

**Integrating the speed of gravity in Newton's gravitational law, we're it probably... belongs: the universal gravitational constant (big G) is very plausibly not a true constant, but only a composite quasi-constant depending on a slightly variable speed of gravity and an electro-gravitational resistivity of (quantum) vacuum (EGRV)**

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Andrei-Lucian Drăgoi<sup>1,2</sup>  
(independent researcher)

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**Abstract**  
**(with some of the main abbreviations used in this paper)**

This paper proposes a new definition of the [Newtonian/universal gravitational constant](#) (aka “big G”) which is stated to be very plausibly not a true constant, but only a composite quasi-constant depending on a slightly variable [speed of gravity](#) (which is stated to be very close to the [speed of light in vacuum](#) [c] defined as the maximum speed limit of any elementary particle allowed in our universe), to which big G is directly proportional) and a very high [energetic/massic linear density of vacuum](#) produced by evanescent/off shell virtual particle-antiparticle pairs (to which G is inversely-proportional): this redefinition brings a natural solution of integrating speed of gravity in the big G scalar. This paper also proposes a variable (energy/length scale-dependent) electro-gravitational resistivity of vacuum (EGRV) determining both a variable (energy/length scale-dependent) quantum big G and the known running coupling constant of the electromagnetic field. In conclusion, this article offers a “patch” for [Einstein's General relativity](#) (EGR), [Newtonian gravitational theory](#) (NGT) and [quantum gravity theory](#) (QGT) which all use the classical empirical big G as a kind of [gravitational coupling constant](#) in their equations.

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, 24, 25, 26]

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**I. The main statements/assumption of this paper regarding the redefinition of big G**

**Integrating the speed of gravity in Newton's gravitational law.** In more and more recent experiments for determining the exact numerical value of big G ( $G \cong 6.674 \times 10^{-11} m^3 kg^{-1} s^{-2}$ ), the distance  $r$  between any two experimental masses  $m_1$  and  $m_2$  is usually measured by using lasers together with very precise atomic clocks, thus speed of light in vacuum  $c$  ( $\cong 2.99 \times 10^8 m/s$ ) is the main “tool” of these experiments, so that measured distances  $r$  depend on the experimentally-determined time intervals  $\Delta t$ , such as  $r = c\Delta t$ . If  $m_1$  and  $m_2$  “gravitationally communicate” with a (quasi-constant/slightly variable) [speed of gravity](#)  $v_g$  (as stated by EGR, with  $v_g \leq v_{\max} (= c)$ ) then, the [Newtonian gravitational attraction force](#) scalar  $F_g = Gm_1m_2 / r^2 [= Gm_1m_2 / (c\Delta t)^2]$  obviously depends direct-proportionally on  $v_g$  ( $\leq c$ ) based on these 3 arguments: (1)  $v_g$  doesn't explicitly appear in the  $F_g$  scalar, (2) obviously  $F_g$  cannot be inversely-proportional to  $c^2$  (because inversely-proportional to  $r^2 = c^2\Delta t^2$ ) and (3) the composite unit of measure  $m^3 kg^{-1} s^{-2}$  of big G contains a unit of measure for squared speed such as  $m^3 kg^{-1} s^{-2} = (m/s)^2 / (kg/m)$ . *The only solution to integrate  $v_g$  in the  $F_g$  scalar (were it very plausibly belongs!) is to redefine big G as a function of  $v_g^2$  and the Planck linear density  $\rho_{Pl} = c^2 / G \cong 10^{27} (kg/m)$ , such as:*

$$\boxed{G = v_g^2 / \rho_{Pl}} \quad (1a)$$

No matter its exact nature, the gravitational signal (GS) (including [gravitational waves](#) and possibly hypothetical [gravitons](#)) emitted by  $m_1$  simultaneously spreads in all directions of its local 3D space and disperses radially and uniformly on a spherical surface centered in  $m_1$  with area  $A_r = 4\pi r^2 = 4\pi c^2 \Delta t^2$  including the direction oriented towards  $m_2$  (the same with GS emitted by  $m_2$  which is also dispersed on another spherical surface centered in  $m_2$  with the same area  $A_r$ ) so that both redefined big  $G (= v_g^2 / \rho_{Pl})$  and  $F_g (= Gm_1m_2 / r^2) [= 8\pi Gm_1m_2 / (2A_r)]$  scalars can be rewritten as inversely-proportional to the sum of both

