A proposed set of relatively new conjectures and hypotheses in modern physics, mainly the concept of subquantum movement (SQM), the finite “elasticity” of spacetime hypothesis (FESTH), the self-repulsiveness of electromagnetic charge (SR-EMC) and the plausible gravitational significance of the fine structure constant (GS-FSC)

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Motto: “The greatest secret of our universe may be hidden in some of its tiniest elementary particles: the electron and the neutrino.” (dr. Andrei-Lucian Drăgoi)

* 0. Abstract (with main abbreviations used in this paper)

This paper proposes a set of relatively new conjectures and hypotheses in modern physics, mainly concept of subquantum movement (SQM), the finite “elasticity” of (charged/neutral) spacetime hypothesis (FESTH) (a unifying concept which may bring under the “same umbrella” both Einstein’s General relativity [EGR] and Quantum Field Theory [QFT]), the self-repulsiveness of electromagnetic charge (SR-EMC) and the gravitational significance (GS) of the fine structure constant (GS-FSC); each conjecture (or hypothesis) in part is based on at least one observation and generates some interesting predictions. This paper continues (from alternative angles of view!) the work of other past articles/preprints of the same author [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23]

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1. Observations and conjectures

Observation no. “0” (Obs0) (indexed as “0” to emphasize its central role and importance in this paper!) [3]. It is well known/demonstrated that ~99% of a nucleon (proton [p] or neutron [n]) rest mass \( m_{p/n} \) (which \( m_{p/n} \) is actually the inertial mass) of a nucleon measured by an observer which is “at rest” in respect to that nucleon) IS IN FACT produced by BOTH, primarily, the kinetic energy of their subcomponent gluons (the quanta of the strong nuclear field [SNF]), which gluons bind “nucleonic” up and down quarks together, by the so called quantum chromodynamics binding energy which is actually the SNF energy) and, secondarily, the kinetic energy of quarks: tertiarly, only the rest of ~1% of \( m_{p/n} \) is due to the rest masses of all its subcomponent quarks, HOWEVER all \((99% + 1\%) m_{p/n}\) couples gravitationally (because the gravitational mass [URL3] and inertial mass of a nucleon were experimentally proved to be equal, at least in the error limit of the experiments).

Conjecture no. “0”a (Conj0a) (based on Obs0) (indexed as “0” to emphasize its central role and importance in this paper!). Starting from Obs0, Conj0a “inductively” pushes Obs0 to its extreme possibilities by stating that: a non-zero (NZ) rest mass (RM) (NZRM) of any known elementary particle (EP) indicates subquantum movement (SQM) of “something” inside that NZRM-EP, which SQM “sine-qua-non”-ly needs a non-zero volume (to …logically take place!), which implies that all NZRM-EPs have non-zero (3D) and finite and non-infinitiesesimal) volumes (NZVs) (which NZVs are a fable solution to avoid the infinite self-energy paradox of any NZRM-EP); Conj0a additionally (and ambitiously!) states that all NZRMs of all EPs can ONLY be FULLY explained by the kinetic energy of other “ultimately” (“more”) fundamental (UF) ZRM-EPs moving inside those NZVs of those NZRM-EPs: these UF-ZRM-EPs are stated to have zero-RMs [ZRMs] and ONLY relativistic masses limited by the speed of light in vacuum \( c (= v_{\text{max}}) \) (like the photons and the gluons for example), which \( c \) is considered equal to the maximum speed allowed in OU \( v_{\text{max}} \) for any movement of any EP from OU (including UF-ZRM-EPs): this \( v_{\text{max}} (= c) \)-rule/law/principle is stated by both Einstein’s Special relativity (ESR) and General relativity (EGR) SO THAT Conj0a assumes both ESR and EGR to be at least partially true, at least in this essential aspect (the existence of a finite \( v_{\text{max}} = c \).

The main argument of Conj0a. The main argument of Conj0 (which is the strongest of all!) would be that the quantum angular momentum (QAM/ spin) of any point-like EP (because all EPs are currently treated by quantum field theory [QFT] as 0D [mathematical/geometrical/abstract] points) has NO logical sense if the object is 0D (zero-length, zero-thickness, zero-depth etc): a 0D point is an abstract mathematical/virtual point which CANNOT “rotate” AND actually CANNOT have any physical properties at all (from which spin would be really an obvious “crass” logical paradox for any 0D EP!) AND that is why all EPs (including the electrons/positrons for example) are surely 3D entities with very small but finite and non-infinitiesesimal NZVs; the fact that QFT treats EPs as 0D points doesn’t literally mean that EPs are truly such 0D points, but ONLY means that, for QFT (and physics in general), it’s convenient to treat EPs as 0D points for many types of estimations and predictions which can be greatly simplified this way (however, convenience should NOT be confused with quantum and/or possibly subquantum reality!)

