic is proportional to thickness of a corresponding mantle layer.

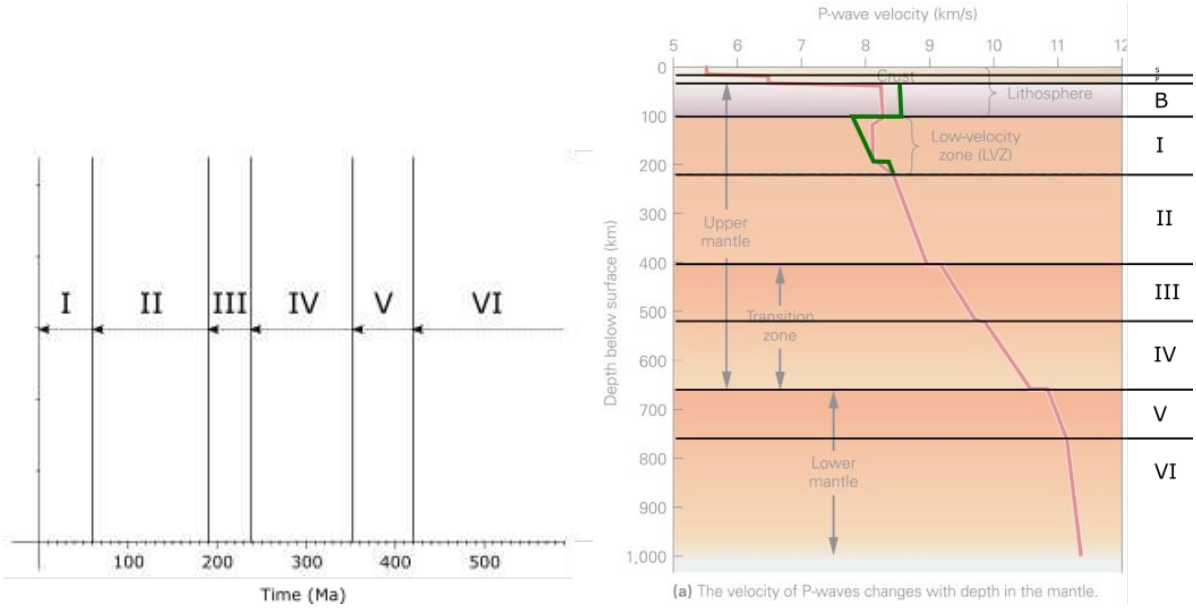

Figure 27. Correlation of major extinctions (left) with Earth's mantle layers (right)

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Such correlation should not be surprising - all lifeforms grow in layers. But it also confirms the previous hypothesis that asteroid impacts are correlated with discontinuities (changes in energy levels) in Earth.

This is, effectively, a conversion of time separated discontinuities into events separated in space.

To quantify the correlation, periods of weak evolution and thicknesses of mantle layers have been normalized:

$$T_n(i) = \frac{T(i)}{\sum_{j=1}^{N} T_j}$$

$$D_n(i) = \frac{D(i)}{\sum_{j=1}^{N} D_j}$$

Results are shown in Table 32. Here, corrected extinction ages are used, although non-corrected ages would yield similar results. Correlation in absolute value varies between the pairs, but overall, it is apparent.

Table 32. Comparison of weak evolution periods and mantle layers, sources: a[94], b[95]

i	Period of weak evolution T [My]	Normalized period of weak evolution T_n	Corresponding mantle layer thickness D [km]	Normalized layer thickness D_n
5	421.348 - 352.461 = 68.887	0.163	780^b - 660^b = 120	0.176
4	352.461 - 238.041 = 114.42	0.272	660^b - 520^b = 140	0.206
3	238.041 - 190.308 = 47.733	0.113	520^b - 410^b = 110	0.162
2	190.308 - 61.986 = 128.322	0.305	410^b - 220^a = 190	0.279
1	61.986 - 0 = 61.986	0.147	220^a - 100^b = 120	0.176

At least some discrepancy could be explained by the fact that formation is not yet complete - ie. the boundary between layers 3 and 4 might change with the pending extinction.

If layer 3 decrease would be equal to layer 4 increase (≈ 0.0575 in normalized value) and layer 1 decrease to layer 2 increase ($\approx 0.0275 \approx 0.0575 / 2$), with a small decrease in layer 5 ($0.013 \approx 0.0275 / 2$) coupled with equivalent increase in layer 6, normalized extinction and mantle boundaries would be almost equal.

Effectively, what is necessary for better agreement is the *upward* movement of 3 discontinuities (between layers I and II, III and IV, V and VI).

There are two interpretations for the correlation. Extinction events are either memorized in Earth's [brain] mantle as they occur or they are programmed events and can be predicted through the analysis of discontinuities (layers) in the mantle. The ongoing 6th major extinction and existing discontinuity at 100 km depth suggest the latter, although superposition may be more likely - discontinuities are ancient but they move/adjust as extinctions occur.
In any case, the correlation is good evidence for living Earth and its neurogenesis.
The entanglement of 3 discontinuities (I/II, III/IV, V/VI) suggests that all 3 move during a single extinction, thus, if movement is correlated with asteroid impacts, 3 impacts may be ahead.

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However, exact location of boundaries is a matter of debate. They must have some thickness, so it may be more appropriate to equate layer thickness with distance between discontinuities. If that would be a distance between lower discontinuities of two boundaries, it would, for layer 1, yield a normalized value exactly equal to the corresponding normalized period of weak evolution:

$$\frac{220-120}{680}=\frac{100}{680}=0.147$$

Also, globally average velocities might not be the best choice for determination of layer discontinuities - ie. Lehmann discontinuity is at 220 km for tectonic North America, but 200 km for shield North America [96], while it may be absent beneath north Atlantic and other oceans.

> No graviton can be completely neutral. If discontinuities are [large scale] gravitons, holes in these, proportional to polarization, are expected.

If one assumes that 200 km is a *proper* boundary (220 km may be a precursor boundary that will reduce to 200 km with complete formation), the correlation with extinctions for both layers, I and II, becomes remarkable:

$$\frac{200-100}{680}=\frac{100}{680}=0.147$$

$$\frac{410-200}{680}=\frac{210}{680}=0.309$$

Some report the base of the upper mantle at 670 km[97] rather than 660, this improves the correlation with layers 5 and 4:

$$\frac{780-670}{680}=\frac{110}{680}=0.162$$

$$\frac{670-520}{680}=\frac{150}{680}=0.221$$

Now, the only *problematic* boundary is the one between layers 3 and 4 (at 520 km). Some do report this boundary at 500 km, which gives much better agreement:

$$\frac{670-500}{680}=\frac{170}{680}=0.250$$

$$\frac{500-410}{680}=\frac{90}{680}=0.132$$

Note that extinction boundaries also have some thickness or uncertainties, notably first three, which may explain differences in reported discontinuity depths. The 3rd major extinction (Permian) is apparently split into two events (End-Capitanian and Permian-Triassic). Using End-Capitanian 245.793 Mya (259.8 Mya non-corrected) instead of Permian-Triassic 238.041 Mya (251.9 Mya non-corrected) as the date of Permian extinction gives results in remarkable agreement with the obtained layers 3 and 4 (with discontinuities at 410 km, 500 km and 670 km):

$$\frac{352.461-245.793}{421.348}=\frac{106.668}{421.348}=0.253$$

$$\frac{245.793-190.308}{421.348}=\frac{55.485}{421.348}=0.132$$

The correlation, with above adjustments, is shown in Table 33 (with ages rounded to a single decimal). The correlation, using uncorrected ages for major mass extinctions, is shown in Table 34.

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Table 33. Correlation of weak evolution periods and mantle layers (or, major extinctions and discontinuities)

i	Period of weak evolution T [My]	Normalized period of weak evolution T_n	Corresponding mantle layer thickness D [km]	Normalized layer thickness D_n
5	421.3 - 352.5 = 68.8	0.163	780 - 670 = 110	0.162
4	352.5 - 245.8 = 106.7	0.253	670 - 500 = 170	0.250
3	245.8 - 190.3 = 55.5	0.132	500 - 410 = 90	0.132
2	190.3 - 62.0 = 128.3	0.305	410 - 200 = 210	0.309
1	62.0 - 0 = 62.0	0.147	200 - 100 = 100	0.147

Table 34. Correlation of weak evolution periods and mantle layers, using uncorrected ages

i	Period of weak evolution T [My]	Normalized period of weak evolution T_n	Corresponding mantle layer thickness D [km]	Normalized layer thickness D_n
5	445.2 - 372.2 = 73.0	0.164	780 - 670 = 110	0.162
4	372.2 - 259.8 = 112.4	0.252	670 - 500 = 170	0.250
3	259.8 - 201.4 = 58.4	0.131	500 - 410 = 90	0.132
2	201.4 - 66.0 = 135.4	0.304	410 - 200 = 210	0.309
1	66.0 - 0 = 66.0	0.148	200 - 100 = 100	0.147

Interestingly, corrected ages are in all cases except for i=4 in better agreement with mantle layers. Unless an artefact of rounding/imprecision (ie. in depths of discontinuities, which may be averages) this can be interpreted as evidence for effective time compression (pulses of abrupt temporary changes in decay rates of elements).

The excellent agreement here suggests no further adjustment of discontinuities is needed, except possibly for layer I, as shown in green in Figure 27 (right) which should be unsurprising given the correlation with the current extinction.

Correlation of layer 6 and the corresponding period of weak evolution has not been determined due to unknown boundary.

However, assuming the extinction at the start of Phanerozoic (511.664 mya in corrected age, or 541 mya non-corrected) is correlated with the lower boundary of layer 6, one can calculate the thickness of layer 6:

$$\frac{T_6}{T_5} = \frac{D_6}{D_5}$$

$$D_6 = \frac{T_6}{T_5} D_5 = \frac{511.664 - 421.348}{421.348 - 352.461} 120 = 157\,km$$

In that case, a discontinuity, if formed, should exist in Earth's mantle at a depth of 937 km (assuming boundary between layer 5 and 6 at 780 km).

Apparently, this discontinuity has been detected[98] (at 940 km).

14.4.5. Evidence in time compression

If planetary neurogenesis is happening on Earth, it was likely happening on Mars and Venus too. Time, however, flows differently for animals of different size. The rate of evolution on Mars should then be different from the rate of evolution on Earth - it should be faster.

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Applying Kleiber's law, 4.54 billion years of evolution on Earth would, on Mars, last:

$$T_M = \frac{(M_M)^{\frac{3}{4}}}{(M_E)^{\frac{3}{4}}} T_E = 852 \text{ million years}$$

$M_M = 0.642 * 10^{24}$ kg
$M_E = 5.972 * 10^{24}$ kg
$T_E = 4.54 * 10^{9}$ years

Assuming Mars was formed roughly at the same time as Earth, present time on Earth corresponds to a time 3.69 billion years ago on Mars (4.54 - 0.85 = 3.69).

This is a very interesting result as studies show that Martian climate shifted from habitable to uninhabitable - when its atmosphere was lost and liquid water disappeared from surface, roughly 3.6 billion years ago[99] (src[100]).

This suggests that current major extinction on Earth may indeed be the final major extinction of the planetary embryogenesis (neurogenesis), after which the Earth's surface will become permanently uninhabitable (although periodic and possibly spatially limited pulses of habitability cannot be excluded, as hypothesized pulses of adult neurogenesis).

The same equation gives evolution period of 3.9 billion years for Venus, suggesting Venus lost habitability some 640 million years ago. Again interesting, as studies show that Venus did lose habitability roughly 700 million years ago[101].

It is a common assumption that all planets in the Solar System have been formed at the same time (this is also the case with my theory of inflation of the system), and calculations above certainly can be interpreted as a confirmation of that assumption. However, the term is relative and a deviation on the order of millions or tens of millions of years is possible.

14.4.6. Some additional predictions of neurogenesis

If cultivation of life on planet's surface is equivalent to cultivation of neural cells during embryonic neurogenesis in mammals, the events hypothesized above are not the only upcoming events that can be predicted.

Obviously, cultivation of cells/proteins must be limited. The most effective (or most energy efficient) way to limit population growth is to substantially decrease its fertility. Recent studies show that fertility in humans is indeed decreasing, at an accelerating pace[102].

Accelerated evolution likely includes accelerated ageing in some species or sub-species (in some, possibly reversed), cases of which are showing up in studies too[103].

14.5. Metabolism of Earth

Transfer of energy in wild flora and fauna is generally balanced both horizontally and vertically.

Vertical transfer of energy is a part of metabolism but changes in horizontal current affect the vertical transfer too (and vice versa).

Humans dominate in both horizontal (surface to surface) and vertical (Sun - Earth interior) energy distribution and transformation, disrupting the harmonics of life.

Horizontal effect is the increasing number of individuals at the cost of decreasing number and diversity of other species, while vertically it is the unsustainable exploitation of radiated and stored resources of the Sun/Earth ecosystem.

Thus, one may interpret humans as the metabolism energy carrier particles, in a limited domain.

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With a human population N of 7.674 * 10^9, average mass m of 62 kg, and average lifetime Δt of 72.6 years (data for year 2019, except mass - 2012):

$$P = \frac{N * m * c^2}{\Delta t} = \frac{7.674 * 10^9 * 62 * (2.99792458 * 10^8)^2}{72.6 * 365.25 * 24 * 60 * 60} = 1.86644116 * 10^{19}\, W$$

$$\frac{P}{0.0484259259 \frac{day*W}{kcal}} = 70 * M^{\alpha} = 3.8542188 * 10^{20}\, \frac{kcal}{day}$$

where M is the mass of Earth (5.9723 * 10^{24} kg).

This gives a value of 0.756 for α exponent, in agreement with Kleiber's law.

However, in case of organ interpretation, the exponent suggests a superposition of a brain and a kidney.

Note that Earth has kidney [precursor] equivalents on surface.

In order for this superposition to differentiate into the brain, the exponent would have to reduce to 0.7.

There are several ways to achieve that (sorted by probability, from highest to lowest):

1. increasing human lifetime (≈25 times) to 1813 years,
2. reducing population (≈25 times) to 307243423,
3. reducing mass (≈25 times),
4. increasing Earth's mass ≈100 times (≈ mass of Saturn).

If humans are indeed precursor proteins of neuron proteins of Earth, as carriers of energy of its brain metabolism, I would expect the solution to be a weighted superposition of the above.

However, if Earth has a heart equivalent (core), most likely it also has a kidney equivalent and the population might differentiate into proteins of varying function.

> *I, strive for neutrality - the equal, balanced usage of all parts of my universe. I am aware though, that this is an unreachable singularity, but it is the journey that makes one alive - for without it there would be no senses, for a sense of reason, and a reason for existence.*

14.5.1. Nature of human cells

Dominance of lifeforms changes over time. At present time, homo species occupies and controls most of the surface of the planet. Human population is rising and thriving at the expense of other species.

While the dominion of species may be related to precursor nature of vital organism components, its behavior can be corrupted, so cultivation of new proteins becomes evolution of disease rather of something integral for survival.

While it is not questionable whether human species is a disease for the planet, it is questionable whether this is fatal or rather a normal part of evolution of healthy cells and proteins with self-correcting mechanisms.