[1] Email: [dr.dragoi@yahoo.com](mailto:dr.dragoi@yahoo.com)

[2] Main pages: [dragooi.com](http://dragooi.com) (CV: [cvrg.dragooi.com](http://cvrg.dragooi.com)); [rg.dragooi.com](http://rg.dragooi.com); [academia.dragooi.com](http://academia.dragooi.com); [vixra.dragooi.com](http://vixra.dragooi.com); [gsj.dragooi.com](http://gsj.dragooi.com); [smp.dragooi.com](http://smp.dragooi.com); [se.dragooi.com](http://se.dragooi.com)

spherical areas of GS dissipation  $2A_r (=8\pi r^2 = 8\pi c^2 \Delta t^2)$  such as:

$$G_r = \frac{8\pi v_g^2}{\rho_{Pl}} (=8\pi G) \quad (2a)$$

$$F_g = G_r \frac{m_1 m_2}{2A_r} = \frac{G_r}{c^2} \frac{m_1 m_2}{8\pi \Delta t^2} \quad (2b)$$

Given the maximum speed  $v_{\max} (=c)$  allowed in our universe (assumed by both EGR and QGT) and because  $v_g / v_{\max} \cong 1$ , the previous  $F_g$  scalar is generalized as a function of  $v_{\max}$ , such as:

$$F_g = \frac{(v_g / v_{\max})^2}{\rho_{Pl} / (8\pi)} \frac{m_1 m_2}{8\pi \Delta t^2} \left( \cong \frac{1}{\rho_{Pl} / (8\pi)} \frac{m_1 m_2}{\Delta t^2} \right) \quad (2c)$$

**The electro-gravitational resistivity of vacuum (EGRV).**

The parameter  $R_{vac} \stackrel{def.}{=} \rho_{Pl} / (8\pi) (\cong 10^{26} \text{ kg/m})$  (which is subcomponent of  $G_r = v_g^2 / R_{vac}$ ) may also be interpreted as a *gravitational resistivity of vacuum (vac) (GRV)* opposing to any emitted GS to reach any other target distinct from the source of that GS.  $R_{vac} [= \rho_{Pl} / (8\pi)]$  is conjectured to be an independent parameter of vacuum so that both  $G_r$  and  $v_{\max} (=c)$  are actually considered indirect measures of  $R_{vac}$  (and not vice-versa!) so that:

$$v_{\max}^2 / G_r = R_{vac} \quad (3)$$

Because  $R_{vac}$  is conjectured to determine both  $v_{\max}$  (plus both photon speed  $c = v_{\max}$  and GS speed  $v_g \stackrel{\leq}{\cong} v_{\max}$  implicitly) and  $G_r$ ,  $R_{vac}$  can be regarded as a “hybrid”/dual “*electro-gravitational unifying parameter of nature*” which determines both the strength of the gravitational field (**GF**)/gravitational force (possibly a pseudo-force/field as stated by EGR) (with GF strength measured by  $G_r = f(R_{vac})$ ) and the strength of the electromagnetic field (**EMF**) measured by the [fine-structure constant](#) at rest (which is a function of  $c = v_{\max} = f(R_{vac})$ )

$\alpha_0 = k_e q_e^2 / (\hbar c) (\cong 137^{-1})$  which is the value at rest of the EM

[running coupling constant](#)  $\alpha(E) = \frac{\alpha_0}{1 - \alpha_0 f(E)}$  which is known

to vary with the energy scale  $E \geq E_0$  (with

$$f(E) = \ln \left[ \left( E / E_0 \right)^{2/(3\pi)} \right], \quad E_0 = u_\alpha \cdot eV \quad \text{and}$$