Conjecture no. “0”b (Conj0b) (also based on Obs0). Conj0b completes Conj0a by mainly stating that: movement of anything CANNOT be infinitely compressed and limited in our universe (OU), because the act of progressively limiting the movement of

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any quantum/subquantum EP would progressively increase its kinetic energy inside that finite (and non-infinitesimal) NZV (volume of compression) and thus would progressively (and exponentially!) increase its rest-mass (RM) (generated by that SQM). This may be called the “exponential asymptotic self-repulsiveness of movement/SQM” which limits the compression of any NZRM-EP down to a maximum density \( \rho_{EP(max)} \), similarly to \( c(=v_{\text{max}}) \): Conj0b co-states that this finite (/non-infinite) \( \rho_{EP(max)} \) is ACTUALLY caused by

\[ v_{\text{max}} = \frac{1}{c} \]  

-rule/law/principle (stated by both ESR and EGR), which \( c(=v_{\text{max}}) \) is ALSO stated to be a speed limit for any UF-ZRM-EP from inside those finitely compressible NZRM-EPs (as previously/already stated/conjectured by Conj1a). Prediction. Conj0b predicts that OU doesn’t allow true gravitational singularities with infinite mass/energetic densities (as wrongly predicted by Einstein’s general relativity [EGR]), BUT ONLY (gravitational) quasi-singularities with very large but finite densities which cannot surpass \( \rho_{EP(max)} \) : the pre-Big Bang Singularity (pBBS) is thus predicted to have been actually a gravitational quasi-singularity with density \( \rho_{PBBS} = \rho_{EP(max)} \).

Conjecture no. “0”c (Conj0c) (also based on Obs0 and Conj0b). Conj0c states that: (1) the electron neutrino (en) with NZRM estimated as \( m_{en} \equiv \text{leV} / c^2 \) is, very plausibly, the lightest neutral (zero electromagnetic charge [EMC]) NZRM-EP conceivable and allowed in OU; (2) the Planck length

\[ l_{pl} = \sqrt{\hbar G / c^3} \left( \equiv 1.6 \times 10^{-35} \text{m} \right) \]

is, very plausibly, the smallest conceivable length with physical meaning in OU (and ALSO the minimum diameter of any spherical NZV of movement of any UF-ZRM-EP). Based on its first two sub-statements (1 and 2), Conj0c mainly states that en has a spherical NZV with diameter

\[ d_{en} = l_{pl} = \sqrt{\hbar G / c^3} \left( \equiv 1.6 \times 10^{-35} \text{m} \right) \]

(That spatially bounds/limits the subquantum movement [SQM] of any conceivable UF-ZRM-EP vibrating inside en/its NZV and generating its NZRM when observed from a larger scale), implying a finite maximum density of en

\[ \rho_{en} = \frac{m_{en}}{(4\pi/3)(d_{en}/2)^3} \equiv 8.1 \times 10^{68} \text{kg/m}^3 \].

Conj0c additionally states that \( \rho_{en} \) is actually the maximum massic/energetic density allowed in OU so that

\[ \rho_{EP(max)} = \rho_{en} \left( \equiv 10^{69} \text{kg/m}^3 \right), \]

which implies (as combined with the prediction of Conj0b)

\[ \rho_{PBBS} = \rho_{EP(max)} = \rho_{en} \left( \equiv 10^{69} \text{kg/m}^3 \right). \]

Conj0c further (co-)states that NOT ONLY pBBS, BUT ALL neutral (n) (zero-EMC)-NZRM-EPs (briefly abbreviated “nEPs”) share this same (constant) maximum density (allowed in OU)

\[ \rho_{EP(max)} \left( \equiv 10^{69} \text{kg/m}^3 \right), \]

so that

\[ \rho_{nEPs} = \rho_{EP(max)} \left( \equiv 10^{69} \text{kg/m}^3 \right). \]

Conjecture no. “0”d (Conj0d). Conj0d states that electromagnetic charge (EMC) is even more rigid (less compressible) than “simple/neutral” SQM (the SQM of neutral UF-ZRM-EPs) due to an additionally conjectured “self-repulsiveness of EMC” : in other words, EMC is stated to oppose even more strongly to limiting (by compression) the NZV circumscribing that SQM (associated with a non-zero EMC) SO THAT EM-charged-EPs (briefly abbreviated “cEPs”) are conjectured to actually have a maximum allowed density \( \rho_{cEP(max)} \) significantly smaller than

\[ \rho_{nEPs} = \rho_{EP(max)} \left( \equiv 10^{69} \text{kg/m}^3 \right), \]

so that

\[ \rho_{cEPs(max)} \ll \rho_{EP(max)} \].