Dividing the total surface area of Earth (R = 6371 * 10^3 m) with the number of people, one gets the maximum size of the cell:

$$A = \frac{4\pi R^2}{7.7 * 10^9} = 66242.13921\, m^2$$

Radius of space per person is:

$$r = \sqrt{\frac{A}{\pi}} = 145.2085665\, m$$

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If the radius of a human occupied cell of Earth is the mean free path r, the radius of a cell equivalent in human body of average diameter (height) h = 1.7 m is:

$$r_c = \frac{r}{R}\frac{h}{2} = 19.373298 * 10^{-6}\, m = 19.373298\, \mu m$$

If one calculates using landmass only (people don't naturally live on water):

$$A = \frac{1.4894 * 10^{14}\, m^2}{7.7 * 10^9} = 19342.85714\, m^2$$

$$r = \sqrt{\frac{A}{\pi}} = 78.46669775\, m$$

$$r_c = \frac{r}{R}\frac{h}{2} = 10.46879502 * 10^{-6}\, m = 10.46879502\, \mu m$$

Taking into account space used by wild flora and fauna:

$$r = \frac{1}{2}\sqrt{A} = 69.53930029\, m$$

$$r_c = \frac{r}{R}\frac{h}{2} = 9.277728025 * 10^{-6}\, m = 9.277728025\, \mu m$$

This is in the range of a typical cancer cell. It is, of course, in the range of healthy cells too, but human cells are far from healthy.

It might seem that the radius r (r_c) changes with population, but this is not the case - if human space decreases, the space of wild flora and fauna increases and vice versa, thus it generally evolves weakly, remaining almost constant.

Figure 30 illustrates a homo cell on Earth's surface, circled space (red) is occupied by a human and domesticated flora and fauna, other (green) by wild flora and fauna.

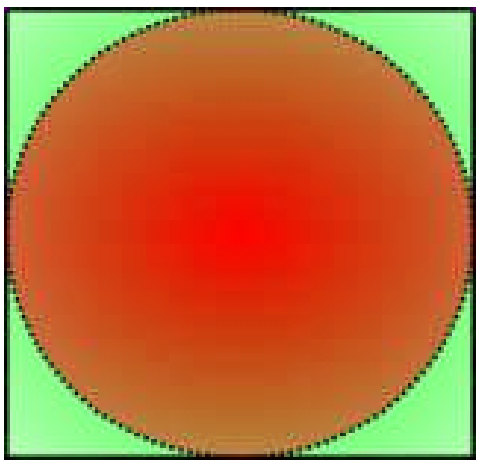

Figure 30. Homo.beta cell

Figure 31 illustrates what I would consider a normal (healthy) unit of space on Earth. Red is a cell of homo.sapiens (Earth's neuron cell), black lines are mental connections (synapses) to other cells.

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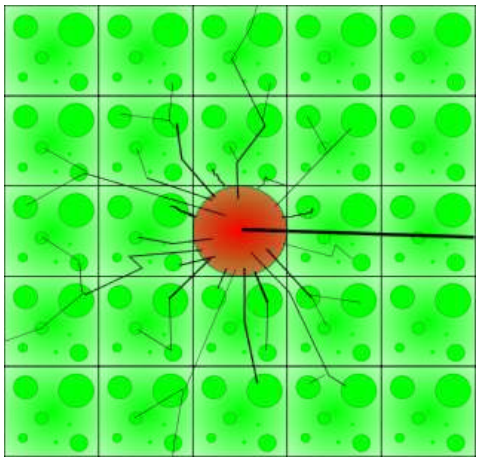

Figure 31. Normal cells

Figure 32 illustrates the cancerous, or current typical, unit of space on Earth. Blue and red are polarized human (cancer) cells.

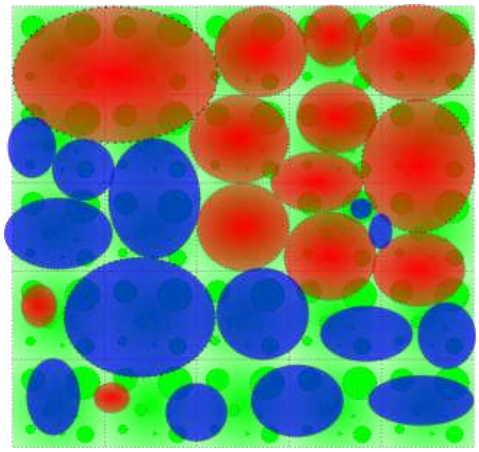

Figure 32. Cancer cells

Figure 33 illustrates the outcome - death.

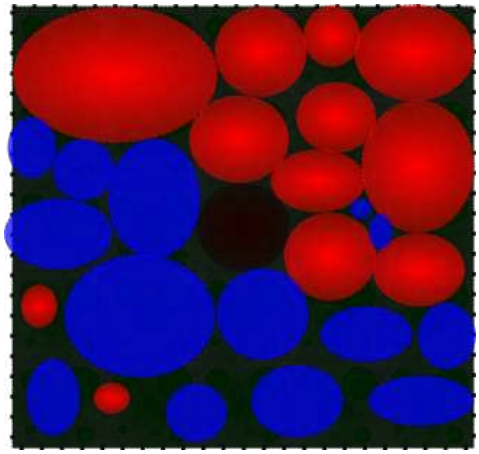

Figure 33. Dead space

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Carbon footprint is not the issue. It is just a side-effect of the real issue - nature of the human footprint.

Cancer cell contains the individuals (proteins) and space affected by cancerous population, but one can even calculate the role of a human in the cancer cell:

$$\lambda = \frac{h}{2}\frac{1}{r}r_c = \frac{h}{2}\frac{1}{R}\frac{h}{2} = \frac{h^2}{4R} = 1.134044891 * 10^{-7}\, m$$

This is in the range of a TGF-β protein, a key player in cancer development.

Confirmation of this comes from recent studies[104], revealing human nature of TGF-β:

> *"And while it may be difficult to imagine a protein with two dramatically different faces, it may be even more difficult to contemplate cancer cells exhibiting traits, such as cunning and deception. But the research underway at the University of Basel, and collaborating laboratories, has revealed that TGF-β not only is a two-faced protein, it also is one that seems almost Machiavellian in its activities."[105]*

Cancerous TGF-β suppresses the immune response and prevents old cells/proteins from dying (regenerating). Humanity is, at the time of this writing, expressing this cancerous behavior on many levels:

- through treatment of diseases (including cancer) humanity is suppressing the immune system of Earth,
- forcing human life at all costs and treating death (as a disease) - instead of letting cells (and proteins - people/animals) die as programmed so they can regenerate,
- treating Earth and other life forms (and, generally, even people) as resources - instead of living in a sustainable symbiotic relationship,
- creating and living in centralized, stressful environments, promoting inequality in wealth and health,
- denying the truth.

Earth's cells are not fuel cells, they are living cells.

The average cell cycle period of eukaryotic cell is T_0 = 14.5 hours, scaled to Earth size, it is:

$$T_1 = \sqrt{T_0 * T_x} = 50\, years$$

where T_x is the period of 3rd order existence cycle of Earth ($1.512 * 10^6$ years).

15. Quantization of Moon orbits

If gravity of the Earth's [major] gravitational maximum is, as hypothesized, equal (or was initially equal) to surface gravity of the Sun, one would expect for orbitals of natural moons of Earth to be scaled orbitals of inner planets.

Allowed orbitals are thus:

$$r = \frac{r_p}{R_\odot} r_c$$

where r_c is the Earth's gravitational maximum radius (= inner core radius), $R_\odot$ is the radius of the Sun and r_p is the orbital radius of a corresponding planet.

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Using $R_\odot$ = 695735 km, r_c = 1206.115 km, one obtains orbitals shown in Table 35. Evidently, the Moon is currently at the scaled Mars' orbit. Even the distance between perihelion and aphelion is scaled by equal orders of magnitude - for Mars it is 42.61 * 10^6 km, while for the Moon, the distance is 42.2 * 10^3 km.

Table 35. Allowed orbitals of the Moon

entanglement	r_p (km)	r (km)
Mercury	57910000	100392
Venus	108210000	187591
Earth	149600000	259344
Mars	227920000	395118

Small deviations from calculated values should be attributed to oscillation and phase shift in synchronization.

Note that Earth is probably receding from the Sun at the scaled rate of Moon's recession from Earth.

16. Quantization of the Sun

During inflation of the Sun, multiple gravitational maxima were inflating within. Collapse of these maxima as the Sun was deflating was fossilized in the Sun, in the form of discontinuities. As these maxima are now gravitational maxima of inner planets, entanglement exists between radii of discontinuities and planetary orbits.

Some discontinuities are strong (permanent) while some are weak, evolve over time and may periodically disappear. Apparent discontinuities are those between the core, radiative and convective zone, surface discontinuity and the boundaries of tachocline.

Regardless of current configuration ($1e^+$ or $2e^+$), each inner planet probably formed with the collapse of two maxima. Thus, each is entangled with 2 discontinuities in the Sun.

Initial inflation of planetary maxima must have been faster than light to preserve invariance.

If one assumes that all maxima *initially* had the mass of the Sun and energy density remained constant during inflation, with the collapse (energy level change) occurring once escape velocity was equal to the speed of light (in CR, discontinuities between energy levels are speed limits), orbital radii of planets become fossils of Schwarzschild radii:

$$r = \frac{2Gm}{c^2} = \frac{2G\rho V}{c^2} = \frac{r^3}{R^3}\frac{2GM}{c^2}$$

$$r = \sqrt{R^3\frac{c^2}{2GM}}$$

R = *initial* radius
M = 1.988500 * 10^{30} kg
c = standard speed of light = 2.99792458 * 10^8 m/s
G = 6.674 * 10^{-11} m^3/kgs^2

With equal escape velocity (pressure per surface quantum) between maxima (note that a smaller maximum is inside the other), radius of fusion of two maxima becomes the arithmetic mean of two radii:

$$r = \frac{1}{2}\left(\sqrt{{R_1}^3\frac{c^2}{2GM}} + \sqrt{{R_2}^3\frac{c^2}{2GM}}\right)$$

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In that case, discontinuities entangled with planetary orbits are at 1/5 $R_\odot$, 2/5 $R_\odot$, 1/2 $R_\odot$, 2/3 $R_\odot$ and 1 $R_\odot$. Correlation of orbital and Schwarzschild radii is shown in Table 36, where $R_\odot$ is the radius of the Sun (695700 km).

Table 36. Correlation of orbital and Schwarzschild radii

Planet	R_1	R_2	Schwarzschild radius r (10^6 km)	current orbital radius (10^6 km)	orbital radius (MAU)
Mars	$R_\odot$	1/2 $R_\odot$	228.52	227.92	1
Earth	2/3 $R_\odot$	1/2 $R_\odot$	151.59	149.6	2/3
Venus	2/3 $R_\odot$	1/5 $R_\odot$	107.00	108.21	1/2
Mercury	2/5 $R_\odot$	1/5 $R_\odot$	57.81	57.91	1/4

Significant orbital eccentricity of Mercury and Mars also seems correlated with Sun's discontinuities.

If Sun's core radius oscillates between 0.1 + 0.186 $R_\odot$ = 0.286 $R_\odot$ (previously hypothesized initial radius) and 1/5 $R_\odot$ (current radius), with constant energy density between the two radii, time independent core radius [as superposition of two oscillatory states] is at 1/4 $R_\odot$.

This is correlated with Mercury's orbit, as its distance from the Sun is at 1/4 MAU, while its perihelion is at 1/5 MAU.

According to equation S1.1 describing rotational velocities of plasma, and the actual velocity curve, significant points are at 0.1 $R_\odot$, ≈1/2 $R_\odot$, 1 + 0.18686 $R_\odot$ = 1.18686 $R_\odot$ and 32.8 $R_\odot$ (0.1 MAU, half of Mercury's perihelion).

The aphelion of Mars is at 1 + 0.18686/2 MAU = 1.09343 MAU = 249.2 * 10^9 m.

Note that the aphelion of Mars can also be obtained as volumetric mean of Schwarzschild radii associated with 3 discontinuities:

$$r^3 = \frac{1}{3}\left\{\left[(1\,R_\odot)^3\frac{c^2}{2GM}\right]^{\frac{3}{2}} + \left[\left(\frac{2}{3}R_\odot\right)^3\frac{c^2}{2GM}\right]^{\frac{3}{2}} + \left[\left(\frac{1}{2}R_\odot\right)^3\frac{c^2}{2GM}\right]^{\frac{3}{2}}\right\}$$

$$r = 249.2 * 10^9\ m$$

Similarly, approximate aphelions can be obtained for other planets, ie. for Mercury:

$$r^3 = \frac{1}{2}\left\{\left[\left(\frac{2}{5}R_\odot\right)^3\frac{c^2}{2GM}\right]^{\frac{3}{2}} + \left[\left(\frac{1}{4}R_\odot\right)^3\frac{c^2}{2GM}\right]^{\frac{3}{2}}\right\}$$

$$r = 70.4 * 10^9\ m$$

16.1. Layers of the Sun

Internal gravity of the Sun depends on the location of maxima and acquired real mass.

Distribution of mass, however, should not be complex unless there are collapsed large scale maxima inside. In any case, matter accumulated between two maxima should, in equilibrium, imitate a maximum and can thus be approximated as one (induced maximum).

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One way to obtain gravity of a primordial Sun is to derive it from rotation of real mass - assuming greater rotation with greater gravitational mass, down to the inner core radius r_c, quantization is *1-dimensional*:

$$\frac{1}{g}vr = nh_2 \tag{L1.1}$$

Giving the scaled h constant:

$$h = h_2 = 5 * 10^9\ ms$$

$$n = 1$$

Another way is to assume a completely naked Sun, in which case gravity from the surface down to the core is:

$$g_p = GM_\odot \frac{r^2}{{R_\odot}^4} = 274\frac{r^2}{{R_\odot}^2} \tag{L1.2}$$

Gravitational profile of the primordial Sun (not taking into account the gravity of inner core maximum) is given in Table 37. Here matter velocity (v) is extrapolated from measurements, while space (Keplerian) velocity (v_s) is calculated from gravity:

$$v_s = \sqrt{gr}$$

$$v_p = \sqrt{g_p r}$$

Table 37. Gravitational profile of the primordial Sun

n	r/R	note	space velocity v_p (km/s)	space velocity v_s (km/s)	matter velocity v (m/s)	orbital radius r (km)	calculated gravity g_p (m/s^2)	calculated gravity g (m/s^2)	gravity g_i (v_cr product) m/s^2
1	1	Convective disc.	436.602565	436.602565	1969.239615	695700	274	274	200 ($1*10^{12}$)
1	3/4	4p6n disc.	283.581685	286.551447	1508.068146	521775	154.125	157.37	150 (0.75 $*10^{12}$)
1	2/3	Radiative disc.	234.100417	230.556106	1248	459162	119.3544	114.61	132 (0.66 * 10^{12})
1	1/2	4p6n disc.	154.362317	151.266563	945.454545	347850	68.5	65.78	100 (0.5 * 10^{12})
1	2/5	weak	110.452683	108.233652	756.363636	278280	43.84	42.1	80 (0.4 * 10^{12})
1	1/4	Outer core disc.	54.575321	91.901023	1396	173925	17.125	48.56	50 (0.25 * 10^{12})
1	1/5	Inner core disc. = r_c	39.050921	74.602949	1437.401179	139140	10.96	40	40 (0.2 * 10^{12})

Note that multiplying any discontinuity radius with inner core velocity v_c gives values proportional to r/R ratio and gives integer gravity (g_i) for inner core and all layers above.

I have previously hypothesized that the Sun has inflated to a much larger radius before being compressed to current one. In the exchange of components of angular momentum, radius might have been exchanged for space (Keplerian) velocity, as shown in Table 38.

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Table 38. Possible initial radii of Sun's discontinuities and correlation with bodies

discontinuity (r/R)	space velocity v_s	correlated radius (10^6 km)	possible body correlation
1	436.6 km/s	436.6	end of the main asteroid belt
3/4	286.6 km/s	286.6	beginning of the main asteroid belt
2/3	230.6 km/s	230.6	orbit of Mars (semi-major)
1/2	151.3 km/s	151.3	orbit of Earth (semi-major, aphelion)
2/5	108.2 km/s	108.2	orbit of Venus (semi-major)
1/5	74.6 km/s	74.6	orbit of Mercury (aphelion?)