$u_\alpha = 0.15 \times 10^{-9}$  being the relative standard [uncertainty](#) of  $\alpha_0$  value at rest corresponding to the deviation of  $E_0$  expressed in eV from absolute zero energy which is not attainable however, given the [recently proved unattainability principle \[UP\]](#)<sup>3</sup>).  $R_{vac}$  is thus an *electro-gravitational resistivity of vacuum (EGRV)* because it determines all three speeds  $v_{\max}$ , ( $=v_{\max}$ ),  $v_g \left( \begin{smallmatrix} \leq \\ \cong c \end{smallmatrix} \right)$  (by

limiting the speed of both GS and the photon to a maximum allowed finite value  $v_{\max}$ ) and also determines  $G_r (=v_g^2 / R_{vac})$  implicitly. **Prediction.** Furthermore, we predict that  $\alpha(E)$  is actually generated by and inverse-

proportional to an energy scale-dependent EGRV  $R(E)$  so that a lower-valued  $R(E)$  will determine a larger-valued  $\alpha(E)$  and thus a stronger EMF (together with a stronger GF). **Explanation of EGRV.**  $R_{vac}$  is stated to be essentially determined by the density of [virtual particle-antiparticle pairs \(VPAPs\)](#) created per unit of vacuum length: both GS and photons are stated to interact with these VPAPs (including by GS/photon absorption-emission and scattering by VPAPs) and significantly influenced (and delayed in their movement) by VPAPs. The rate of GS/photon-VPAPs interaction may vary with the length scale (thus energy scale) explaining the variable energy scale-dependent EGRV  $R(E)$ .

**Estimation.**  $R_{vac} (\cong 10^{26} \text{ kg/m})$  implies

$N_{VEPPs} = R_{vac} / (2m_e) \cong 10^{55}$  [virtual/\(evanescent/off shell\)](#) electron-positron pairs (**VEPPs**) per each meter of vacuum (with  $m_e \cong 0.51 \text{ MeV} / c^2$  being the rest mass of an electron/positron)

resulting  $N_{VEPPs} \cdot l_{Pl} \cong 10^{22} \text{ VEPPs / Planck length } (l_{Pl})$ : if each VEPP has a mean lifetime of at least one Planck time unit  $t_{Pl} (\cong 10^{-43} \text{ s})$  (measured from its spontaneous “birth” until its disappearance back in the vacuum), then vacuum needs only a timer interval of  $N_{VEPPs} \cdot l_{Pl} t_{Pl} \cong 10^{-21} \text{ s}$  (~ a million times shorter time interval than the duration of one orbit/oscillation of the 1<sup>st</sup> electron in ground state around the nucleus of a hydrogen atom) to generate, one-by-one, all those  $10^{22} \text{ VEPPs}$  in each Planck volumic unit  $V_{Pl} = l_{Pl}^3$  and thus generating that massic density  $R_{vac} (\cong 10^{26} \text{ kg/m})$  of the vacuum at Planck scale.

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<sup>3</sup> **UP states that:** “It is impossible by any procedure, no matter how idealized, to reduce any assembly to absolute zero temperature in a finite number of operations.”; also rephrasable as “No refrigerator can cool a system to absolute zero temperature at finite time.” [\[URL\]](#)