Estimation/prediction of the electron/(positron) non-zero diameter. If the electron/(positron) would share the same density

\[ \rho_{EP(max)} = \rho_{en} \left( \equiv 10^{69} \text{kg/m}^3 \right) \]

with the electron neutrino (en), the diameter of the electron/positron \( d_e \) would be equal to \( d_{en} \sqrt{m_e / m_{en}} = 80 l_{pl} \) : HOWEVER, the density of the electron/(positron) is predicted (by Conj0d) to be much smaller than \( \rho_{EP(max)} \left( = \rho_{en} = \rho_{nEPs} \right) \), implying a predicted \( d_e \gg 80 l_{pl} \) : on the other hand, the upper limit of the electron size (as determined by observing the electron in a Penning trap) is \( d_{e(ad)} \left( \equiv 10^{-22} \text{m} \right) \), so that \( d_e \) may be actually close to the geometric average of these two extremes, such as

\[ d_{e \text{estim.}} \equiv \sqrt{(80 l_{pl}) \cdot 10^{-22} \text{m} \cdot 10^7 l_{pl} \cdot 10^{-28} \text{m}} \]

: the density of the electron/(positron) is thus predicted to be

\[ \rho_e \ll \rho_{cEPs(max)} \left( = \rho_{en} \equiv 10^{52} \text{kg/m}^3 \right). \]

Important note.

Both the estimated densities
\[\rho_{n\text{EPs}}(\text{estim.}) = \rho_{\text{EP(max)}} \approx 10^{69} \text{ kg} / \text{m}^3\] and

\[\rho_{c\text{EPs}}(\text{estim.}) = \rho_e \approx 10^{52} \text{ kg} / \text{m}^3\]

are much larger than any density of any conceivable macro black hole, but are considerably lower than the Planck density \(\rho_{\text{Pl}} = m_{\text{Pl}} / l_{\text{Pl}}^3 \approx 10^{97} \text{ kg} / \text{m}^3\) (which is approximately the density of a quantum/micro black hole defined by the equality between its Compton wavelength and its Schwarzschild radius).

Conjecture additionally states that \(\rho_{n\text{EPs}}(\text{estim.}) \approx 10^{69} \text{ kg} / \text{m}^3\) and \(\rho_{c\text{EPs}}(\text{estim.}) \approx 10^{52} \text{ kg} / \text{m}^3\) are sufficiently large to disrupt the 4D spacetime (4DST) of OU and to create closed “bubble”-like hyperspatial spacetime circularities (aka closed timelike curves) in which a local patch of local 3D space (3DS) is wrapped around a 4th dimensional (4thD) “core” with compact topology: that is why Conjecture additionally states that all NZRM-nEPs and all NZRM-cEPs are actually two distinct types of 4D “bubble”-like quantum/micro black holes (mbhs) (which nEPs being with approx. 17 orders of magnitude more compact than cEPs). Important note. Such a 4D-mbh (used as a generic model for any NZRM-EP) cannot be further compressed from our 3DS, because it is partially isolated from our 3DS (by its own closed circularity) and because it has a finite elasticity (which may be explained by an infinitely rigid 4thD-core which may oppose to any further compression).

The Finite Elasticity Spacetime Hypothesis (FESTH). Based on all previous conjectures (Conj0a/b/c/d/e) we propose a Finite “Elasticity” of Spacetime Hypothesis (FESTH) which states that neutral 4DST disrupts at (compression)-densities equal or larger than \(\rho_{n\text{EPs}}(\text{estim.}) \approx 10^{69} \text{ kg} / \text{m}^3\) generating neutral 4D “bubble”-like mbhs (which oppose to any further compression, with estimated density \(\rho_{n\text{EPs}}\) and identified with nEPs) and EM-charged 4DST disrupts at (compression)-densities equal or larger than \(\rho_{c\text{EPs}}(\text{estim.}) \approx 10^{52} \text{ kg} / \text{m}^3\) generating EM-charged 4D “bubble”-like mbhs (which oppose to any further compression, with estimated density \(\rho_{c\text{EPs}}\) and identified with cEPs). Important note on FESTH (1). FESTH (predicting a very large but finite spacetime “elasticity”) naturally explains how our 4D spacetime (4DST) may have “very smooth” geodesics at macroscopic scales (describable by EGR) but “jagged” quantized deformations/geodesics at subatomic scales close to Planck length scale (describable by QFT/quantum mechanics [QM] at those very small scales) so that FESTH can be regarded as a unifying concept accommodating both EGR and QFT/QM under the same “umbrella” of a future theory of everything (TOE). FESTH also prevents gravitational singularities and allows ONLY gravitational quasi-singularities (with possibly very large but finite densities).

\[x_e = [q_e / m_e] \approx 1.76 \times 10^{11} \text{ C} / \text{kg}\]

and dimensionless ratio \(x_e = [q_e / (m_e \sqrt{G})] \approx 2.04 \times 10^{21}\) (with \([q_e] \approx 1.6 \times 10^{-19} \text{ C}\) being the absolute value of the elementary EMC assigned to both the electron and the positron).