However, orbits may be correlated with arithmetic mean of v_s and v_p. This gives much better results for the orbit of Mercury - 56.8 * 10^6 km, agreeing with semi-major, rather than aphelion. Another possibility is entanglement with v_p instead of v_s. In that case 1/4 R discontinuity roughly agrees with the orbit of Mercury.
Remarkable correlations are found subtracting velocities between layers, as shown in Table 39.

Table 39. Alternative initial radii of Sun's discontinuities

discontinuity (r/R)	space velocity v_s (km/s)	correlated radius (10^6 km)	possible body correlation
1 - 3/4	436.6 - 286.6	150	orbit of Earth (semi-major)
1 - 2/3	436.6 - 230.6	206	orbit of Mars (perihelion)
3/4 - 2/3	286.6 - 230.6	56	orbit of Mercury (semi-major)
3/4 - 1/5	286.6 - 39.1	247.5	orbit of Mars (aphelion)*
2/3 - 1/5	230.6 - 74.6	156	orbit of Earth (aphelion)
2/5 - 1/5	108.2 - 39.1	69.1	orbit of Mercury (aphelion)*
1/2 - 2/5	154.4 - 108.2	46.2	orbit of Mercury (perihelion)*

* here, one of the velocities used in subtraction is v_p, rather than v_s

Entanglement with v_p suggests that Mercury and Mars were created before Venus and Earth, as hypothesized previously. Entanglement with both, v_s and v_p, seems to be the cause of orbital eccentricity.

Difference between current surface gravity and g_i is roughly equal to the sum of surface gravities of inner and outer planets:

$$g - g_i = 274 - 200 = 74 \frac{m}{s^2}$$

thus, some entanglement might exist there too.

Below the gravitational minimum at inner core (r_c), quantization is *3-dimensional* and gravity should be increasing until the next maximum:

$$g = n^2 T \frac{\hbar_1}{r^2},$$

$$\hbar_1 = 1.273239545 * 10^{12} \frac{m^3}{s^3}$$

16.1.1. Current G model

Unlike in space *above* the outer maximum, where gravity falls to zero effectively at infinity (due to next maximum being extremely far), below the maximum gravity falls to zero at finite distance due to compression of space.

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With no inner maxima, the single point of zero gravity would be at the centre, however, due to relativity, inner maxima must exist (each inner maximum must also be a relative outer maximum).

If the radius of the outer maximum of the Sun is the surface radius, gravity should thus be decreasing below the surface to the point where it is cancelled by the [next] inner maximum.

Without the inner maximum, any free-falling real mass would be concentrated around the surface maximum. With inner maxima, concentration of real mass begins at the centre.

However, as each inner maximum has lower capacity than its outer maximum, greatest density of real mass will not be at the centre. Once inner maximum is at full capacity, as real mass accumulates between the inner maximum and the outer maximum, its counteracting the gravity of the outer maximum.

In equilibrium thus, greatest density of real mass is not at the outer maximum, rather between the inner and outer maximum.

This is shown on Figure 28. Here, dark matter gravity provided by [img] gravitational maxima is represented by solid black lines, while real gravity provided by real mass and its induced (effective) maximum is represented by dashed black lines. In case of outer maximum, grey line represents gravity with no real mass acquired (naked maximum), while for inner maximum, it represents the initial core maximum. Red dashed lines show linearly approximated density of real mass.

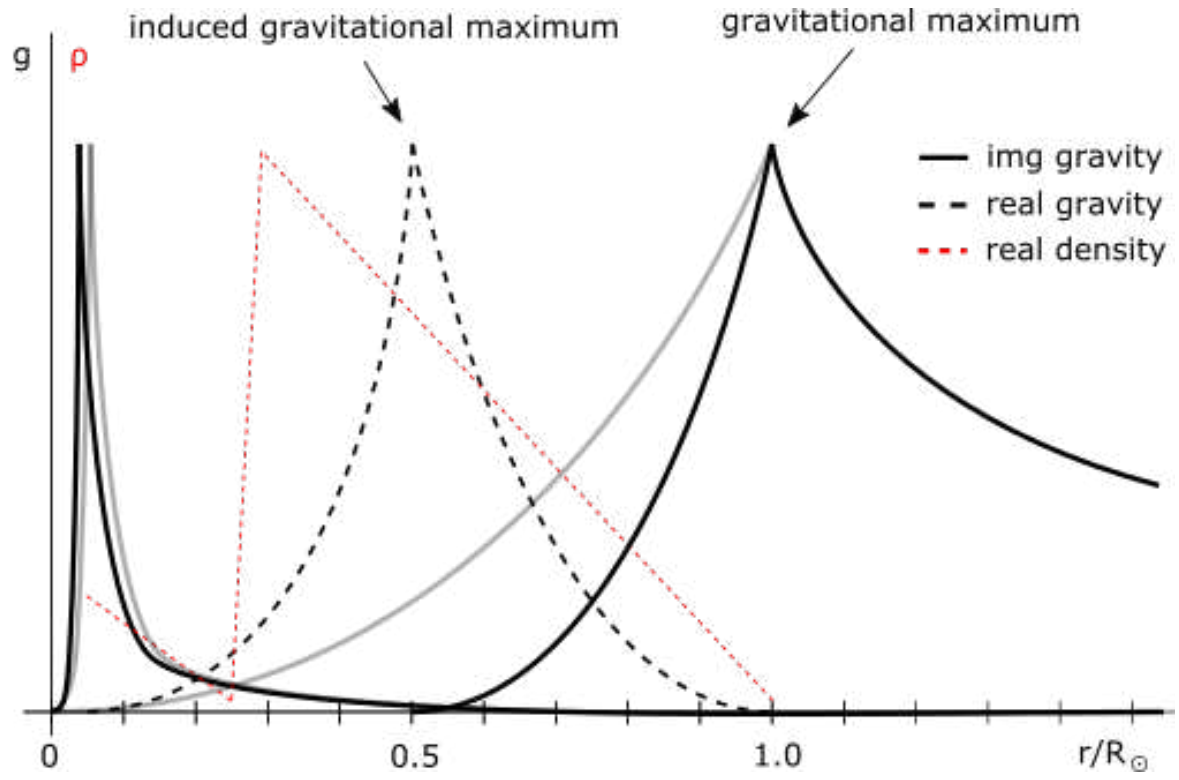

Figure 28. Gravity of the Sun

Note that Figure 28 shows gravity in absolute values. Gravities of maxima cancel at multiple points inside the Sun. At these points, gravity is zero. Induced gravitational maximum should thus, in reality, have negative gravity relative to other maxima.

From Figure 28 one can extrapolate discontinuity candidates ($r/R_{\odot}$): $0.0385 \approx 2/5 * 1/10$, $2/3 * 1/10$ (initial core maximum), $1/5$, $1/4$, 0.286, $1/2$, $2/3$, $3/4$, 1.

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Note that there should be two major charge radii inside the Sun, if the outer charge is located at tachocline, and charge radii are mirrored relative to the induced real maximum, other charge radius boundary should be at 2/5 $R_\odot$ (mirroring the 2/3 $R_\odot$ boundary).

In addition to these, there are other candidates, representing maximum deviation from these values - ie. discarding CMB relative relativistic energy, rest surface maximum is at 0.94 $R_\odot$.

16.2. Energy replenishment

Primary energy source of the Sun is, most likely, fusion.

Fuel for fusion must either be the real mass of the Sun (accumulated matter) or matter created through conversion of imaginary mass (dark gravitational potential) to real mass by some unknown mechanism.

In case of such conversion it would take tens of billions of years to spend all fuel.

However, this solution implies the Sun is eating itself and is highly unlikely.

The Sun is thus, most likely, burning its real mass which was accumulated most likely during inflation of its maxima (whether through inflation of smaller maxima or acquisition of matter by increasing vacuum pressure on U_1 scale).

When compared to other living beings, it would be reasonable to assume that Sun has a relatively constant real rest (constitutional) mass and an amount of fuel which is being cyclically replenished.

To determine how much fuel the Sun has left it is necessary to determine how much fuel it had at the beginning and the rate of fuel consumption.

Assuming fusion reaction 4H -> He (energy per reaction E_r = 4.32 * 10^{-12} J) and power output P of 3.8 * 10^{26} J/s, time needed to spend all fusion fuel is:

$$\Delta t = \frac{m}{m_p} * \frac{E_r}{4} * \frac{1}{P} * N$$

m = available mass
m_p = proton mass
E_r = energy per reaction
P = power output
N = fraction of mass used in fusion

Since the Sun has two [major] maxima, fusion may be occurring at two places - in the core and above the core.

Gravitational mass of the surface maximum is assumed to be 1.988500 * 10^{30} kg (or half that value at full capacity in case of interpretation with no mass shielding), while the gravitational mass of the core has been calculated previously to be 2.951797 * 10^{27} kg.

Assuming that the calculated core mass is the mass of the maximum and therefore equal to the internal capacity for real mass, this capacity in equilibrium should be full and, due to mass loss (ie. through radiation), *excess* real mass must be constantly (cyclically) consumed as fuel.

Note that calculated mass implies such density of the core that temperature should be orders of magnitude higher than current assumptions, for thermonuclear fusion to occur.

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If fusion is occurring in the core, most likely it is not thermonuclear.

It has also been hypothesized that the ratio of core mass and surface mass should be correlated with the ratio of mass between inner and outer planets.

Assuming that at the beginning of the core feeding cycle, these ratios are equal, fuel mass is the *excess* mass in the outer core corresponding to the ratio.

In case of thermonuclear fusion and with 2/3 of mass consumed, time needed for the core to spend all fuel is:

$$\Delta t = \frac{m}{m_p} * \frac{E_r}{4} * \frac{1}{P} * N = \frac{8.90211033 * 10^{27}\, kg}{1.67265 * 10^{-27}\, kg} * \frac{4.32 * 10^{-12}\, J}{4} * \frac{1}{3.8 * 10^{26}\, \frac{J}{s}} * \frac{2}{3}$$

$$\Delta t = 10084091956967735\, s = 319545591.5\, years$$

where m = 8.90211033 * 10^{27} kg is the previously calculated initial mass of the core.

Assuming that, at the start of consumption cycle, imaginary mass (gravitational maximum) grows to initial mass radius (0.286 $R_\odot$) and decreases with energy loss, time left (assuming constant rate of consumption) before the next feeding cycle is then:

$$t = \left(2.951797 * 10^{27} - \frac{1}{3} 8.90211033 * 10^{27}\right) * \frac{3}{2} \frac{1}{8.90211033 * 10^{27}} \Delta t$$

$$t = -26461406017707\, s = -838511.4\, years$$

Negative time may be interpreted as the next cycle being overdue (core spent all fuel 838k years ago and is currently *burning* constitutional mass), or, that more than 2/3 of mass must be consumed in fusion.

In case 70% of mass may be spent:

$$\Delta t = 10588296554816122\, s = 335522871\, years$$

$$t = 1114734114271587\, s = 35323792.5\, years$$

However, as stated already, thermonuclear fusion in the core is unlikely. In case there is no fusion in the core at all, ruling out standard chemical reactions and radioactivity, the remaining possibility is heat generation through gravitational (Kelvin–Helmholtz) contraction:

$$\frac{dU_r}{dt} = \frac{-3GM_i^2}{10R_i^2} \frac{dR}{dt}$$

M_i = initial core mass = 8.90211033 * 10^{27} kg
R_i = initial core radius = 0.286$R_\odot$ = 198970200 m

assuming logarithmic relationship between mass and radius contraction, the contraction may be approximated from the rate of Jupiter contraction:

$$\frac{dR}{dt} = \frac{10^{\frac{M_i}{M_J}}}{3^{\frac{R_i}{R_J}}} \frac{dR_J}{dt} = -7.29401291 * 10^{-8}\, \frac{m}{s}$$

M_J = Jupiter mass = 1.89819 * 10^{27} kg

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R_J = Jupiter radius = 71492000 m
dR_J/dt = rate of Jupiter contraction = -3.17 * 10^{-11} m/s

giving energy radiation of:

$$\frac{dU_r}{dt} = 2.9233705 * 10^{21} \frac{J}{s}$$

and time to spend all fuel:

$$\Delta t = \frac{3G(M_i - M)^2}{10R_i}\left(\frac{dU_r}{dt}\right)^{-1} = 1218751736351319\, s = 38619912\, years$$

M = current core mass = 2.951797 * 10^{27} kg

From this one can calculate core radius at the end of the cycle (all fuel spent):

$$R = R_i - \Delta t\frac{dR}{dt} = R_i - (M_i - M)^2\frac{R_i}{{M_i}^2} = 0.158221\, R_\odot = 110074291\, m$$

$R_\odot$ = Sun surface radius = 695700000 m

With current core radius at 0.2 $R_\odot$, amount of fuel left is:

$$\frac{0.2 - 0.158221}{0.286 - 0.158221} = 0.327 \approx \frac{1}{3}$$

It is unlikely though that all fuel is spent during the cycle, total amount spent is probably equal to 2/3 (equivalent to fusion), in which case the cycle period is:

$$\Delta t_{re} = \frac{2}{3}\Delta t = 25746608\, years$$

and the core is at the end of a cycle.
The obtained core cycle period agrees well with the hypothesized 2nd order cycle period of the Solar System (≈ 26 million years).
Since the 2nd order cycle period is also equal to periodicity of impacts and extinctions on Earth and other planets, all these Solar events are likely synchronized - once the core fuel is exhausted, additional fuel is provided by the outer half of the Sun at the same time equal quantity of its own fuel is replaced with new mass (from impactors?).
Gravitational stress may even create relative wormholes through core/surface sunspots enabling direct consumption of new mass by the core.
Note that, with core radius oscillation, its time independent radius is obtained from the volumetric superposition of 0.2 $R_\odot$ and 0.286 $R_\odot$ cores:

$$\frac{4}{3}\pi R^3 - \frac{4}{3}\pi {R_c}^3 = \frac{4}{3}\pi {R_i}^3 - \frac{4}{3}\pi R^3$$

$$R^3 = \frac{{R_i}^3 + {R_c}^3}{2} = \frac{(0.286^3 + 0.2^3){R_\odot}^3}{2}$$

$$R = \sqrt[3]{\frac{(0.286^3 + 0.2^3)}{2}}R_\odot = 0.25R_\odot = \frac{1}{4}R_\odot$$

Such oscillation must be present on standard scale too - thus, all results obtained from measurements of nuclear observables may be understood as superpositions in time and/or

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space, however, in reality these are not constants, rather statistical mean state of evolving phenomena.
Regardless of scale, no equally evolved (identical) phenomena can exist at two points in time, nor can they exist at multiple points in space. De-localization may seem possible through stretching of [a point in] space/time, however, this is fragmenting (quantizing) the phenomena and its space. Even if it remains strongly entangled, it is never, as a whole, at multiple points in space/time, although, with energy applied, de-localized space may collapse to one of the fragmented points.