**Explanation on the apparently paradoxal divergence of the experimental values of big G.** This newly redefined big  $G$  ( $\propto v_g^2$ ) may naturally explain the apparent paradox of the [divergent variation of experimental G values](#), „despite” constant improvements in the measurement systems: the redefined  $F_g$  varies direct-proportionally (and exponentially!) with the squared ratio  $(v_g / v_{\max})^2$  and  $v_g$  may slightly vary (thus altering both experimental  $G$  and  $F_g$  “expected” values) when any experiment (of determining big G) takes place on Earth, while Earth moves through various regions of space (by moving around its axis, around the Sun WHILE simultaneous movement of our solar system in our galaxy etc). Small variations of  $R_{vac}$  may also occur in some regions of space “swept” by Earth in its various movements (concomitant to the big G determination experiments taking place on Earth). **Prediction.** The largest big G experimental values are predicted to correspond to those experiments in which  $v_g$  reaches its closest values to  $v_{\max}$ . **Important generalization and note.** One may choose any quasi-arbitrary way to integrate  $v_g$  in the  $G_r$  definition such as  $G_{i(n)} = v_g^i / R_{vac(i)}$  (with integer index  $i \geq 1$  and  $G_r = G_{i(2)} = v_g^2 / R_{vac}$ ). Note that, the larger the integer index  $i (\geq 1)$ , the more sensitive may be the experimentally-determined  $G = G_{i(n)} / (8\pi)$  to any slight variation of  $v_g$  and  $v_g / c$  ratio. **Important example and remark.** For the special case  $i = 4$ ,  $R_{vac(4)} (\cong 10^{42} N)$  is equal to the [Planck force](#) ( $F_{Pl} = c^4 / G \cong 10^{42} N$ ) which can be interpreted as a (huge) tension in the spacetime fabric which may influence both GS transmission and photon speed (as these electromagnetic and gravitational signals slightly curve spacetime when propagating through it *and because the speed of their propagation plausibly depends on their capacity to deform spacetime*). Both  $R_{vac} (= R_{vac(2)})$  and  $R_{vac(4)}$  are in direct relation with [Einstein’s gravitational coupling constants](#)  $\kappa_1 = 8\pi G / c^2 (= 1 / R_{vac})$  and  $\kappa_2 = 8\pi G / c^4 (= 1 / R_{vac(4)})$  respectively.

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Additionally to the conjectured fact that  $R_{vac}$  determines all three speeds  $v_g (\cong c = v_{\max})$  and  $G_r (= v_g^2 / R_{vac})$ , there is also a striking binary logarithmic coincidence inter-relating  $\alpha_0 (\cong 137^{-1})$ ,  $R_{vac}$ , the reduced Planck constant  $\hbar = h / (2\pi)$ , the maximum allowed speed in our universe  $v_{\max} (= c)$  and the minimum elementary rest mass that may “store” elementary electromagnetic charge (which is equal to the

rest mass of the electron and positron  $m_e \cong 0.51 MeV / c^2$ )  $m_q (= m_e)$ , such as:

$$\alpha_0 \cong \frac{1}{\log_2 \left( \frac{\alpha_0 \hbar R_{vac}}{m_q^2 v_{\max}} \right)} (\cong 136.93^{-1}) \quad (4a)$$

The previous numerical closeness is *too elegant and logical for just a pure coincidence* with the following arguments: **(1)** in equation 4a (**Eq.4a**),  $\alpha_0$  is inversely-proportional with  $R_{vac}$  (which is in concordance with the initial definition of  $R_{vac}$  and with the  $R_{vac}$ -based prediction from the previous section) a fact that is quite logical and intuitive: the larger the electro-gravitational resistivity of vacuum  $R_{vac}$ , the lower will be *the probability of a real electron/positron to emit or absorb a real photon* (the probabilistic definition of  $\alpha_0$ ); **(2)** if the very large dimensionless *physical constants (DPCs)* (aka “big numbers” of physics) (which are GF-related in general, like  $\frac{\alpha_0 \hbar R_{vac}}{m_q^2 v_{\max}} \cong 10^{41}$  for example) are

deeply related with the small DPCs (usually close to 1 and related to quantum mechanics, like  $\alpha_0$  for example), by any (yet unknown) mathematical function, then *logarithmic function (LF)* would be the simplest (and thus the most natural) candidate solution of connecting these large and small DPCs. Furthermore, even if it is not the case of such a logarithmical connection, a potential/possible LF (connecting those DPCs) would still have to be ruled out first. **Additional note.** In the last century, a small minority of physicists also considered a hypothetical binary logarithmic connection between the large and the small DPCs, which also implies a base-2 power law (Fürth, 1929; Eddington, 1938; Teller, 1948; Salam, 1970; Bastin, 1971; Sirag, 1980, 1983; Sanchez, Kotov and Bizouard, 2009, 2011, 2012; Kritov, 2013). **Secondary argument.** Until present, various LFs were proved to successfully describe the variation of all running coupling constants (of all the non-gravitational fundamental physical fields) with the energy scale.