Conjecture no. 1b (Conj1b). Based on Obs1b, we conjecture that \(x_e\) is the largest \(x_{EP}\) allowed in OU so that Conj1b essentially states that \(x_{EP(\text{max})} = x_e\).

\[m_e / [q_e] \approx 5.686 \times 10^{-12} \text{ kg} / \text{C}\]

so that the correspondent

Observation no. 1c (Obs1c). Note that the electron and the positron also possess the smallest known specific EMC from OU
$x_e^{-1} = m_e \sqrt{G / (|q_e| \sqrt{k_e})} \approx 10^{-21}$ is also minimum known from OU, because there isn’t any known EM-charged EP lighter than the electron and the positron.

**Conjecture no. 1c (Conj1c).** Based on Obs1c, we conjecture that there isn’t any EM-charged EP in OU lighter than the electron (or the positron) so that there is a finite dimensionless “ambitus” in nature associated with the electron

$$N_e = x_e / x_e^{-1} = x_e^{-1}^2 = k_e q_e^2 / (G_m e^2) \approx 4.166 \times 10^{42}.$$ 

Important note. $N_e$ can be considered a fundamental scaling factor of OU and spacetime (ST) itself, not only a finite ambitus of the electron and positron: furthermore, $N_e$ can be used as a measure-unit of all the other dimensionless ratios of OU, helping understanding even more profoundly those ratios (as explained next).

**Explanation no. 1c (Expl1c).** If we define the ambitus between the strength of the gravitational field (GF) (the weakest known force/field of OU with a gravitational coupling constant $\alpha_G = G m_e^2 / (\hbar c) \approx 1.75 \times 10^{-45}$) and the strength of the strong nuclear field (SNF) (the strongest known force/field of OU with a SNF coupling constant $\alpha_S \approx 1$), then

$$\alpha_S / \alpha_G \approx 1 / a - \alpha_N \approx a N_e,$$

with $a = \alpha^{-1} = \left( k_e q_e^2 / (\hbar c) \right)^{-1} \approx 137$

being the inverse of the fine structure constant ($\alpha$), which $\alpha$ is the EM field (EMF) coupling constant (at rest).

**Observation no. 1d (Obs1d).** Interestingly, the maximum known mass ambitus between the top quark ($tq$) (the heaviest known EP with non-zero rest mass $m_{\text{tq}} \approx 173 \text{GeV} / c^2$) and the electron neutrino ($en$) (the lightest known EP with non-zero rest mass estimated as $m_{en} \approx 1 \text{eV} / c^2$) is

$$n_{\text{max}} = m_{\text{tq}} / m_{en} \approx 1.7 \times 10^{11} \approx (2a N_e)^{1/4}.$$

**Conjecture no. 1d (Conj1d).** Based on Obs1d, we conjecture that $n_{\text{max}} (m_{\text{tq}} / m_{en})$ is truly the maximum EP mass ambitus of OU and that OU can be assigned an exact equality

$$n_{\text{max}} = m_{\text{tq}} / m_{en} = (2a N_e)^{1/4}.$$ 

**Prediction.** Based on the previous equality (stated by Conj1d), we predict $m_{en}$ to be exactly

$$m_{en} = \left( m_{\text{tq}}^4 / (2a N_e) \right)^{1/4} \approx 0.947 \text{eV} / c^2.$$ 

Important co-statement of Conj1d. The ratio between the (non-zero) rest mass of the heaviest known EM-charged EP (the top quark and its antiparticle: the top antiquark) and the (non-zero) rest mass of lightest known EM-charged EP (the electron and the positron) $m_{\text{tq}} / m_e \approx 3.4 \times 10^5$ has also a special significance in physics, as it represents the finite mass ambitus of any EMC: Conj2 also emphasizes that

$$m_{\text{tq}} / m_e \approx \sqrt{n_{\text{max}} \approx (2a N_e)^{1/8} \approx x_e^{1/4}}$$

and even more

$$m_{\text{tq}} / m_e \approx \sqrt{(d_{\text{tq}} / q_e) n_{\text{max}} \approx (\sqrt{2/3}) n_{\text{max}}}.$$ 