Unlike the core, the outer part of the Sun is most likely powered by fusion.
However, it too must have constitutional mass and fuel mass fraction of real mass (excess mass).
Most likely, fuel mass is equal to the previously calculated relativistic energy (CMB relative) of the Sun. In that case, time to spend the fuel is:

$$\Delta t = \frac{m}{m_p} * \frac{E_r}{4} * \frac{1}{P} * N = \frac{1.18437729 * 10^{29}\, kg}{1.67265 * 10^{-27}\, kg} * \frac{4.32 * 10^{-12}\, J}{4} * \frac{1}{3.8 * 10^{26}\, \frac{J}{s}} * \frac{2}{3}$$

$$\Delta t = 4.25 * 10^{9}\, years$$

The value is in agreement with the hypothesized 1st order cycle and it is likely equal to previously calculated real age of Earth (4.29±0.05 * 10^9 years), suggesting the Solar System is at the end of the 1st order cycle.
Note that the calculated age is exactly 1/3 of the obtained age of the observable universe in one class of measurements (Lensedquasars/Near) - 12.75 * 10^9 years (also in agreement with more recent bTFR measurements[106]), supporting the cycling hypothesis (this would be the end of a 3rd cycle).
Gravitational stress of the 1st order must be order(s) of magnitude larger than that of the 2nd order.
Likely, at the end of a 1st order cycle, Sun's outer graviton (gravitational maximum) briefly loses some momentum (relative to CMB) inverting spin in the process. It *falls* into a lower energy level, closer to the galactic centre. Afterwards, it starts expanding again consuming hydrogen fuel as it returns to the current state again (process may be relatively equivalent to initial inflation).
Note that the reason for discrepancy in measurements of the age of the universe (Hubble constant) could be the same as in the case of the age of Earth. I have previously hypothesized cyclic time compression (evolution inflation, due to gravitational stress), with coupled periods of 1.512 and ≈26 million years. With the next larger period being T_u = 4.25 Gy, its time compression should be:

$$\Delta t_{c_u} = \frac{\Delta t_{c_x}}{T_x} T_u = \frac{24751.794\, y}{1512000\, y} 4.25 * 10^{9}\, y = 69573495.04\, years$$

where Δt_{c_x} is the previously calculated compression of time with a single Tx (1512000 years) pulse.

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Now one can calculate how much overestimated is the currently accepted age of the observable universe T_{img} = 13.799 ± 0.021 * 10^9 years:

$$\sigma_{T_{img}} = \left\lfloor \frac{T_{img}}{T_u} \right\rfloor \left[\Delta t_{c_u} + \left(\Delta T_{E_{img}} - T_u \right) \right] = 1.07872048512 \pm 0.05 * 10^9 \, years$$

where $\Delta T_{E_{img}}$ (4.54±0.05 * 10^9 years) is the currently accepted age of Earth.
This gives for the real age of the universe:

$$T = T_{img} - \sigma_{T_{img}} = 12.72027951488 \pm 0.071 * 10^9 \, years$$

resolving the discrepancy.

Another interesting solution is obtained if the fuel amount is equal to real mass of the Sun calculated with the assumption of, across Solar System, invariant, real $\hbar_{mg}$ *constant*:

$$m = \frac{\hbar_{mg}}{g} = \frac{6.968267285 * 10^{20} \, N}{274 \, m/s^2} = 2.543163243 * 10^{18} \, kg$$

For N = 2/3 (here, the other 1/3 would be the solar wind), time needed to spend this fuel is:

$$\Delta t = \frac{m}{m_p} * \frac{E_r}{4} * \frac{1}{P} * N = \frac{2.543163243 * 10^{18} \, kg}{1.67265 * 10^{-27} \, kg} * \frac{4.32 * 10^{-12} \, J}{4} * \frac{1}{3.8 * 10^{26} \, \frac{J}{s}} * \frac{2}{3}$$

$$\Delta t = \frac{2}{3} * 4321249.297 \, s = 33.3 \, days$$

For N = 1/2:

$$\Delta t = \frac{1}{2} * 4321249.297 \, s = 25 \, days$$

This solution is not plausible as it requires continuous hydrogen uptake from interstellar medium. While charged protons and electrons may be absorbed at Sun's poles (at least at times) and could be combined to form hydrogen at the centre (assuming the Sun is not ideally neutral and has gravitational holes at poles - at least periodically opened, although the charges could also be inefficiently transferred inside as electric current), energy bandwidth is not sufficient to power the Sun.
Interestingly, the solution (with N = 2/3) is close to the polar rotation period of the Sun (N = 1/2 gives equatorial period) where the uptake would happen.
However, although unlikely in a stable state, this is likely the feeding method at the end/beginning of the 1st order cycle (4.25 * 10^9 years cycle). Once the spin momentum collapses into a two-dimensional form, the Sun's maximum will be extremely charged. With an extremely strong non-homogeneous magnetic field it would be able to acquire required mass efficiently and quickly.
Differential rotation of the Sun could be a fossilized evidence of spin collapse, suggesting it breaks into multiple quanta in the form of concentric rings (oppositely charged rings must have anti-aligned spin to conserve the magnetic field).
Such fossil is perhaps more evident on Jupiter, where wind velocities are correlated with gravity.

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The extremely stable and *static* cyclones on Jupiter's poles indicate that it might have small gravitational holes open today.
However, if these are open, small gravitational gaps or indentations should also exist between layers associated with each ring quanta. Strong magnetic field and measurements of gravity do support this theory, although the indentations would have to be extremely small - if gravitational disturbances are not due to standard (U_0) scale matter, as currently interpreted (in which case they would be the fossil of the *healing* process).

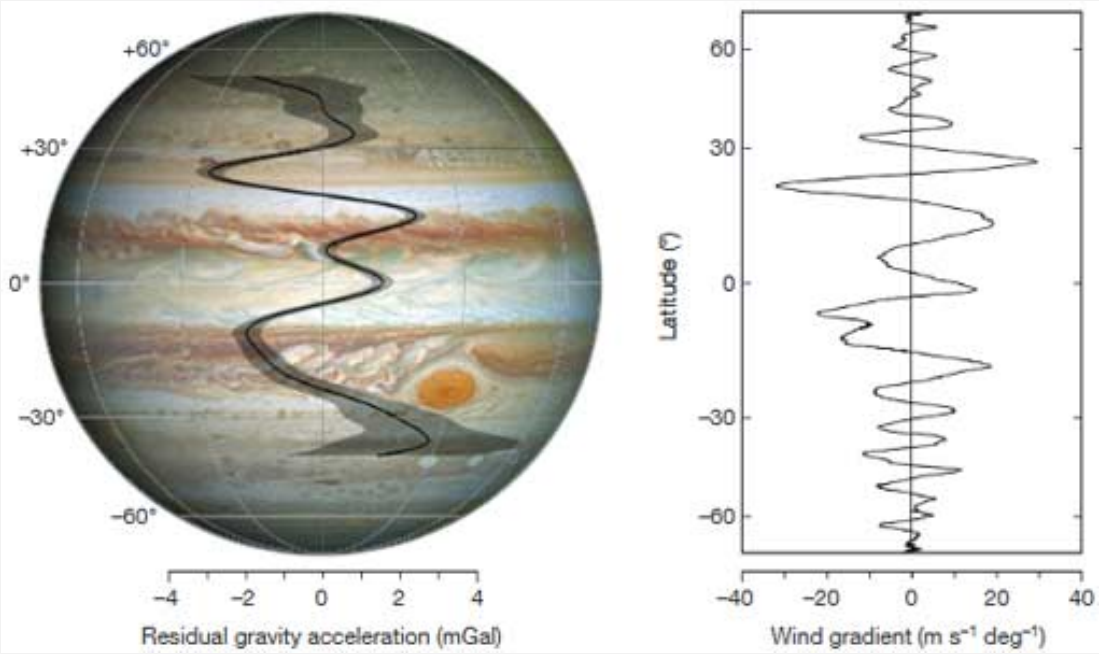

Figure 29. Jupiter gravity disturbances and wind gradient[107]

The cells of all living species are regenerating on a periodic basis, for example, 1/3 of hippocampal neurons in humans and mice is exchanged during the lifetime [108], thus, the cellular regeneration in the Sun should not be surprising, whether it is food or constitutional mass.
Capacity for real mass below the Sun's surface may be full, but all mass orbiting the Sun may be considered as its real mass.

However, it is obviously not fuel mass, rather constitutional or symbiotic mass.

The 3rd order period of the Solar System cycle may be related to this mass through the mass barycentre of the system.

I have previously calculated the neutral gravitational mass equivalent for the surface plasma at the equator which would make its angular velocity Keplerian.

The source for this energy may be the motion of the barycentre.

In any case, if one assumes that conversion between neutral and electro-magnetic component of the general force of the Sun is also periodic and that such energy replaces fusion reactions in equivalent way, the period of *recharge* is:

$$\Delta t = \frac{m_{re}}{m_p} * \frac{E_r}{4} * \frac{1}{P} * N = \frac{4.042341 * 10^{25}\, kg}{1.67265 * 10^{-27}\, kg} * \frac{4.32 * 10^{-12}\, J}{4} * \frac{1}{3.8 * 10^{26}\, \frac{J}{s}} * \frac{2}{3}$$

$$\Delta t = 45790644230537\, s = 1451018\, years$$

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and it is in good agreement with the hypothesized 3rd cycle period (a fraction of mass N = 0.6946847 would yield the hypothesized value - 1512000 years).

In comparison with living beings, one might notice a problem of exhausted fuel - what happens with the *ash* from fusion reactions (end products of fusion)?
There are couple of solutions:

1. the ash is ejected periodically,
2. the ash forms the constitutional mass.

Time compression at the end of Solar System cycles implies gravitational stress of Solar System maxima.
While the 2nd solution may be plausible during initial formation of the Sun, at least at the end of one of the cycles some mass must be ejected out from the Sun.
It certainly seems *easier* than in case of planets, as unlike the planets, the Sun does not have a solid [real] mantle to block the explosion (although terrestrial planets may be interpreted as Sun's mantle they are in a collapsed form with plenty of space in between).
The *ash* content depends on the cycle period, being mostly Helium in smaller cycles but with heavier elements formed in explosions at the end of larger cycles.
A full collapse of the maximum is a collapse of a 3-dimensional spherical neutral form into 2-dimensional charged form. Since the surface maximum of the Sun is entangled with Mars' maximum, at the time of collapse, two ring maxima are aligned and the ejection of *ash* is probably not isotropic, rather targeting Mars.
At that point, both the Sun and Mars have a significant (extreme) magnetic field generated by charged maxima so Mars would likely attract ferromagnetic/charged ejecta from the Sun.
The Fe covered surface of Mars could be interpreted as the evidence for this.
Note that the collapse involves change of spin of the maxima. First, the holes are opening on the poles of the spherical Sun maximum while the axial tilt starts increasing, the poles of the Sun and Mars are only briefly fully aligned before the equilibrium of stable spin states is reached.
Thus, most mass is ejected in the first and last moments of the spin change, through the *equilibrium poles* - out of the Solar System.
Note that the magnetic field is weakest at these times, as it increases, the momentum of particles is curved and aimed at Mars.

16.3. As a living organ[ism]

Considering the energy output (metabolic rate) of P = 3.8 * 10^{26} W, the standard relation between metabolic rate and mass[109]:

$$\frac{P}{0.0484259259\frac{day*W}{kcal}} = 70 * M^{\alpha}$$

gives 0.86 for the α exponent (M = total mass of the sun = 1988500 * 10^{24} kg). For a mammalian organ this would be between a kidney and a liver[110], suggesting an embryonic stem cell in the process of differentiation.

17. The cycle of life and death

An atom or a planetary system consists of relatively massive matter and relatively empty space of gravitational wells.

The energy of this space is in its vacuum, generally proportional to its spin momentum but also characterized by electric and magnetic permeability of polarized quanta of certain scale.

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Gravitational wells (souls) are not intrinsically coupled with matter - otherwise, there would be no death.

All souls thus oscillate between different bodies. This oscillation can be vertical (between different scales) or horizontal (between species of the same element, such as carbon), although even horizontal oscillation includes a temporary scale inflation/deflation between stable states.

Species in horizontal oscillation have comparable lifetimes so gravitational collapse generally indicates a permanent decoupling of particular soul/matter pair (death).
Primary (prevalent) oscillation type depends on pressure/temperature of the environment.

18. Inflation and dark energy

According to CR, observable universe cannot be absolute - if it had a beginning it was a relative beginning and if it was inflated it was inflated from a relative, not absolute, singularity.

The inflation thus did not proceed from a single point, rather inflation of galaxies should be regarded as inflation of spatially separated relative universes even if that separation was relatively small or such that could be considered as quantum-like condensation. Similar is true for planetary systems.

This suggests that development of galaxies was relatively fast and implies there are no large differences between distant and near galaxies when relatively equal energies are involved in their creation (with the assumption of a stable state, dominantly weak and cyclic evolution of components after initial inflation).

UPDATE 2023.02.26
Multiple analyses of data obtained by the James Webb Space Telescope (JWST) confirm[111] this hypothesis[112].

If planetary systems are equivalents of standard atoms in a particular state (pressure/temperature), observable universe becomes a gas of extremely low density. Dark energy, if it exists, is thus simply the energy of gas expansion due to scaled pressure/temperature change. Galaxies are then simply large scale quantum vortices.

Black holes and other gravitational wells of U_1 scale can be understood as vacuum quanta, increasing in strength with inflation and causing contraction of constituent matter, with stretched space (at times of inflation of space, not expansion) between them creating (inflating) new gravitational wells (primal stars) between galaxies. This exponential growth of energy is what eventually ends inflation.

UPDATE 2023.02.23
It seems that dark energy is not stretching space rather *creating* new space (energy density of space remains constant). This is consistent with gas-like expansion, thus, the observable universe should be cooling down. However, *creation* of new space cannot be instant and should be preceded by stretching of space (vacuum quanta) with stretched space returning to initial state eventually (creation should be understood as relative - new space might be inflated from smaller scale or added from space external to observable universe).
Here, stretching vacuum quanta should be large scale vacuum quanta (ie. large scale gravitons or gravitational maxima of black holes). Thus, correlation should exist between dark energy and black hole sizes. If expansion is not slowing down the growth of black holes should be continuous (although probably in oscillating manner).
Indeed, recent analyses support the notion that growth of black holes is proportional to dark energy[113].

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The expansion of the observable universe has been questioned before and there are results consistent with a non-expanding, Euclidean universe[114] regarding some phenomena previously considered to favour expanding universe, although none solve all the problems - ie. increasing redshift with distance or time dilation of distant events.

Some recent analyses suggest that the expansion of the observable universe is not accelerating[115] and the redshift previously used as evidence for acceleration should be attributed to local "bulk flow" instead.

If photons have rest mass on some scale, as CR implies, energy will be lost with distance (if not replenished periodically). If the mechanism for energy loss from distant galaxies is not scattering of light through interactions with standard (U_0 scale) matter, the interactions must be involving smaller scales of photon energy components. These are causing changes in values of momentum relatively independent of wavelength, and without affecting direction significantly. Photons, having mass, must have a range - which then explains decreasing brightness with distance.

However, even these interactions cannot explain time dilation, which apparently has been observed in Type Ia supernovae[116].

Signatures of time dilation have also been found in gamma-ray bursts but with lower confidence[117].

In any case, the current accelerating expansion or at least its magnitude should be questionable. Observations also suggest that small scale effects on photon energy are oscillating with distance - consistent with hypothesized oscillation of photon mass, which, periodically results in acceleration rather than deceleration of photons. The oscillation must be correlated with properties of space. If there is no significant loss of energy, energy of the photon may be kept relatively constant through these interactions.

19. Stability of elements

Structure of U_0 elements is entangled with the configuration of U_1 universe. This also makes the stability of isotopes dependent on this configuration.

The stability curve and decay rates of individual isotopes thus change strongly in transition from one cycle state to another, but also oscillate during state lifetime.