**Conjecture on EGVR.** Given the previous two arguments, we conjecture that *the running coupling constant of EMF  $\alpha(E)$  is actually an indirect measure of a variable EGRV  $R(E)$  (varying with energy scale  $E$ ) and  $\alpha_0$  corresponds to a predicted EGRV at*

$$\text{zero-energy scale } R_0 = m_q^2 c \alpha_0^{-1} 2^{1/\alpha_0} / \hbar \quad (\cong 5.8 \times 10^{25} \text{ kg m}^{-1})$$

so that  $\alpha_0$  is redefined as the unique positive solution  $w$  of the following exponential equation (derived from **Eq.4a**):

$$\frac{1}{w} 2^{1/w} = \frac{\hbar R_0}{m_q^2 v_{\max}} \quad (4b)$$

**Eq.4b** can be solved by using the [Lambert function](#) only after converting that equation to its natural-base (e) variant  $we^w = z$  such as:

$$\frac{\ln(2)}{w} e^{\ln(2)/w} = \frac{\hbar R_0 \ln(2)}{m_q^2 v_{\max}} \quad (4c),$$

with the unique positive solution (see below)

$$\alpha_0 = \frac{\ln(2)}{W\left(\frac{\hbar R_0 \ln(2)}{m_q^2 v_{\max}}\right)} (\cong 1/137.036) \quad (4d)$$

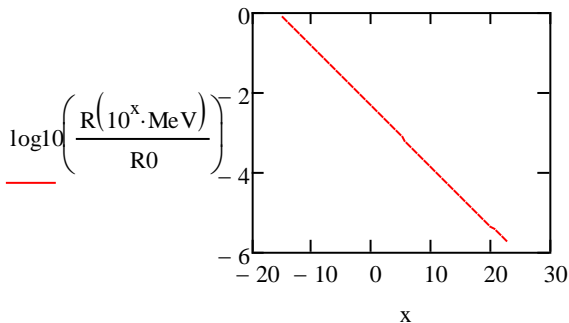
By considering fixed-valued  $\hbar$ ,  $m_q$  and  $c$  (not varying with the energy scale  $E$ ),  $\alpha(E)$  is also generalized and redefined as a function of a generalized EGRV  $R(E)$  (varying with the energy scale  $E$ ):

$$R(E) \stackrel{def.}{=} \frac{R_0 - R_0 f(E) / \log_2\left(\frac{\hbar R_0}{m_q^2 c}\right)}{2^{f(E)}} \quad (4e),$$

$$\text{with } \alpha(E) = \frac{\ln(2)}{W\left(\frac{\hbar R(E) \ln(2)}{m_q^2 v_{\max}}\right)} \left( = \frac{\alpha_0}{1 - \alpha_0 f(E)} \right) \quad (4f)$$

$$\text{and } f(E) = \ln\left[\left(E/E_0\right)^{2/(3\pi)}\right] \quad (\text{based on } E_0 \cong 10^{-10} \text{ eV}).$$

$R(E)$  drops with about 5 orders of magnitude (when energy scale  $E$  increases from  $E_0 (\cong 10^{-10} \text{ eV})$  to [Planck energy](#)  $E_{Pl} = \sqrt{\hbar c^5 / G} (\cong 10^{18} \text{ GeV})$ ), from its estimated maximum  $R_{\max} = R_0 = R(E_0) (\cong 5.8 \times 10^{25} \text{ kg m}^{-1})$  to an estimated minimum  $R_{\min} = R(E_{Pl}) (\cong 1.34 \times 10^{20} \text{ kg m}^{-1})$  (see the next graph, as built in base-10 logarithmic units)