**Conjecture no. 2a (Conj2a).** Also based on Obs0 (like Conj0 is) and assuming Einstein’s General Relativity (EGR), we conjecture that gluons and the quarks (from inside any nucleon) actually “stress” and deform with their movement (thus kinetic energy) the local spacetime (ST) of each nucleon in part from any mass (in OU) so that they effectively produce ST-microdeformation (micro-ST-curvature [micSTC] definable by a set of micro-geodesics) AND it is that STC which generates (micro-)gravity which SHOULD NOT be treated as a real force, but only the consequence of STC, as it is treated by the successful EGR: in other words, EGR and quantum chromodynamics (QCD) (the quark–gluon model of hadrons) are compatible and EGR somehow anticipated CQD by also predicting STCs not only at large macroscopic scales (macro-STCs [macSTC]), but also micSTCs (at microscopic scales). In the case of Newtonian gravitational force $F_g = \frac{G m_1 m_2}{r^2}$ for example, although both $m_1$ and $m_2$ are considered point-like (in respect to the distance $r$ between those two masses), each mass $(m_1, m_2)$ is approximately the sum $(\sum m_{p/n})$ of all its subcomponent nucleons (because the electrons, with rest mass $m_e \approx m_{p/n} / 1837$, have a very small contribution <1/1000 of the total rest energy-mass of atoms with nucleons at rest): Conj2 also states that any macSTC generated by a macroscopic mass may be modeled as the resultant of all micSTCs generated by all moving gluons and quarks of each nucleon (subcomponent of that mass) in part: in a flat Euclidean ST (as our ST was demonstrated to be) the macSTC geodesics created by $m_1 = \sum m_{p/n(1)}$ spread in all the 3 directions of our 3D space so that they dissipate on a 3D spherical surface with progressively growing area of emission (em)

$$A_{\text{em(1)}} = 4\pi r^2$$

until reaching a target mass $m_2$ (located at distance $r$ of $m_1$, which $m_2$ also “emits” geodesics towards $m_1$ with the same area of emission

$$A_{\text{em(2)}} = A_{\text{em(1)}} = 4\pi r^2 = A_{\text{em(1)}}$$

explaining the inverse square law (ISL) of gravity in a flat 3D Euclidean space, such as

$$F_g = 8\pi G \frac{m_1 m_2}{A_{\text{em(1)}} + A_{\text{em(2)}}} = 8\pi G \frac{m_1 m_2}{2A_{\text{em}}} = 8\pi G \frac{m_1 m_2}{8\pi r^2} = G \frac{m_1 m_2}{r^2}.$$ 

The $8\pi G$ factor/constant also appears in Einstein’s field equations (EFE) of EGR

$$R_{\mu\nu} - \frac{1}{2} R g_{\mu\nu} + \lambda g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu},$$

as part of Einstein’s constant

$$\kappa = \frac{8\pi G}{c^4}$$

(with $c \approx 2.99 \times 10^8 m/s$.
being the speed of light in vacuum). Conj2a also proposes this redefined \( r \) big \( G_r = 8\pi G \) as an alternative to the “standard” big \( G \): based on this \( G_r \), Conj2a also proposes an alternative redefinitions of \( x_e \) and \( N_e \) such as

\[
x_{e(r)} = \frac{|q_e| \sqrt{k_e}}{m_e \sqrt{G_r}} \approx 4.07 \times 10^{20}
\]

and

\[
N_e(r) = x_{e(r)}^2 = k_e q_e^2 \left( \frac{G_r m_e^2}{e} \right) \approx 1.657 \times 10^{41}.
\]

**Important note.** Interestingly, the \( m_W / m_e \approx 1.6 \times 10^5 \) ratio (the ratio between the mass of \( W \) boson [the heaviest known EP possessing an elementary charge \( q_e \)] AND the rest mass of the electron [the lightest known EP possessing an EC]: the maximum massic “ambitus” of the EC) has a value very close to \( x_{e(r)}^{1/4} \approx 1.4 \times 10^5 \) which may have a profound significance related to the number of 4 dimensions of spacetime.

**Observation no. 2b (Obs2b).** The electron’s cloud (EC) of virtual particles (VPs) (virtual electron-positron pairs dragged by the point-like electron in its spin movement and/or other types of movements) was recently demonstrated to be perfectly spherical (with no experimentally detected electric quadrupole moment [URL] and no detected gravitational quadrupole moment [and thus not emitting any gravitational waves]) and NOT slightly bulgy (along the electron’s axis of spin) as predicted by some extensions to the Standard model (SM) of particle physics.

**Conjecture no. 2b (Conj2b).** Based on Obs2b and related to Conj2a, we also conjecture the electron to be actually a closed and perfectly spherical deformation of a very small patch of local 3D space (3DS) around a 4th dimensional (4D) relatively empty “core” with compact topology: the 4th-D-core of the electron (or positron) is practically trapped inside that spherical closed 3D hypersurface (represented by that small patch of local 3DS closed/twisted/”curled” around that 4th-D-core). Conj2b essentially redefines the electron (and positron) as a (closed) 4D hyperspherical “bubble” (synonymous to a closed timelike curve) composed by a 4th-D-core (with a finite non-zero 4D hypervolume) trapped inside a 3D hypersurface (the local 3DS of that electron/positron with finite non-zero 3D circular volume): the diameter of this 4th-D-core \( d_e \) is stated to be smaller than the upper limit of the electron size (as determined by observing the electron in a Penning trap)

\[
d_{e(ul)} \approx 10^{-22} \text{m} \] [URL]: Conj2b thus explains the perfect sphericity of the electron cloud (EC) by the perfect sphericity of the 3D hypersurface of this hyperspherical electron, so that the VPs (from the EC) pop out in this perfectly spherical 3D hypersurface of the electron/positron (which 3D hypersurface is hugely “rigid” and practically non-deformable even at high relativistic speeds).