Stable isotopes are concentrated along this curve:

$$N(P,t) = \left\lfloor P * \left[1 + \left(\frac{N_{max}}{P_{max}} - 1\right) * \frac{P}{P_{max}}\right] + \sigma_T \right\rfloor$$

$$\sigma_T = \left[-(C_1 * C_2) * \left(\frac{C_2}{C_1} - 1\right) + (C_2 - C_1) * \frac{t}{\Delta_t} * (C_1 + C_2)\right] * \frac{P}{P_{max}}$$

$$\sigma_T = \left[(C_1 * C_2 - {C_2}^2) + ({C_2}^2 - {C_1}^2) * \frac{t}{\Delta_t}\right] * \frac{P}{P_{max}}$$

where $N = N_0$ is the number of neutrons, $P = P_0 = Z$ is the number of protons of the isotope and P_{max} is the maximum number of protons for a stable element (for the Solar and equivalent systems, P_{max} = 82, corresponding to Pb - lead). σ_T is the small shift in value of N due to weak evolution through state lifetime (Δ_t).

$$\frac{P_{max}}{N_{max}} = \frac{N_1}{P_1}$$

$$P_{P_{max}/N_{max}} = \left\lfloor EH_{N_1/P_1}(P_s, N_{P_{max}/N_{max}}) \right\rfloor$$

where N_1 is the number of neutrons and P_1 the number of protons of the parent system - U_1.

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P_s is the atomic number (number of protons) of the most stable element - element with maximum number of stable isotopes.

$P_{P_{max}/N_{max}}$ is the atomic number of the element lying on the N(P,t) curve with P/N ratio equal to P_{max}/N_{max}.

For the Solar System, in state 6p4n:

$$\Delta_t = 1.51 * 10^6 \text{ years}$$

$$\frac{P_{max}}{N_{max}} = \frac{2}{3}$$

$$P_{2/3} = \left\lfloor EH_{4/6}(P_s, N_{2/3}) \right\rceil$$

$$C_1 = 2\,,\ C_2 = 3$$

Note that constants C_1 and C_2 are the same as those determined in chapter *Earth, as a living organ[ism] - Age, lifespan and the 3rd order period - Speed of time*.

Figure 34 shows all stable isotopes of the Solar System (green) and the N(P,t) curve (black).

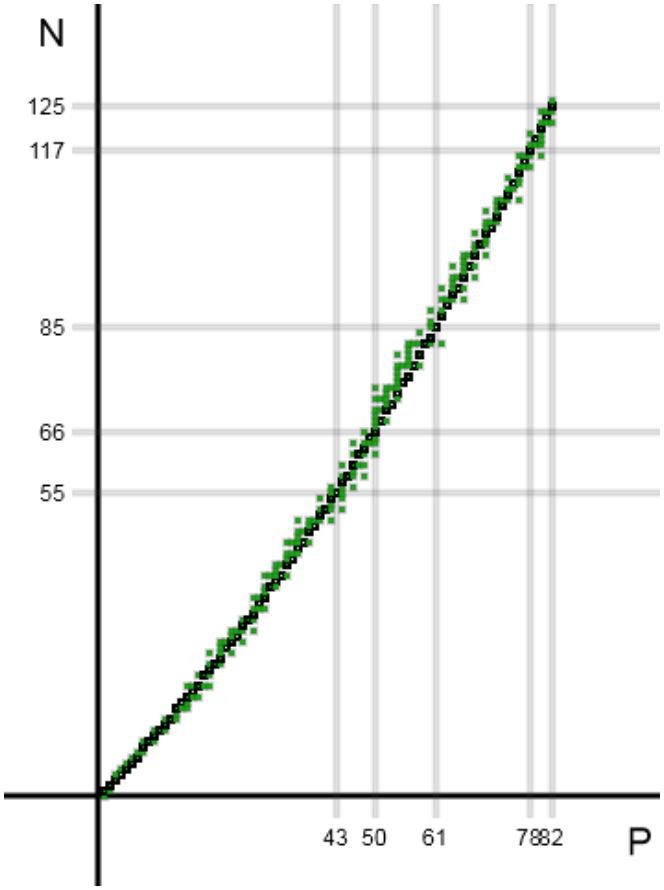

Figure 34. Stable isotopes of the Solar System in state 6p4n at t > 1495840 years

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Note the following:

- for t > 1495840 years ($t \approx \Delta_t$), the isotope lying on the curve with P/N ratio exactly equal to 2/3 is Pt-195 (Platinum, P = 78). The placement of other Platinum isotopes is symmetric relative to the curve,
- for $\sigma_T = 0$ ($t = 3/5\ \Delta_t$), the $P_{2/3}$ isotope is Pb-205 (Lead, P = 82). At $t = 3/5\ \Delta_t$ this was a stable isotope. 1/3 of other stable isotopes are above the curve, 2/3 below,
- for $t = 4/5\ \Delta_t$ the $P_{2/3}$ isotope is Hg-200 (Mercury, P = 80). 1/3 of other stable isotopes are above the curve, 2/3 below,
- the ratio of horizontal to vertical distance between Lead-205 and Platinum-195 is (82 - 78) / (123 - 117) = 4/6 = 2/3,
- the ratio of horizontal to vertical distance between Lead-205 and Hg-200 is (80 - 78) / (120 - 117) = 2/3,
- at $t \approx \Delta_t$, Tin (Sn, P = 50) has the highest number of stable isotopes (10). Tin isotope lying on the curve is Sn-116 (50 protons, 66 neutrons). 2/3 of other stable Tin isotopes is above the curve, 1/3 is below,
- at $t \approx \Delta_t$, the only elements without stable isotopes are Tc (Technetium, P = 43) and Pm (Promethium, P = 61). The isotopes lying on the curve are Tc-98 and Pm-146. Vertical distance from Sn-116 to Tc-98 is equal to horizontal distance from Sn-116 to Pm-146.

20. Electric gravity

According to CR, electric force is a polarized component of the general force.

Inside the atom, force field between negative and positive charges is neutralized and electro-magnetic potential may be exchanged with gravitational potential.

Thus, a Hill sphere radius (r_H) of an atom should be correlated with its charge radius.

$$r_H = R\sqrt[3]{\frac{m}{3M}}$$

This gives, for Carbon-12 atom with nucleus mass m = 1.992646883 * 10^{-26} kg inside the gravity field of Earth at R = 6371 km (surface):

$$r_H = 66 * 10^{-12}\, m = 66\, pm$$

This is in agreement with experimentally obtained radius of 70 pm (±5 pm). Calculation for other elements of the periodic table yields similar results.

Note that Hill radius is different for different isotopes of the same element while experimentally obtained atomic radii are charge radii and thus independent of the number of neutrons (radius represents the orbit of the outermost electron). In example, for Carbon-14 the obtained value is 69.5 * 10^{-12} m, and even closer to 70 pm if one calculates using equatorial radius of Earth instead of mean volumetric (a possible indicator that the Solar System soul was a part of a ^{14}(C-N-O) cycle in previous incarnation).

Figure 35 shows experimentally obtained radius (green) and calculated Hill sphere at R = 6371 km (black) for all stable isotopes. Evidently, radii are not only correlated but values of covalent radii oscillate around the Hill radii, confirming the entanglement of U_0 and U_1.

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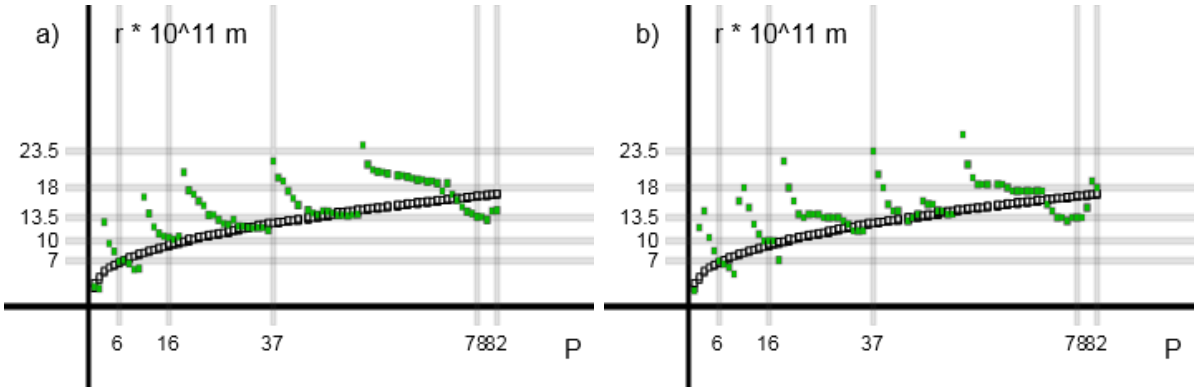

Figure 35. Calculated Hill sphere and measured radius for stable isotopes: a) data from 2008. b) data from 1964.

Comparing data from 1964.[118] and 2008.[119] shows a compression of radii and convergence to Hill radii - such changes are expected in CR (no constants) and these should be accelerating as the Solar System approaches the end of the current state (6p4n).

In the intermediate state (5p5n) charges may be completely neutralized, and the radii of all elements may converge to Hill radius.

Figure 36 shows the experimentally obtained radius (green squares) and calculated Hill sphere at R = 6371 km (black squares) for isotopes with neutron number adjusted to match the charge radius.

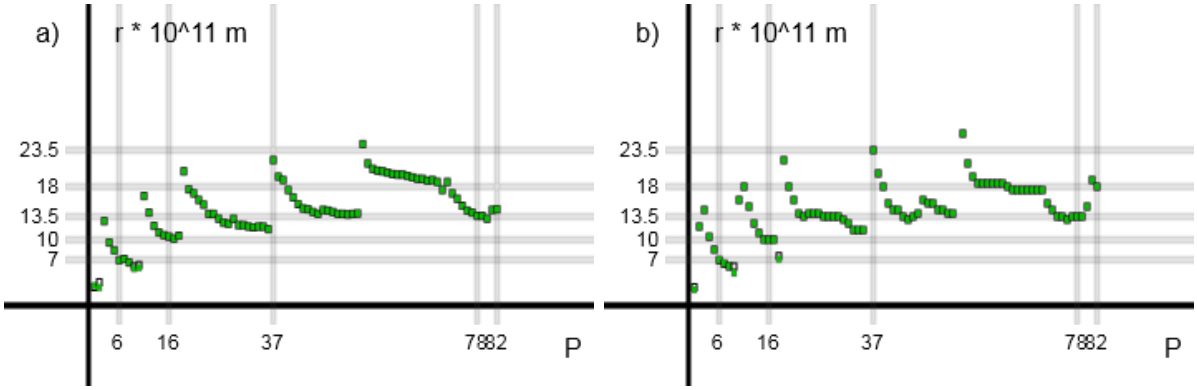

Figure 36. Calculated Hill sphere (adjusted) and measured radius for stable isotopes: a) data from 2008. b) data from 1964.

In calculations above, atomic mass has been quantized by u = 1.66053907 * 10^{-27} kg (atomic mass constant) with integer number of protons P and neutrons N [m = (P + N) * u] so Hill radii are quantized too. The overlap of Hill radii with charge radii in Figure 36 shows that charge radius is quantized too (there is a number of neutrons N for which the Hill radius will match the charge radius).

Figure 37 shows the number of neutrons N used with each element to obtain Hill radius equal to charge radius.

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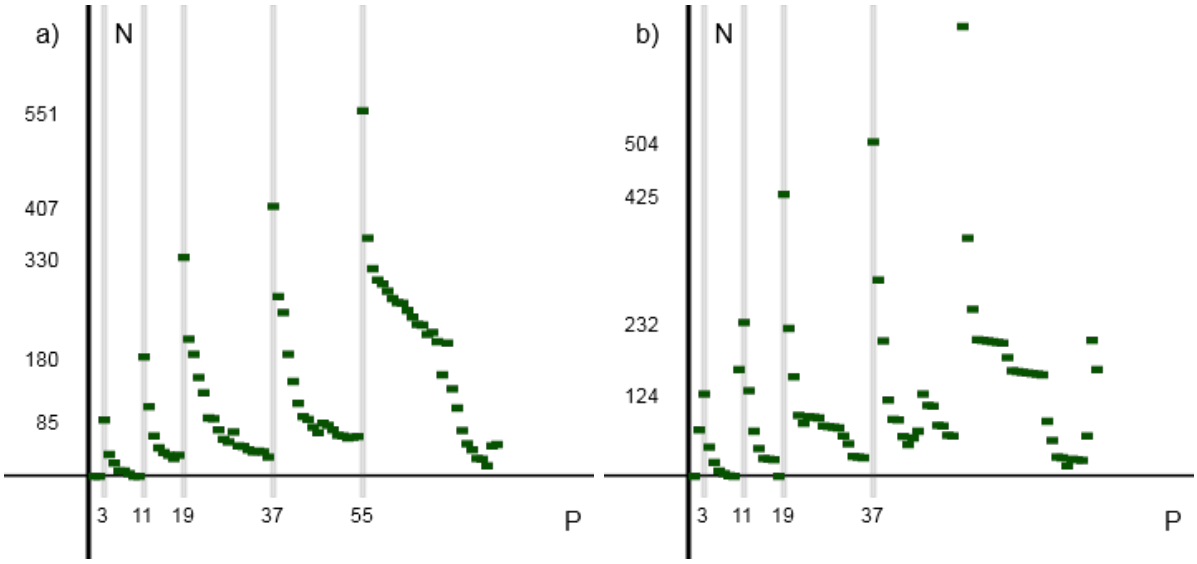

Figure 37. Isotopes used in Figure 36 calculation: a) data from 2008. b) data from 1964.

From above figures it is obvious that elements (atoms) can be grouped into shells the same way as electrons are grouped within atoms.

Grouping is shown in Table 40. There are two possibilities - either the shells L, M and N are doubled or the grouping is reflected after the N shell, so shells O, P and Q contain the same number of elements such as shells N, M and L, respectively. Note that in case of alternative (Og) grouping, no elements beyond Og are theoretically possible - otherwise another shell would be present between He and Li.

Table 40. Grouping of elements

n	shell (alt shell)	entanglement	elements	total elements = $2n^2$
1	K	-	1-2 (H - He)	2
2	L	Q	3-10 (Li - Ne)	8
2	L (Q)	L	11-18 (Na - Ar)	8
3	M	P	19-36 (K - Kr)	18
3	M (P)	M	37-54 (Rb - Xe)	18
4	N	O	55-86 (Cs - Rn)	32
4	N (O)	N	87-118 (Fr - Og)	32

Note that no elements beyond Oganesson (Og) have been found (or synthesized) to date, despite numerous attempts.

Gravitational constant G is not dimensionless and therefore not invariant to vertical scale transformation.

On the standard atom scale U_0, gravitational constant for a completely neutralized general force can be derived from previously obtained orbital momentum of the Carbon-10 outermost electron:

$$\frac{mv^2}{r} = G\frac{Mm}{r^2}$$

$$v^2 = G\frac{M}{r}$$

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$$M = \frac{\text{Sun mass}}{\text{Neptune mass}} * m$$

$$G = G_0 = v^2 \frac{r}{M} = 1.234879253 * 10^{27} \frac{m^3}{kgs^2}$$

v = v_{U_0} = 5.585837356 * 10^5 m/s
r = r_{U_0} = 70 * 10^{-12} m

where m, v, r are components of the outermost electron orbital momentum (mass, velocity, radius).

If one now, equalizes electric with gravitational force (for photon/graviton m > 0 - Yukawa, Proca[120]):

$$k_0 Q^2 \left(\frac{1}{r^2} + \frac{\mu_\gamma}{r} \right) e^{(-\mu_\gamma r)} = G_0 m^2 \left(\frac{1}{r^2} + \frac{\mu_n}{r} \right) e^{(-\mu_n r)}$$

discarding μ / r factors due to being practically equal and equal to 0 on both sides (expecting large r):

$$\mu_n - \mu_\gamma = \frac{1}{r} \ln \left(\frac{G_0 m^2}{k_0 Q^2} \right)$$

$$\frac{M_n c_n}{\hbar_n} - \frac{M_\gamma c_\gamma}{\hbar_\gamma} = \frac{1}{r} \ln \left(\frac{G_0 m}{k_0 Q} \right)$$

$$\frac{c_n}{\hbar_n} = \frac{c_\gamma}{\hbar_\gamma} = \frac{c}{\hbar}$$

$$M_n - M_\gamma = \frac{\hbar}{c} \frac{1}{r} \ln \left(\frac{G_0 m^2}{k_0 Q^2} \right)$$

$\hbar$ = reduced Planck's constant = 1.054573 * 10^{-34} Js
c = 2.99792458 * 10^8 m/s
k_0 = Coulomb constant = 8.9875517873681764 * 10^9 Nm^2/C^2
Q = electron charge = 1.60217733 * 10^{-19} C
M_γ = photon mass
M_n = U_0 graviton mass

Using previously obtained photon mass M_γ = 2 * 9.10938356 * 10^{-73} kg and carbon graviton mass M_n = 2 * 1.663337576 * 10^{-68} kg, this gives:

$$r = 1.3032821975 * 10^{26}\ m$$

as the distance in space when two forces become equal.