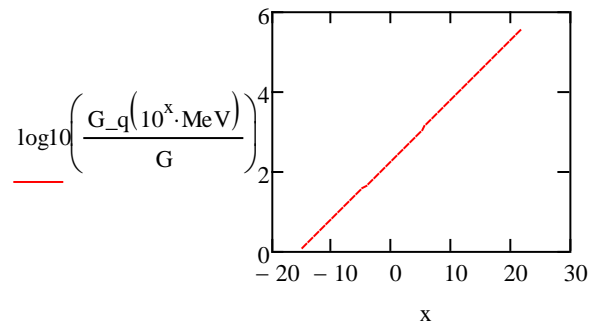
**Image 1.** The graph of  $\log_{10}\left(R(10^x \text{ MeV})/R_{\max}\right)$  for integer  $x \in [y, z]$ , with  $y = \text{int}\left[\log_{10}(E_0 / \text{MeV})\right] (\cong -15)$  and  $z = \text{int}\left[\log_{10}(E_{Pl} / \text{MeV})\right] (= 22)$

**Explanation on EGRV decreasing with energy scale increment (thus decreasing with length scale).** Larger vacuum length scales  $\lambda_{vac}$  (implying lower energy scales  $E = hc / \lambda_{vac}$ ) contain a larger number of [virtual particle-antiparticle pairs \(VPAPs\)](#) which may organize and interact more complexly (than they would interact at lower  $\lambda_{vac}$  scales) prolonging their average lifetimes and thus shielding both GS and photons more significantly: this phenomenon may explain the direct-proportionality  $R(E) \propto \lambda_{vac}$ . At lower  $\lambda_{vac}$  scales VPAPs are stated to be more evanescent (/unstable) and thus interact weaker with GS/photons: that is how VPAPs actually facilitate the spatial movement of GS/photons at lower  $\lambda_{vac}$  scales (by less opposing it, thus strengthening both GF and EMF) and significantly shields GS/photons at larger  $\lambda_{vac}$  scales (weakening both GF and EMF implicitly).

**Quantum big G prediction.** A predicted quantum big G  $G_q(E)$  (which also varies with energy scale  $E$ ) can be also derived from the same  $R(E)$  (from which  $\alpha(E)$  was already obtained by using Lambert function):

$$G_q(E) = \frac{1}{8\pi} v_{\max}^2 / R(E) \quad (5)$$

$G_q(E)$  is inversely-proportional to  $R(E)$  and it increases with about 5 orders of magnitude (when energy scale  $E$  increases from  $E_0 (\cong 10^{-10} \text{ eV})$  to [Planck energy](#)  $E_{Pl} = \sqrt{\hbar c^5 / G} (\cong 10^{18} \text{ GeV})$ ), from an estimated minimum  $G_q(E_0) \cong 6.19 \times 10^{-11} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2}$  to an estimated maximum  $G_q(E_{Pl}) \cong 2.68 \times 10^{-5} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2}$  (see the next graph, also built in base-10 logarithmic units)



**Image 2.** The graph of  $\log_{10}(G_q(10^x \text{ MeV})/G)$  for integer  $x \in [y, z]$ , with  $y = \text{int}[\log_{10}(E_0/\text{MeV})](\cong -15)$  and  $z = \text{int}[\log_{10}(E_{Pl}/\text{MeV})](= 22)$