**Observation no. 2c (Obs2c).** The sphere is known to have a maximum volume for a given area (enclosing that volume) so that the generic \( r \)-radius sphere has a maximum ratio

\[
\frac{V_{sph}(r)}{A_{sph}(r)} = \frac{4\pi r^3}{4\pi r^2} = r/3
\]

(depending on radius \( r \)) when compared to any other 3D non-spherical volume with average radius \( r \) (including any other regular polyhedron with the same radius of inn-sphere \( r \) [URL]). The \( V_{sph}(r)/A_{sph}(r) \) remains a maximum for any n-sphere (ns) [URL] (with an integer number \( n \) of Euclidean dimensions [EDs]) (when compared to any other n-polyhedron with the same number \( n \) of EDs and the same radius \( r \) of its inn-sphere) and has a general form

\[
\frac{V_{ns}(r)}{A_{ns}(r)} = \frac{r}{n}
\]

**Conjecture no. 2c (Conj2c).** Conj2c proposes a double equivalence principle (EqP): (1) the EMC-hypervolume EqP and (2) the mass-hypersurface EqP. More specifically Conj2c “translates” the NoEMCWithoutRM principle (Conj1a) into a NoFiniteEmpty4DHypervolumeWithoutAnEnclosing3DHypersurface principle. Based on Obs2c but also on the redefined

\[
x_{e(r)} = \frac{|q_e| \sqrt{k_e}}{m_e \sqrt{G_r}} \approx 4.07 \times 10^{20}
\]

Conj2c actually proposes (conjectures) the following bijective equivalences (equiv.): (1) the equiv. between the numerator \( |q_e| \sqrt{k_e} \) (of \( x_{e(r)} \)) and the 4D (hyperspherical) hypervolume of the electron/positron

\[
V_{e(4D)} = \frac{\pi^2}{2} r_e^4
\]

AND (2) the equiv. between the denominator \( m_e \sqrt{G_r} \) (of the same \( x_{e(r)} \)) and the 3D (spherical) hyper-area of the electron/positron

\[
A_{e(3D)} = 2\pi^2 r_e^3
\]

(with \( r_e = d_e / 2 \) being the radius of electron/positron, \( l_{pl} \) being the non-zero thickness of \( A_{e(3D)} \) in the 4thD and \( k \) being an arbitrary common constant of direct-proportionality) SO THAT \( x_{e(r)} = V_{e(4D)} / \left( l_{pl} A_{e(3D)} \right) \): in this way, Conj2c redefines: (1) the elementary electromagnetic charge (EMC) \( (|q_e|) \) as a (minimal finite and non-zero) fixed unit/quota of 4D (hyperspherical) volume ENCLOSED by (2) a non-zero rest mass redefined as (identified with) a (minimal finite and non-zero) unit/quota of 3D hypersurface (with minimal finite and non-zero 3D hyperspherical hyper-area allowed by an EM-charged EP); in other words, Conj2c redefines non-zero EMC as being “storable” in (and equivalent to!) a 4D hypervolume (enclosed by a 3D boundary) and redefines non-zero mass as being “storable” on and equivalent to a 3D hypersurface (enclosing that 4D hypervolume identified with EMC): (explanation) that how Conj2c actually explains why EMC doesn’t appear in nature other than associated with non-zero rest mass EPs, because you cannot have a defined non-zero EMC without a (3D) massic boundary (enclosing that EMC equivalent to that enclosed 4D hypervolume).

Conj2c states the electron/positron to be actually a 4D quantum micro black hole (mbh) (with all its mass actually stored on a possible “ultra-thin” 3D hypersurface boundary), with \( x_{e(r)} \approx 4.07 \times 10^{20} \) being redefined as the maximum number of the inner possible subquantum states of one electron/positron at
rest: in other words, Conj2 invokes and assumes the black hole electron hypothesis (BHEH) in another form.

Let us now define an electron-associated FSC based on the quantum angular momentum \( h_e = \hbar / 2 \) of an electron/positron such as \[ \alpha_e = k_e q_e^2 / (h_e) \] and its inverse \[ a_e = h_e / (k_e q_e^2) = \frac{a}{2} \].