As shown previously, components of general force, charge and mass are exchangeable through inflation/deflation of momentum components (even in neutral particles, the amount of gravitational mass can increase at the expense of charge *mass*, with particle remaining neutral). Nature of the force thus has to oscillate over distance.
Taking into account error margins, obtained distance is equal to the radius of observable universe, assuming currently accepted [img] age (13.799 * 10^9 years), constant speed of light and flat space:

$$r = c\Delta t = 2.99792458 * 10^8 * 13.799 * 10^9 * 365.25 * 24 * 60 * 60 = 1.305 * 10^{26}\ m$$

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The fact that obtained distance is equal to the radius of observable universe is not a coincidence.

For an inflation at the speed of light, for standard particles, distance in space is distance in time so this may be interpreted as the time when both forces (carrier masses) were equal, after which point one particle started losing mass while the other was gaining mass.

This is expected with the exchange of one potential for the other.

Note that previously obtained real age of observable universe ($12.75 * 10^9$ years) implies inflation was at times faster than current c which, for the same radius, implies the c in flat space was also higher at these times.
In expanding vacuum - with decreasing density, speed of *light* must be proportional or inversely proportional to speed of inflation wherever the density of space is affected.

In the past the observable universe likely did expand, but geometry deformation was localized (quantized, gravitational wells being the quanta of vacuum) and expansion may have lasted only up to the point of CMB emission (at this point the speed of *light* also became equal to c). The redshifts thus may be caused by lower scale (U_{-2}) particles in intergalactic medium absorbing photon energies.

Taking into account the scaled density of the observable universe (gas), evidently this is a discontinuity, and possibly a gravitational maximum between layers of, relatively, dense matter.

If its angular velocity is equal to c, this is a black hole maximum (escape velocity = $\sqrt{2}$ c).

Thus, light coming from large distances might be the light *reflected* off of the firewall, providing a window to the past of inner content. This explains correlation of apparently spatially separated phenomena (galaxies) - these may not be images of different phenomena separated in space, but one separated in time.

Note that, if one fixes the gravitational constant G_0 to

$$G_0 = 1.257920328 * 10^{27} \frac{m^3}{kgs^2}$$

one obtains this:

$$\frac{G_0 m}{k_0 Q} = K^{-1} {\mu_0}^{-1} = {\mu_0}^{-1}$$

$$c^2 = 4\pi \frac{G_0 m}{Q} K = 4\pi \frac{G_0 m}{Q}$$

where μ_0 is the vacuum permeability (magnetic) constant and K = 1 C/m.

One can now obtain k and Q for the U_1 scale (Solar System):

$$\frac{k_1 {Q_1}^2}{G_1 {m_1}^2} = \frac{k_0 {Q_0}^2}{G_0 {m_0}^2}$$

$$k_1 = \frac{k_0 {Q_0}^2}{G_0 {m_0}^2} G_1 \frac{{c_1}^4}{16\pi^2 {G_1}^2} {K_1}^{-2} = \frac{k_0 {Q_0}^2}{G_0 {m_0}^2} \frac{{c_1}^4}{16\pi^2 G_1}$$

Using $G_1 = 6.674 * 10^{-11}$ m^3/kgs^2 and previously obtained $c_1 = 2.930445979 * 10^6$ m/s:

$$k_1 = 3.95052951 * 10^{38} \frac{Nm^2}{C^2}$$

$$Q_1 = 10001.92779151\, C \approx 1 * 10^4\, C$$

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Ranges on U_1 scale:

$$M_{\gamma_1} - M_{n1} = \frac{\hbar_1}{c_1}\frac{1}{r}\ln\left(\frac{G_1\, m_1}{k_1\, Q_1}\right)$$

$$\hbar_1 = \frac{h_{m2}}{2\pi} = 7.95683841 * 10^{40}\, Js$$

Using m_1 = 1.02413 * 10^{26} kg and previously obtained M_{n_1} = 1.663337576 * 10^{-26} kg, M_{γ_1} = 9.10938356 * 10^{-31} kg, the distance where two forces become equal, r = 1.0059686 * 10^{62} m $\approx$ 1 * 10^{62} m.

Note that, if one fixes m_1 to

$$m_1 = 0.99026311 * 10^{26}\, kg \approx 1 * 10^{26}\, kg$$

one obtains this:

$$\frac{G_1\, m_1}{k_1\, Q_1} = K_2\, M_p = M_p$$

where M_p = 1.6726218977 * 10^{-27} kg is the mass of a standard proton.

Range of U_1 electric force:

$$\lambda_{\gamma_1} = \frac{\hbar_1}{c_1}\frac{1}{M_{\gamma_1}} = 2.98069699 * 10^{64}\, m \approx 3 * 10^{64}\, m$$

Range of U_1 gravitational force:

$$\lambda_{n1} = \frac{\hbar_1}{c_1}\frac{1}{M_{n1}} = \frac{\hbar_1}{5 * 10^{-20}} = 1.63239937 * 10^{60}\, m$$

Here, unit m (meter) is unscaled, for a properly scaled metric the ranges are equal to ranges on U_0 scale.

21. Relation of G variation to Sun's discontinuities

Equalizing the strength of electric and gravitational force between two free particles (positron and electron), disregarding small mass of carrier particles:

$$k_0\frac{Q^2}{r^2} = G\frac{M^2}{r^2}$$

$$\frac{1}{4\pi\varepsilon_0}Q^2 = GM^2$$

yields the following value for the gravitational *constant* G:

$$G = \frac{k_0 Q^2}{M^2} = 2.78025476 * 10^{32}\,\frac{m^3}{kgs^2}$$

k_0 = 8.9875517873681764 * 10^9 Nm^2/C^2
Q = 1.60217733 * 10^{-19} C
M = 9.10938356 * 10^{-31} kg

In CR, gravitational *constant* G changes with scale. But it is also modified with neutralization of EM force, when k_0 decreases, while G increases.

This enables the gravitational force to be, at least in some cases, a prevailing force in the atom, rather than EM force.

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I have previously calculated G relative to a ^{10}C atom nucleus mass obtained through current Sun mass, the constant G using rest mass of ^{10}C nucleus is:

$$G_0 = v^2 \frac{r}{M} = 1.29864745 * 10^{27} \frac{m^3}{kgs^2}$$

v = 5.5550351679 * 10^5 m/s
r = 70 * 10^{-12} m
M = 1.663337576 * 10^{-26} kg

where m, v and r are components of the orbital angular momentum of the outermost electron.

Calculated G (G_0) is now only 5 orders of magnitude smaller than G required for gravity to be equal in strength to EM force between an electron and a positron.

But instead of G increasing, one might assume that k_0 decreases by 5 orders of magnitude, or more precisely by this amount:

$$\Delta k = \frac{G}{G_0} = 2.140884935 * 10^5$$

Thus, the increase of G (ΔG) of Earth's inner core maximum, after extraction, neutralization and collapse to current radii, is equal to Δk.

I have previously calculated that this G has increased to 5.731534632 * 10^{-6} m^3/kgs^2, which is, relative to *surface* G (6.674 * 10^{-11} m^3/kgs^2), an increase of:

$$\Delta G = \frac{5.731534632 * 10^{-6}}{6.674 * 10^{-11}} = 8.58785531 * 10^4$$

which is also the ratio between imaginary mass M (5.97 * 10^{24} kg) and real mass m (6.95 * 10^{19} kg) of Earth from some reference frames.

> If gravitational *constant* G measured on the surface of the Earth (*surface* G) is relative to standard scale (U_0), proper G for U_1 scale must be different.

But what was the initial G of Earth's inner core?

According to above hypothesis, it should have been:

$$G_i = \frac{5.731534632 * 10^{-6}}{\Delta k} = 2.677180141 * 10^{-11} \frac{m^3}{kgs^2}$$

If Earth's core has been extracted from the Sun, as hypothesized, one can get its original radius using this constant:

$$r = \sqrt{\frac{G_i M}{g}} = 440784499.323\, m \approx 440785\, km$$

M = img mass of the Sun = 1.988500 * 10^{30} kg
g = gravity of the maximum = 274 m/s^2

This agrees very well with the hypothesis of entanglement of discontinuities with inner planetary orbitals:

$$\frac{r}{R} \approx \frac{r_E}{r_M} \approx \frac{2}{3}$$

R = Sun radius = 695700 km
r_E = Earth orbital = 149.6 * 10^6 km
r_M = Mars orbital = 227.92 * 10^6 km

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The discontinuity (r/R = 0.63) is evident through the profile of rotational velocities of the Sun:

Above this discontinuity is the tachocline (transition region between the radiative and convective layer of the Sun), a major source of the Sun's magnetic dipole, analogous to the region of charge above Earth's inner core.

The hypothesis of neurogenesis, assuming pending neurogenesis on Earth and completed neurogenesis on Mars and other terrestrial planets, explains why Earth is the only one with an active surface magnetic dipole. The connection of tachocline with 0.63R discontinuity would suggest:

1. its position is not permanent and it moves between discontinuities, corresponding to the planet with ongoing neurogenesis,
2. possible multiple active discontinuities and associated tachoclines in the past, initially at maximum, or
3. current position is the place of birth of all planetary embryos (cores).

The 2nd hypothesis here is most plausible - the tachocline is active as long as the magnetic dipole of the corresponding planet is active (the two phenomena are synchronized).

However, if the tachocline is localized to 0.71R [122] and distance between the tachocline and the discontinuity is scaled from Earth (distance between the charge radius and gravitational maximum), the associated discontinuity is at:

$$r = \frac{1206115}{1705704}0.71R = 0.5R \approx \frac{1}{\sqrt{2}}0.71R$$

which would be a discontinuity associated with Venus.

In that case the tachocline is the location of a charge radius associated with a 0.5R gravitational maximum and, assuming equal g-factor, such charge radius should also be located at:

$$r = \frac{1705704}{1206115}R = 983868.265\,km \approx \sqrt{2}R$$

In this case though, the g-factor of a neutron might be more appropriate, yielding r = 1.111507303 * 10^6 km (and a mirror at 444533.257 km = 0.639R).

Note that the 0.71R tachocline is 3/4 of 0.94R, which according to Figure 38 seems to be another discontinuity or a fossilized *initial* Sun radius.

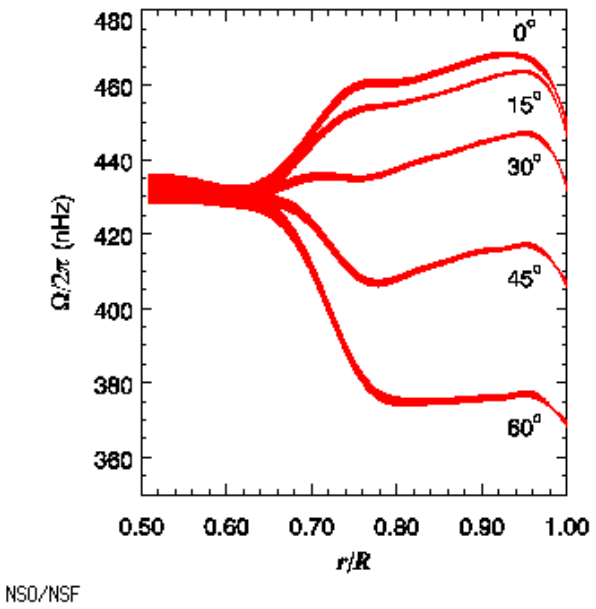

Figure 38. Sun rotation rates[121]

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Such fossil is also visible at 0.75R, which should be a discontinuity in 4p6n state.
The 0.63R (2/3 of 0.94R) is also a fossil, as the current location associated with Earth is 0.66R.

Note that 0.63R discontinuity is, similarly to 0.4R (2/5 R) discontinuity, weak (unstable) - it may not always be present in the rotational profile of the Sun.
The 0.63R has been revealed in *seismic* analysis (periodic, 1.3y signal), and possibly the 0.4R discontinuity too (noted as a low significance bump in rotation variability between 0.2R and 0.6R)[123].

Sun's GM product has increased 0.06% due to relativistic energy relative to CMB, so initial radius at 0.94R implies that surface radius changes proportionally:

$$R = \frac{R_0}{\sqrt{1 - \frac{v^2}{{c_1}^2}}}$$

for previously obtained $c_1 = 2.93 * 10^6$ m/s and $v = v_s + v_p = 996$ km/s, gives $R_0 = 654271.142$ km = 0.94 R.

Note 1:

This is analogous to the decrease of Bohr radius due to relativistic mass of the electron. Bohr radius:

$$a_0 = \frac{\hbar}{m_e c \alpha}$$

using relativistic mass:

$$a_{rel} = \frac{\hbar\sqrt{1 - \frac{v_e^2}{c^2}}}{m_e c \alpha}$$

It follows:

$$\frac{a_{rel}}{a_0} = \sqrt{1 - \frac{v_e^2}{c^2}}$$

Here, however, the radius of the atom is decreasing with the relativistic mass of electron, while the radius of the nucleus must increase with the relativistic mass of the gravitational maximum.

Note 2:

Although GM changes proportionally to R, differential rotation can shift discontinuities. Effectively, for the polar regions of the Sun, change is proportional with R^2:

$$R^2 = \frac{{R_0}^2}{\sqrt{1 - \frac{v^2}{{c_1}^2}}}$$

This gives $R_0 = 0.97$ R, and, according to Figure 38, it is indeed the correct value for polar regions. Note that the same discontinuity (0.97 R) can be obtained is one assumes that gravity of Sun's surface maximum is invariant to changes in energy levels (Earth's maximum at inner core radius does suggest this to be true, which also implies equal species of the maximum for these two, if one is characterized by its gravity). In that case, with the loss of accumulated CMB kinetic energy, radius of the Sun decreases to 0.97 R.

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If this discontinuity is correlated with the energy of real mass, and if decrease in radius has passed 0.97 R in all regions apart from high polar region, the collapse of the surface maximum to 0.97 R should be imminent.
Note also that with the end of 1st order cycle, collapse to 0.97 R may be intermediary to larger collapse (up to core radius). Note that, taking the shift of 0.03 R into account, 0.63 R discontinuity becomes 0.66 R.
Note also that orbits of planets have been shifted equally, as shown in Table 41.

Table 41. Shifting of planetary orbits

planet	distance from the Sun r [10^9 m]	r/r_M	initial r/r_M	shift
Mercury	57.91	0.25	0.28	-0.03
Venus	108.21	0.47	0.5	-0.03
Earth	149.6	0.66	0.63	+0.03
Mars	227.92	1	0.97	+0.03

The Earth has thus moved from 0.63 r_M to 0.66 r_M, while Venus moved equally but in opposite direction, from 0.5 to 0.47. Mars moved from 0.97 to 1 r_M and Mercury too moved accordingly.

22. Gyro-magnetic ratio and its correlation with Earth/Moon

The gyro-magnetic ratio of a particle is the ratio of its magnetic moment to its angular momentum:

$$\gamma = \frac{\mu}{L}$$

With the assumption that mass and charge have equal momentum:

$$\gamma = \frac{\mu}{L} = \frac{q}{2m}$$

where q, m are charge and mass of the particle, respectively.