In a **checkpoint conclusion**, progressively smaller vacuum length-scales  $\lambda_{vac}$  are associated with progressively lower EGRV  $R(E)$  (thus with progressively larger  $\alpha(E)$  and much larger  $G_q(E)$  measuring progressively larger strength of EMF and even larger strength of GF respectively): in contrast, progressively larger vacuum length-scales  $\lambda_{vac}$  are associated with progressively larger EGRV  $R(E)$  (thus with progressively lower  $\alpha(E)$  and much lower  $G_q(E)$  measuring progressively lower strength of EMF and even lower strength of GF respectively). **Important explanation.** This predicted length/energy scale-dependent behaviour of  $R(E)$  may “bring some light” regarding the characteristics of the pre-**Big Bang singularity** (pBBS) which is estimated to have had much lower  $R(E)$  (due to its very low accessible length scales  $\lambda_{vac}$ ) and thus stronger EMF and much stronger GF (with  $\sim 5$  orders of magnitude larger than measured in the present): these stronger EMF and GF are stated to be compensated/counterbalanced by the **asymptotic freedom** (AS) of **quantum chromodynamics** (QCD) (which states that gluons and quarks cannot be infinitely compressed, because the strong nuclear force [SNF] becomes strongly repulsive when quarks are brought very close together, closer than a critical distance). pBBS may be thus redefined as actually being a *gravitational quasi-singularity* with large but finite massic/energetical density in which EMF was only  $\alpha(E_{Pl})/\alpha(E) - 1 \cong 15\%$  stronger (than in the present epoch of our universe) but gravity was  $G_q(E_{Pl})/G_q(E_0) \cong 10^5$  times stronger (than in the present) and both were counterbalanced by AS-QCD. AS-QCD may have initiated a slow (not a fast explosion-like) expansion (a slow Big Bang), and the accelerated expansion of our universe (AEOU) may be explained by the progressive increase of  $R(E)$  (due to a progressively larger  $\lambda_{vac}$  scales) which produce a progressively weaker EMF and even weaker GF, allowing AEOU implicitly.

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**Final conclusion of this paper.** The energy scale-dependent electro-gravitational resistivity of vacuum (EGRV)  $R(E)$

(determining both a variable  $G_q(E)$  and  $\alpha(E)$ ), thus redefining big G as a quantum big G and FSC as having a profound gravitational significance) may have important impact in Einstein’s General relativity (EGR), Newton’s gravitational theory (NGT) and quantum gravity theory (QGT), which all use the classical empirical big G as a kind of **gravitational coupling constant** in their equations.