When expressing \( x_{e(r)} \approx (4.07\times10^{20}) \) in binary logarithmic units, we get \[ \log_2 (x_{e(r)}) \approx 99.92 \% \] so that, \[ \alpha_e \geq 1 / \log_2 (x_{e(r)}) \]. Conj2c considers this numerical closeness to be too elegant and logical for just a coincidence and offers a more profound gravitational interpretation of FSC (also using this alternative interpretation as an additional new argument for BHEH): that is why Conj2c redefines both \( x_{e(r)} \) and \[ a_e = \log_2 (x_{e(r)}) \] as actually being the direct measure (and binary logarithmic measure respectively) of the maximum curvature achievable by any EM-charged 3D hypersurface (identiﬁed with our 3D space) around an EM-charged 4-th-D-core (with compact topology and possessing an EMC equal to \( q_e \)): this finite maximum achievable curvature conjectured by Conj2c actually completes the Finite Elasticity of Spacetime Hypothesis (FESTH) (launched in the 1st part of this paper): in this new interpretation, the diameter of the electron \( d_e \approx 10^{-28} m \) measures the smallest size achievable by any EM-charged hyperspherical 4-th-D-core) with compact topology. Given the previous arguments, Conj2c offers an alternative deﬁnition of \( \alpha_e \) such as:

\[
\alpha_e = 1 / \log_2 (x_{e(r)}) = 1 / \log_2 \left[ q_e \sqrt{k_e / (m_e \sqrt{G_r})} \right] = 1 / \log_2 \left[ V_e(4D) / (l_p A_e(3D)) \right] = -1 / \log_2 \left[ l_p A_e(3D) / V_e(4D) \right]
\]

In other words, Conj2c (essentially) redefines \( \alpha_e \) as being probability for an electron to emit a photon which probability is deﬁned as being directly-proportional to the \( A_e(3D) / V_e(4D) \) ratio (as shown by the last variant of equation 1a): this is a natural/intuitive concept, because the probability for a real electron to emit a real photon may plausibly be directly-proportional to the area of emission \( A_e(3D) \) (which measures the interface between that electron and our 3D space: the larger the interface, the higher the probability of photonic emission/reception and thus the interaction between that electron and our 3D space and its content).

Equation #1a also implies the following conjectured equations #1b, #1c and #1d:

\[
k_e q_e^2 / (h_e) = 1 / \log_2 \left[ q_e \sqrt{k_e / (m_e \sqrt{G_r})} \right]
\]

\[
h_e / (k_e q_e^2) = \log_2 \left[ q_e \sqrt{k_e / (m_e \sqrt{G_r})} \right]
\]

\[
[q_e \sqrt{k_e / (m_e \sqrt{G_r})}] = h_e / (k_e q_e^2)
\]

More ambitiously (and continuing the previous statement of Conj2c), Conj2c also states that EACH EM-charged EP has its own electromagnetic coupling constant at rest \[ \alpha_{EP} = 1 / \log_2 (x_{EP(r)}) = 1 / \log_2 \left[ k_e q_e^2 / (G_{q(r)} m_{EP}^2) \right] \]: all the other non-electron/non-positron EM-charged have \( x_{EP(r)} < x_{e(r)} \) and thus have \( \alpha_{EP} \) slightly larger that FSC \( \alpha \approx 1 / 137.036 \) (and closer to \( \alpha \approx 1 \) implicitly) the larger the \( A_e(3D) / V_e(4D) \) ratio (of that EM-charged EP), the smaller its assigned \( x_{EP(r)} \) resulting a larger probability of those EPs to emit virtual or real photons (and thus to more strongly couple electromagnetically). The \( \alpha_{EP(r)} \approx 1 / \alpha_{EP(r)} \) values for all known EM-charged EPs are graphed next and clearly show a linear pattern trend in this binary logarithmic scale when sorted in ascending order: furthermore, this linear growing pattern is inverse to the linear decreasing pattern of the ratio \( y_{EP} = \log_2 (m_{EP} / m_e) \).

Figure 1. The \( a_{EP(r)} \) and \( y_{EP} \) values for all known EM-charged EPs. Abbreviations: \( \text{tq (top quark)} \), \( \text{Wb (W boson)} \), \( \text{bq (bottom quark)} \), \( \text{cq (charm quark)} \), \( \text{sq (strange quark)} \), \( \text{dq (down quark)} \), \( \text{uq (up quark)} \) and \( \text{e (electron)} \).

Prediction (and explanation). For example, the \text{muon} (\( \mu^- \)) and the \text{tauon} (\( \tau^- \)) (which may be considered two distinct excited...
states of the electron are predicted to have electromagnetic coupling constants at rest

\[ \alpha_{\mu(r)} = 1/\log_2 \left( x_{\mu(r)} \right) \approx 1/122 \]

and

\[ \alpha_{\tau(r)} = 1/\log_2 \left( x_{\tau(r)} \right) \approx 1/114 \]

which are with approx. 13% and 21% larger than FSC at rest (\( \alpha \approx 1/137 \)) (associated with the electron at rest): these larger-than-FSC predicted \( \alpha_{\mu(r)} \) and \( \alpha_{\tau(r)} \) may distort the results of some proton scattering experiments using muons (also used for determining proton’s charge radius) and that is how Conj2c tries to explain the proton radius “puzzle”. Prediction. Furthermore, Conj2c predicts that, if ever accomplished in the future, proton scattering experiments using tausons will generate even larger deviations from the pre-2010 standard measurements of the proton radius (by using electron for proton scatterings).