Measurements show that this is not valid for quantum particles such as electron. Thus, a dimensionless factor g_e (g-factor) was introduced:

$$\gamma = \frac{q}{2m} g_e$$

The factor has been attributed to quantum effects which do not exist in classical (intuitive) reality - point particles with intrinsic magnetic moment (no rotation).

The notion of point particles having any properties is in itself problematic, let alone existence of different point particles with different properties. However, if such particles could exist, due to scale invariance, they would have to exist on bigger scales too. No such thing has ever been *observed* in reality - all magnetic fields are produced by moving charges of objects having a real radius.

Thus, intrinsic magnetic momentum is not intuitive, but intrinsic rotation of charge (producing the momentum) at finite radius greater than 0 is.

In CR there is also no intrinsic coupling of matter and gravity, and since charge field is a polarized gravitational field, the g-factor can be explained simply by a difference in distribution (or angular momenta) of gravitational mass and charge mass within the particle, preserving the intuitive concepts of reality.

Complete relativity not only allows speeds faster than light (photon mass is scale dependent) but implies such speeds must exist at some scale, thus the required superluminal rotation of charge (implied at certain radii) in particles such as an electron is not an issue either.

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The absolute (invariant) speed limit is not a dimensionless constant and thus is counter-intuitive in scale invariant reality (relativity), but, in this case, the required speed would be valid even in the context of General Relativity (charge is at rest relative to rotating space) if it would incorporate scale invariant curvature of space.

Magnetic moment μ and angular momentum L:

$$\mu = IA = \frac{qv_c}{2\pi r_c} \times \pi {r_c}^2$$

$$L = mv_m \times r_m$$

where v_c, r_c are the charge orbital velocity and radius, respectively, and v_m, r_m are the mass orbital velocity and radius, respectively.

The factor g_e is thus:

$$g_e = \frac{v_c \times r_c}{v_m \times r_m}$$

Being dimensionless, it should be scale invariant relative to particle flavor.

This means that the value of g_e for electron and positron is equal to g_e of Earth, as Earth is a large scale Dirac fermion equivalent (obviously not a point particle unless taken relatively), albeit in an environment where its fermionic nature is effectively annihilated.

Just like the electron, Earth consists of intrinsic charge and mass and accumulated mass due to neutralization.

The intrinsic energy is concentrated within the inner and outer core.

Assuming charge radius is in the outer core where gravity equals g_c = 137 m/s^2 and gravitational mass radius is the *inner core* gravitational maximum g_m (274 m/s^2), with equal rotation period (and angle between v and r vectors):

$$g_e = \frac{v_c \times r_c}{v_m \times r_m} = \frac{{r_c}^2}{{r_m}^2} = \frac{g_m}{g_c} = 2$$

Note that it was assumed that mass is not a solid body with radius r_m but, like the charge, a particle or a stream of particles forming a ring at r_m.

This is a valid assumption since this mass is not real mass, but vacuum energy (imaginary mass) which, in case of charged naked maxima, forms a ring rather than sphere surface.

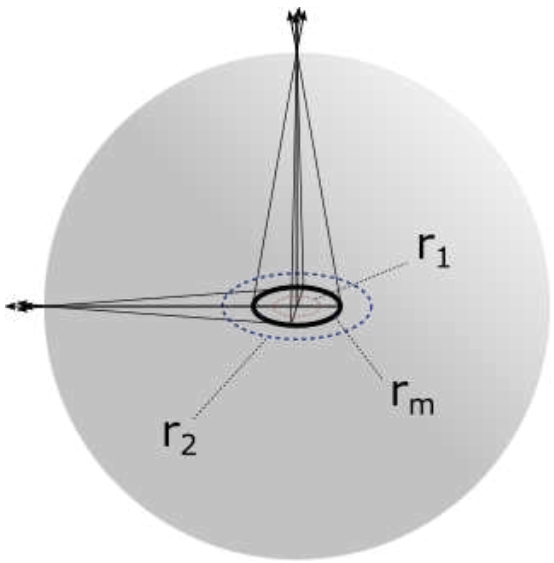

Figure 39. Mass and charge radii of charged bodies

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Since gravitational potential is not isotropic, gravitational acceleration at any point is a vector sum of accelerations induced by vacuum quanta forming the ring:

$$g = \sum_{k=1}^{n} \vec{g_k} = \sum \frac{G_0 M_0}{\vec{dr}^2}$$

In case of equatorial and polar gravity vector components parallel to surface cancel out. Equatorial gravity is thus:

$$g = \sum_{k=1}^{n} \frac{G_0 M_0}{\left[R_e - r_m \cos\left(k\frac{2\pi}{n}\right)\right]^2}$$

where R_e is the equatorial radius.

Polar gravity:

$$g = \sum_{k=1}^{n} \frac{G_0 M_0}{{R_p}^2} = n\frac{G_0 M_0}{{R_p}^2}$$

where R_p is the polar radius.

Deriving G_0M_0 product with equatorial gravity fixed to 9.798 m/s^2 and calculating polar gravity, for n >= 5, gives 9.34 m/s^2.

This is smaller than measured, so the Earth must be a composite of 2 positrons (or positron equivalents), as hypothesized.

> Note that I have previously hypothesized that the shape of a gravitational maximum with charge neutralization is transforming from a ring like to sphere surface form.
> Here, it is assumed that ring form is preserved, for the sake of proving fossilization of initial conditions.

With 2 particles in the same state, energy splits into two levels:

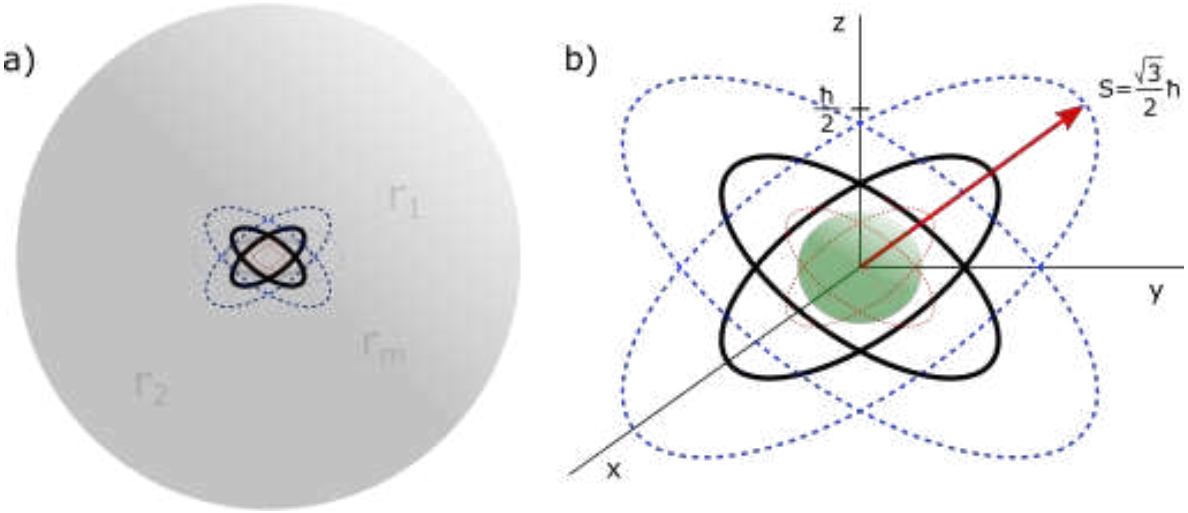

Figure 40. Mass and charge radii of two charged bodies sharing a single state

In such state, two charges are deflected from the equator by this angle:

$$\Delta\varphi = \sin^{-1}\frac{1}{\sqrt{3}} = 35.2643896827547^\circ$$

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Charges are thus separated by 2*35.2643896827547° = 70.5287793655094° (two magnetic north poles on Jupiter seem to be separated by this angle, confirming its 2e configuration).

Confirmation of this configuration of Earth comes from the state of the Moon (Luna) and non-alignment of Earth's north and south magnetic poles.

Initial total obliquity of Luna relative to Earth's equator is 23.44° + 5.14° + 6.68° = 35.26°, equal to $\Delta\phi$.

The Moon orbits one of Earth's positrons and its obliquity shows that it is built around one of the collapsed gravitational maxima of this positron.

One can thus expect this positron to have smaller contribution to gravity and charge of Earth. Further splitting of energy levels due to carbon configuration can also be expected, so number of quanta should be 6 in one positron and 5 in the other (1 is in the Moon).

It appears that, in the collapse, 6.68° of Luna's obliquity to Earth's equator has been exchanged for obliquity to Luna's own orbital plane, this can be due to influence from another body, but, since the *loss* of one quantum causes asymmetry in charge distribution it is more likely that this is the exact amount by which the inner positron decreased its angle to Earth's equator.

Thus, one can expect the orbital plane of this positron to be aligned with the orbital plane of the Moon.

This can then be interpreted as redistribution of charges on the plane, rather than loss. The Moon is thus the reason why Earth still has a dipole magnetic field - with symmetric anti-aligned positron spins the magnetic dipole would be cancelled.

Bigger moons and/or an increased number of moons (with distinct gravitational wells) of outer planets with stronger magnetic fields are thus no surprise and indicate core asymmetry if the spins are anti-aligned (note that a symmetric core does not indicate a planet has no moons, rather that it has the same number of them on each orbital plane).

But rather than the extraction of the Moon core from Earth, in the current, progressive evolution a reverse scenario is more plausible.

Even if the first positron was not fragmented from the beginning, massive extinctions that happened on Earth suggest the second one arrived quantum by quantum on a periodic basis.

There were 5 massive extinctions and there are 5 quanta of the positron in the core, 1 in the Moon.

As the mammal brain has 6 layers, with 6th layer sparsely populated, the theory of neurogenesis is strongly aligned with this hypothesis. Note that the sparse neuron cell population of the 6th layer now indicates an underdeveloped layer - the direct cause for this is the distance of the Moon.

Since this distance is variable it explains variation in intelligence among individuals. A Moon in perigee at the point of formation of the 6th brain layer would increase general intelligence (at the time of formation of other layers would probably impact other skills).
This is not a big increase, but enough to create a difference and allow weak evolution of intelligence, as brain structure is a genetic factor.
Current increasing Moon distance and the fact that our brain size started decreasing 10-15k years ago support the hypothesis of such entanglement.
As the Moon fuses with Earth, one can thus expect a strong evolution of the 6th layer in brains of species (including the brain of Earth itself).
One must now ask whether the position of other planets and the Sun impact the development? Most likely, but not as much.
Interesting is the fact that one has 5 vital organs - these are thus likely entangled with other 5 quanta of the positron associated with the Moon, so variation in the state of these can be determined by organic variation between individuals. Strong disturbance could thus cause mutation in evolution.

Thus, one can not only expect our 6th brain layer to expand during the next strong evolution event, but also a new vital organ (a 6th sense) and mutation of a body into new species.

23. Conclusion

The aim of this paper was to provide good evidence for Complete Relativity, which, I am convinced, it has succeeded in. Indeed, the analysis reveals plenty of correlation and equivalence between small scale and large scale systems that cannot be easily dismissed as coincidence.

Strong correlation of Earth's mantle layers with major extinction events is a strong evidence for planetary neurogenesis. The existence of a discontinuity at 100 km depth even suggests that the formation of a mantle discontinuity precedes surface extinction. This shows that surface extinctions are programmed events, which, however, is not surprising for a neurogenesis of an evolving life-form (one would expect for a brain layer to be at least roughly formed before neurons migrate to that layer).

Some questions remain, however, and there are predictions and hypotheses that require additional experiments and observation to be confirmed or refuted.

References

1. Complete Relativity: Nature of observables (2022), Amenoum. https://amenoum.org/complete_relativity.html
2. NASA Planetary Fact Sheet. https://nssdc.gsfc.nasa.gov/planetary/factsheet/
3. Images of planets (2013), OpenClipart-Vectors. https://pixabay.com/users/openclipart-vectors-30363/
4. Six transiting planets and a chain of Laplace resonances in TOI-178 (2020), A. Leleu et al. https://doi.org/10.1051/0004-6361/202039767
5. CODATA recommended values (2018), NIST. https://physics.nist.gov/cuu/Constants/bibliography.html
6. Complete Relativity: Nature of observables (2022), Amenoum. https://amenoum.org/complete_relativity.html#tag_determination_of_c_n
7. Putovanje kroz vrijeme (2021), Amenoum. https://amenoum.org/log/31_putovanje_kroz_vrijeme.html
8. Rest mass of photon on the surface of matter (2020), M. Goray et al. https://doi.org/10.1016/j.rinp.2019.102866
9. An Electroweak model with electrons of opposite helicities carrying the same quantum numbers (1981), W. B. Yeung.
10. S62 on a 9.9 yr Orbit around SgrA* (2020), F. Peißker et al. https://doi.org/10.3847/1538-4357/ab5afd
11. S62 and S4711: Indications of a Population of Faint Fast-moving Stars inside the S2 Orbit—S4711 on a 7.6 yr Orbit around Sgr A* (2020), F. Peißker et al. https://doi.org/10.3847/1538-4357/ab9c1c
12. On the Formation of Compact Stellar Disks around Sagittarius A* (2008), M. Wardle et al. https://doi.org/10.1086/591471
13. Asymptotic g modes: Evidence for a rapid rotation of the solar core (2017), Fossat et al. https://doi.org/10.1051/0004-6361/201730460
14. Micrometeoroid infall onto Saturn's rings constrains their age to no more than a few hundred million years (2023), S. Kempf et al, Science Advances, 9(19). https://doi.org/10.1126/sciadv.adf8537
15. Measurement and implications of Saturn's gravity field and ring mass (2019), L. Iess et al, Science, 364(6445). https://doi.org/10.1126/science.aat2965
16. Long-term patterns of body mass and stature evolution within the hominin lineage (2017), M. Will et al. https://doi.org/10.1098/rsos.171339
17. Cosmogenic radionuclides reveal an extreme solar particle storm near a solar minimum 9125 years BP (2022), C. I. Paleari et al. https://doi.org/10.1038/s41467-021-27891-4
18. On the Origins of Magnetic Excursions in the Great Lakes (1981), W. F. Kean. https://doi.org/10.1016/S0380-1330(81)72051-3

19. The Norwegian-Greenland Sea, the Laschamps, and the Mono Lake Excursions Recorded in a Black Sea Sedimentary Sequence Spanning From 68.9 to 14.5 ka (2020), J. Liu et al. https://doi.org/10.1029/2019JB019225
20. The Lake Mungo geomagnetic excursion (1976), M. F. Barbetti and M. W. McElhinny. https://doi.org/10.1098/rsta.1976.0048
21. The 26.5 ka Oruanui eruption New Zealand: An introduction and overview (2001), C. J. N. Wilson. https://doi.org/10.1016/S0377-0273(01)00239-6
22. Robust Characteristics of the Laschamp and Mono Lake Geomagnetic Excursions: Results From Global Field Models (2019), M. Korte et al. https://doi.org/10.3389/feart.2019.00086
23. Evidence for two intervals of enhanced 10Be deposition in Antarctic ice during the last glacial period (1987), G. M. Raisbeck et al. https://doi.org/10.1038/326273a0
24. Late Pleistocene geomagnetic excursion in Icelandic lavas: confirmation of the Laschamp excursion (1990), S. Levi et al. https://doi.org/10.1016/0012-821X(90)90019-T
25. The Toba supervolcano eruption caused severe tropical stratospheric ozone depletion (2021), S. Osipov et al. https://doi.org/10.1038/s43247-021-00141-7
26. The Gothenburg Magnetic Excursion (1977), N. Mörner. http://dx.doi.org/10.1016/0033-5894(77)90031-X
27. Evidence for an extraterrestrial impact 12900 years ago that contributed to the megafaunal extinctions and the Younger Dryas cooling (2007), R. B. Firestone et al. https://doi.org/10.1073/pnas.0706977104
28. The 13 million year Cenozoic pulse of the Earth (2015), J. Chen. https://doi.org/10.1016/j.epsl.2015.09.033
29. When and Why Did Human Brains Decrease in Size? A New Change-Point Analysis and Insights From Brain Evolution in Ants (2021), J. M. DeSilva et al. https://doi.org/10.3389/fevo.2021.742639
30. On the 1470-year pacing of Dansgaard-Oeschger warm events (2002), M. Schulz. https://doi.org/10.1029/2000PA000571
31. The Relationship of Sunspot Cycles to Gravitational Stresses on the Sun: Results of a Proof-of-Concept Simulation (2011), D. Jassby. https://doi.org/0.1016/B978-0-12-385956-3.10014-2
32. Internal rotation of Sun (2010), SOHO. https://ase.tufts.edu/cosmos/view_picture.asp?id=1368
33. Velocity Curves for Spiral Galaxies (2015), C. R. Nave. http://hyperphysics.phy-astr.gsu.edu/hbase/Astro/velcurv.html
34. Discovery of variation in Solar coronal rotation with altitude (2001), H. O. Vats et al.
35. A Quantum-Like Description of the Planetary Systems (2007), F. Scardigli. https://doi.org/10.1007/s10701-007-9151-7
36. Self-Organizing Systems in Planetary Physics: Harmonic Resonances of Planet and Moon Orbits (2018), M. J. Aschwanden. https://doi.org/10.1016/j.newast.2017.08.002
37. The deep Earth may not be cooling down (2016), D. Andrault et al. https://doi.org/10.1016/j.epsl.2016.03.020
38. Complete Relativity: Nature of observables (2022), Amenoum. https://amenoum.org/complete_relativity.html#tag_total_mass
39. Eccentricity of the geomagnetic dipole caused by lopsided inner core growth (2012), P. Olson et al. https://doi.org/10.1038/NGEO1506
40. Search for new phenomena in dijet events with the ATLAS detector at $\sqrt{s}$ = 13 TeV (2019), D. Zhang. https://cds.cern.ch/record/2683921/files/ATL-PHYS-SLIDE-2019-426.pdf
41. Signals of a 2 TeV W' boson and a heavier Z' boson (2016), B. A. Dobrescu et al. https://doi.org/10.1007/JHEP05(2016)047
42. Complete Relativity: Nature of observables (2022), Amenoum. https://amenoum.org/complete_relativity.html#ref12
43. NIST Atomic Spectra Database ver. 5.9 (2021), A. Kramida et al. https://doi.org/10.18434/T4W30F
44. Assessments of the energy, mass and size of the Chicxulub Impactor (2014), H. J. Durand-Manterola and G. Cordero-Tercero. https://doi.org/10.48550/arXiv.1403.6391
45. Distributions and moments of asteroid and comet impact speeds upon the Earth and Mars (1998), D. Steel. https://doi.org/10.1016/S0032-0633(97)00232-8
46. Solar Wind Implantation Into the Lunar Regolith: Monte Carlo Simulations of H Retention in a Surface With Defects and the H2 Exosphere (2018), O. J. Tucker et al. https://doi.org/10.1029/2018JE005805

47. Solar Storms Could 'Sandblast' the Moon (2011), NASA. https://www.nasa.gov/topics/solarsystem/features/dream-cme.html
48. Multiple Impacts at the KT Boundary and the Death of the Dinosaurs (1997), S. Chatterjee.
49. 99942 Apophis Earth Impact Risk Summary (2013), NASA. https://web.archive.org/web/20130512035601/http://neo.jpl.nasa.gov/risk/a99942.html
50. Measurements of Newton's gravitational constant and the length of day (2015), J. D. Anderson et al. https://doi.org/10.1209/0295-5075/110/10002
51. Horizons On-Line Ephemeris System (2020), NASA Solar System Dynamics Group. http://ssd.jpl.nasa.gov/
52. Equatorial anisotropy in the inner part of Earth's inner core from autocorrelation of earthquake coda (2015), T. Wang et al. https://doi.org/10.1038/ngeo2354
53. A complex dynamo inferred from the hemispheric dichotomy of Jupiter's magnetic field (2018), K. M. Moore et al. https://doi.org/10.1038/s41586-018-0468-5
54. Uranus fact sheet (2019), NASA/GSFC. https://nssdc.gsfc.nasa.gov/planetary/factsheet/uranusfact.html
55. Neptune fact sheet (2019), NASA/GSFC. https://nssdc.gsfc.nasa.gov/planetary/factsheet/neptunefact.html
56. Up-to-fivefold reverberating waves through the Earth's center and distinctly anisotropic innermost inner core (2023), T. Pham and H. Tkalčić. https://doi.org/10.1038/s41467-023-36074-2
57. Antipodal hotspots and bipolar catastrophes: Were oceanic large-body impacts the cause? (2005), J. T. Hagstrum, Earth and Planetary Science Letters 236(1-2), 13-27. https://doi.org/10.1016/j.epsl.2005.02.020
58. Broad plumes rooted at the base of the Earth's mantle beneath major hotspots (2015), S. French and B. Romanowicz, Nature 525, 95–99 https://doi.org/10.1038/nature14876
59. On the resolution of seismic tomography models and the connection to geodynamic modelling (2019), EGU. https://blogs.egu.eu/divisions/gd/2019/06/05/on-the-resolution-of-seismic-tomography-models-and-the-connection-to-geodynamic-modelling-is-blue-red-the-new-cold-hot-how-many-pixels-in-an-earth/
60. 10Be: Half-life and AMS-standards (1987), H. J. Hofmann et al. https://doi.org/10.1016/0168-583X(87)90198-4
61. A new value for the half-life of 10Be by Heavy-Ion Elastic Recoil Detection and liquid scintillation counting (2010), G.Korschinek et al https://doi.org/10.1016/j.nimb.2009.09.020
62. Rest Heart Rate and Life Expectancy (1997), H. J. Levine. https://doi.org/10.1016/s0735-1097(97)00246-5
63. The species of homo (2022), Amenoum. https://amenoum.org/log/25_species_of_homo.html
64. Athropogenic carbon and ocean pH, Nature 425, 365 (2003), K. Caldeira et al.
65. Ocean acidification and the Permo-Triassic mass extinction (2015), M. O. Clarkson et al. https://doi.org/10.1126/science.aaa0193
66. Essentials of geology, 4th edition, 256 (2013), S. Marshak.
67. Characteristic disruptions of an excitable carbon cycle (2019), D. H. Rothman. https://doi.org/10.1073/pnas.1905164116
68. Thresholds of catastrophe in the Earth system (2017), D. H. Rothman. https://doi.org/10.1126/sciadv.1700906
69. Do Red and Green Make Brown?: Perspectives on Plastid Acquisitions within Chromalveolates (2011), R. G. Dorrell et al. https://doi.org/10.1128/EC.00326-10
70. Future climate forcing potentially without precedent in the last 420 million years (2017), G. L. Foster et al. https://doi.org/10.1038/ncomms14845
71. Periodicity of extinctions in the geologic past (1983), D. M. Raup et al. https://dx.doi.org/10.1073/pnas.81.3.801
72. Periodic impact cratering and extinction events over the last 260 million years (2015), M. R. Rampino et al. https://doi.org/10.1093/mnras/stv2088
73. No Evidence for a Large Atmospheric CO2 Spike Across the Cretaceous-Paleogene Boundary (2019), J. N. Milligan et al. https://doi.org/10.1029/2018GL081215
74. Chart: Atmospheric CO2 Levels Are Rising (2018), Inside Climate News. https://insideclimatenews.org/infographics/chart-atmospheric-co2-levels-have-been-rising/

75. Understanding synchronicity (2020), Amenoum. https://amenoum.org/log/19_understanding_synchronicity.html
76. Never at rest: A biography of Isaac Newton (1983), R. S. Westfall, 816-817.
77. Amenoum (2020), Amenoum https://amenoum.org/authors/Amenoum.html
78. 10Be β- Decay Evaluated Data (2019), TUNL Nuclear Data Evaluation Project. https://nucldata.tunl.duke.edu/nucldata/GroundStatedecays/10Be.shtml
79. Evidence of correlations between nuclear decay rates and Earth–Sun distance (2009), J. H. Jenkins et al. https://doi.org/10.1016/j.astropartphys.2009.05.004
80. Where is the Earth's Radiogenic Helium? (1957), L. G. Carpenter et al. https://www.nature.com/articles/179213a0
81. Paleosol barometer indicates extreme fluctuations in atmospheric CO2 across the Cretaceous-Tertiary boundary (2002), L. Nordt et al. https://doi.org/10.1130/0091-7613(2002)030%3C0703:PBIEFI%3E2.0.CO;2
82. Dark matter's shadowy effect on Earth (2019), M. R. Rampino http://astronomy.com/magazine/2019/07/dark-matters--shadowy-effect--on-earth
83. Statistics of directional data (1972), K. V. Mardia.
84. Large igneous provinces and mass extinctions: An update (2014), D. Bond et al. https://doi.org/10.1130/2014.2505%2802%29
85. Permo-Carboniferous Volcanism in Europe and North Africa: a Superplume exhaust valve in The Center of Pangea (1998), M. Doblas et al. https://doi.org/10.1016/S0899-5362%2897%2900138-3
86. Silurian Cycles: Linkages of Dynamic Stratigraphy with Atmospheric, Oceanic and Tectonic Changes (1998), L. Jeppsson.
87. Discovery of a major negative δ13C spike in the Carnian (Late Triassic) linked to the eruption of Wrangellia flood basalts (2012), J. Dal Corso et al. https://doi.org/10.1130/g32473.1
88. The Silurian Mulde Event and a scenario for secundo – secundo events (2007), L. Jeppsson et al. https://doi.org/10.1017/s0263593300000377
89. The Ireviken Event in the lower Silurian of Gotland, Sweden - relation to similar Palaeozoic and Proterozoic events (2003), A. Munnecke et al. https://doi.org/10.1016/S0031-0182%2803%2900304-3
90. The Kalkarindji Large Igneous Province, Australia: Petrogenesis of the Oldest and Most Compositionally Homogenous Province of the Phanerozoic (2018), B. D. Ware et al. https://doi.org/10.1093/petrology%2Fegy040
91. Magmatic underplating beneath the Rajmahal Traps: Gravity signature and derived 3-D configuration (2004), A. P. Singh et al.
92. A Concise Geologic Time Scale (2016), F. M. Gradstein et al
93. Oceanic crustal carbon cycle drives 26-million-year atmospheric carbon dioxide periodicities (2018), R. D. Müller et al. https://doi.org/10.1126/sciadv.aaq0500
94. Mantle Discontinuities (2017), A. Deuss. http://www.geo.uu.nl/~deuss/research/discontinuities/
95. Imaging Mantle Heterogeneity with Upper Mantle Seismic Discontinuities (2015), N. Schmerr https://doi.org/10.1007/978-3-319-15627-9_3
96. New theory of the Earth (2007), D. L. Anderson.
97. Mantle discontinuities (1991), C. R. Bina. https://www.earth.northwestern.edu/~craig/publish/pdf/rg91.pdf
98. Reflection of P'P' seismic waves from discontinuities in the mantle (1970), J. H. Whitcomb et al https://doi.org/10.1029/JB075i029p05713
99. Why Did the Climate of Mars Shift from Habitable to Inhabitable? Clues from Mapping Ancient Riverbeds (2022), USRA. https://www.lpi.usra.edu/planetary_news/2022/08/02/why-did-the-climate-of-mars-shift-from-habitable-to-inhabitable-clues-from-mapping-ancient-riverbeds/
100. Changing spatial distribution of water flow charts major change in Mars's greenhouse effect (2022), E. S. Kite et al, Science Advances 8(21). https://doi.org/10.1126/sciadv.abo5894
101. Could Venus have been habitable? (2019), Europlanet. https://www.europlanet-society.org/could-venus-have-been-habitable/

102. Temporal trends in sperm count: a systematic review and meta-regression analysis of samples collected globally in the 20th and 21st centuries (2022), H. Levine et al. https://doi.org/10.1093/humupd/dmac035
103. Effects of the COVID-19 Pandemic on Mental Health and Brain Maturation in Adolescents: Implications for Analyzing Longitudinal Data (2022), I. H. Gotlib et al. https://doi.org/10.1016/j.bpsgos.2022.11.002
104. Tumor-derived TGF-β inhibits mitochondrial respiration to suppress IFN-γ production by human CD4+ T cells (2019), S. Dimeloe et al. https://dx.doi.org/10.1126/scisignal.aav3334
105. Deadly 'two-faced' protein drives cancer growth, cripples T-cell avengers (2019), D. Ricks. https://medicalxpress.com/news/2019-10-deadly-two-faced-protein-cancer-growth.html
106. Using the Baryonic Tully–Fisher Relation to Measure Ho (2020), J. Schombert et al. https://doi.org/10.3847/1538-3881/ab9d88
107. Measurement of Jupiter's asymmetric gravity field (2018), L. Iess et al. https://doi.org/10.1038/nature25776
108. Dynamics of Hippocampal Neurogenesis in Adult Humans (2013), Spalding et al. https://dx.doi.org/10.1016/j.cell.2013.05.002
109. Environmental Physiology of Animals (2009), P. Willmer.
110. A Sceptics View: 'Kleiber's Law' or the '3/4 Rule' is neither a Law nor a Rule but Rather an Empirical Approximation (2014), A. J. Hulbert. https://doi.org/10.3390/systems2020186
111. Panic! At the Disks: First Rest-frame Optical Observations of Galaxy Structure at z > 3 with JWST in the SMACS 0723 Field (2022), L. Ferreira et al, The Astrophysical Journal Letters 938(1). https://doi.org/10.3847/2041-8213/ac947c
112. A population of red candidate massive galaxies 600 Myr after the Big Bang (2023), I. Labbé et al, Nature. https://doi.org/10.1038/s41586-023-05786-2
113. Observational Evidence for Cosmological Coupling of Black Holes and its Implications for an Astrophysical Source of Dark Energy (2023), D. Farrah et al, The Astrophysical Journal Letters 944(2). https://doi.org/10.3847/2041-8213/acb704
114. UV surface brightness of galaxies from the local universe to z 5 (2014), E. J. Lerner et al. https://doi.org/10.1142/S0218271814500588
115. Evidence for anisotropy of cosmic acceleration (2019), J. Colin et al. https://doi.org/10.1051/0004-6361/201936373
116. Time Dilation in Type Ia Supernova Spectra at High Redshift (2008), S. Blondin et al. https://doi.org/10.1086/589568
117. Investigating signatures of cosmological time dilation in duration measures of prompt gamma-ray burst light curves (2014), O. M. Littlejohns and N. R. Butler. https://doi.org/10.1093/mnras/stu1767
118. Atomic Radii in Crystals (1964), J. C. Slater. https://doi.org/10.1063%2F1.1725697
119. Covalent radii revisited (2008), B. Cordero et al. https://doi.org/10.1039%2Fb801115j
120. Experimental tests of Coulomb's Law and the photon rest mass (2004), L-C. Tu et al. https://doi.org/10.1088/0026-1394/41/5/S04
121. The Pulse of the Solar Dynamo (2000), R. Howe et al. http://soi.stanford.edu/press/GONG_MDI_03-00/
122. An Introduction to the Solar Tachocline (2007), D. Gough. https://doi.org/10.1017/CBO9780511536243.002
123. Solar Interior Rotation and its Variation (2009), R. Howe. https://doi.org/10.12942/lrsp-2009-1