*Observation no. 2d (Obs2d). The muon (\( \mu^- \)) and the tauon (\( \tau^- \)) (which may be considered two distinct excited states of the electron) have associated dimensionless ratios

\[ x_{\mu(r)} = \left[ |q_e| \sqrt{k_e / \left( m_{\mu} \sqrt{G_{\mu(r)}} \right)} \right] \left( \approx 2 \times 10^{18} \right) \]

and

\[ x_{\tau(r)} = \left[ |q_e| \sqrt{k_e / \left( m_{\tau} \sqrt{G_{\tau(r)}} \right)} \right] \left( \approx 1.2 \times 10^{17} \right) \]

which are both lower than

\[ x_{e(r)} = \left[ |q_e| \sqrt{k_e / \left( m_e \sqrt{G_{e(r)}} \right)} \right] \left( \approx 4.23 \times 10^{20} \right) \]

(which \( x_{e(r)} \) corresponds to a perfect ST 3D sphere or a 4D hypersphere or a perfect n-sphere).

Conjecture no. 2d (Conj2d). Based on Obs2d, we conjecture that \( x_{\mu} < x_{e(r)} \) and \( x_{\tau} < x_{\mu} < x_{e(r)} \) actually indicate that both \( V_{\mu} / A_{\mu} \) and \( V_{\tau} / A_{\tau} \) are smaller than the nature’s maximum \( V_{ns} / A_{ns} \) (which corresponds to the perfectly spherical electron, the electron cloud [EC] of virtual particles [VPs] and its associated \( V_e / A_e \) SO THAT the muon and tauon (and their clouds of VPs) are conjectured and predicted to have imperfect spherical-like/spheroidal shapes (deviated from the perfect sphericity of EC) and thus retrodicted to be much more unstable than the electron (an explanation proposed by Conj2d): furthermore, the tauon’s cloud (of VPs) is predicted to have a shape even more deviated from the perfect sphere than muon has AND THUS the tauon is retrodicted to be more unstable than the muon (an explanation proposed by Conj2d). Generally (as shown in the graph attached to Conj2c), Conj2d states that the larger the mass deviation of any EM-charged EP (relatively to the rest mass of the electron (\( m_e \))), the lower the sphericity of the local surrounding ST of that EP, the larger the \( A_e \) associated with that EP AND the larger the EM coupling constant (at rest) associated with that EP (explained by a larger probability of that EP to emit a virtual or a real photon).

2. References (partially integrated as Wikipedia URLs in the text of this paper)

[1] Andrei-Lucian Drăgoi (January 2020). (QGR - v.1.0 - 30.01.2020 - 11 A4 pages [without References]) toy-model Sketching a new Quantum General Relativity (QGR) variant mainly based on the redefinition of leptons (as quantum micro black holes composed from highly compressed single triquarks under a very strong quantum gravitational field (QGF)), a dual electro-gravitational interpretation of the fine structure constant (FSC), Planck wormholes (“Planck tubes”) and a reinterpretation of Planck units in the “spirit” of Einstein’s GR. Research Gate preprint with DOI: 10.13140/RG.2.1.15522.58567. URL1a (Research Gate main source), URL1b (Academia secondary source), URL1c (Vixra secondary source), URL1d (dragoii.com latest variant source).


[7] Andrei-Lucian Drăgoi (August 2019). (ACUM - version 1.0 - 25.08.2019 - 7 pages) An elegant Adimensional Cyclic Universe (toy-) Model (ACUM) mainly based on the electrogravitation hypothesis (EGH), the quantized gravitational waves hypothesis (QGW-Hyp) and the dimensional relativity hypothesis (DRH). Research Gate preprint with DOI: 10.13140/RG.2.2.13834.28821. URL1a (Research Gate main source), URL1b (Academia secondary source), URL1c (Vixra secondary source), URL1d (dragoii.com latest variant source), URL1e (GSJournal source).

[8] Andrei-Lucian Drăgoi (June 2019). (LifeAsEmergent - version 1.0 - 6 pages - 20.06.2019) On the very low probability of complex life forms to be just emergent phenomena and about the "continuous" versus "intermittent" free. Wiki-like Research Gate preprint. DOI: 10.13140/RG.2.2.22592.58887. URL1a (Research Gate source), URL1b (Academia source), URL1c (Vixra source), URL1d (GSJournal source).


predicting a quantized spacetime. Research Gate preprint. DOI: 10.13140/RG.2.2.29665.35866. URL (Research Gate source).