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

- [1] [Andrei-Lucian Drăgoi \(February 21<sup>st</sup>, 2020\)](#). (BGT - v.1.0 - 21.02.2020 - 3 A4 pages without references) A running coupling constant of a hypothetical quantum gravitational field (QGF) supporting a subtype of bimetric gravity theory (BGT) which implies two graviton modes: a super-massive one and a massless one. Research Gate preprint with DOI: [10.13140/RG.2.2.19607.11687](#). [URL1a](#) (Research Gate main source), [URL1b](#) (Academia secondary source), [URL1c](#) (Vixra secondary source), [URL1e](#) (dragoi.com latest variant source).
- [2] [Andrei-Lucian Drăgoi \(February 2020\)](#). (svEEC - v1.0 - 3.02.2020 - 2.5 A4 pages without references) A strong variant of the ER=EPR conjecture based on Planck wormholes and redefining both big G and Planck constant. Research Gate preprint with DOI: [10.13140/RG.2.2.25647.89762](#). [URL1a](#) (Research Gate main source), [URL1b](#) (Academia secondary source), [URL1c](#) (Vixra secondary source), [URL1d](#) (GSJ secondary source), [URL1e](#) (dragoi.com latest variant source).
- [3] [Andrei-Lucian Drăgoi \(February 2020\)](#). (FESTH - v1.0 - 2.02.2020 - 7.5 A4 pages without references) 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). Research Gate preprint with DOI: [10.13140/RG.2.2.36382.69441](#). [URL1a](#) (Research Gate main source), [URL1b](#) (Academia secondary source), [URL1c](#) (Vixra secondary source), [URL1d](#) (GSJ secondary source), [URL1e](#) (dragoi.com latest variant source).
- [4] [Andrei-Lucian Drăgoi \(January 2020\)](#). (QGR - v1.0 - 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.2.2.15522.58567](#). [URL1a](#) (Research Gate main source), [URL1b](#) (Academia secondary source), [URL1c](#) (Vixra secondary source), [URL1d](#) (GSJ secondary source), [URL1e](#) (dragoi.com latest variant source).
- [5] [Andrei-Lucian Drăgoi \(December 2019\)](#). (GTM - long variant 1.0 - 19.12.2019 - 8.5 A4 pages without references section) A simple Gravitational toy-model (GTM) mainly based on a new reinterpretation of the Newtonian/ universal gravitational constant (big G) which solves from “one-shot” the cosmological constant problem, the hierarchy problem, the dark energy problem and the singularity problem (GTMa, GTMb and GTMc). Research Gate preprint with DOI: [10.13140/RG.2.2.14361.77926](#). [URL1a](#) (Research Gate main source), [URL1b](#) (Academia secondary source), [URL1c](#) (dragoi.com latest variant source).
- a. (GTM - short variant 1.0 - 19.12.2019 - 7 A4 pages without references section). Research Gate preprint with DOI: [10.13140/RG.2.2.31138.99525](#). [URL1a](#) (Research Gate main source), [URL1b](#) (Academia secondary source), [URL1c](#) (dragoi.com latest variant source)
- b. (GTM - very short variant 1.0 - 19.12.2019 - 4.5 A4 pages without references section). Research Gate preprint with DOI: [10.13140/RG.2.2.25738.82885](#). [URL1a](#) (Research Gate main source), [URL1b](#) (Academia secondary source), [URL1c](#) (dragoi.com latest variant source).
- [6] [Andrei-Lucian Drăgoi \(July 2019\)](#). (SGUM - version 1.0 - 9.07.2019 - 10 pages) A “Simply...Gravitonic” Universe (toy-)Model (SGUM). Wiki-like Research Gate preprint. DOI: [10.13140/RG.2.2.28671.36003](#). [URL1a](#) (Research Gate source), [URL1b](#) (Academia source), [URL1c](#) (Vixra source), [URL1d](#) (GSJournal source).
- [7] [Andrei-Lucian Drăgoi \(October 2019\)](#). (MUM - short version 1.0 - 22.10.2019 - 4 A4 pages without references) A “Mirrored” Universe (toy-)Model (MUM) based on a relative big G, a variable quantum big G and a finite mass ambitus of our universe (short variant of the original full preprint). Research Gate preprint with DOI: [10.13140/RG.2.2.11788.05763](#). [URL1a](#) (Research Gate main source), [URL1b](#) (Academia secondary source), [URL1c](#) (Vixra secondary source), [URL1d](#) (GSJ secondary source), [URL1e](#) (dragoi.com latest variant source).
- [8] [Andrei-Lucian Drăgoi \(October 2019\)](#). (MUM - [long] version 1.0 - 21.10.2019 - 7 A4 pages) A “Mirrored” Universe (toy-)Model (MUM) based on a relative big G, a variable quantum big G and a finite mass ambitus of our universe. Research Gate preprint with DOI: [10.13140/RG.2.2.35738.18885](#). [URL1a](#) (Research Gate main source), [URL1b](#) (Academia secondary source), [URL1c](#) (Vixra secondary source), [URL1d](#) (GSJ secondary source), [URL1e](#) (dragoi.com latest variant source).
- [9] [Andrei-Lucian Drăgoi \(August 2019\)](#). (DRH - v 1.0 - 28.08.2019 - 4 pages A4) A Dimensional Relativity Hypothesis (DRH), Research Gate preprint with DOI: [10.13140/RG.2.2.30254.87368](#). [URL1a](#) (Research Gate main source), [URL1b](#) (Academia secondary source), [URL1c](#) (Vixra secondary source), [URL1d](#) (dragoi.com latest variant source), [URL1e](#) (GSJ secondary source).

- [10] 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 electrograviton hypothesis (EGH), the quantized gravitational waves hypothesis (QGW-Hyp) and the dimensional relativity hypothesis (DRH)**. Research Gate preprint with DOI [10.13140/RG.2.2.13834.82881](https://doi.org/10.13140/RG.2.2.13834.82881). [URL1a](#) (Research Gate main source), [URL1b](#) (Academia secondary source), [URL1c](#) (Vixra secondary source), [URL1d](#) (dragoi.com latest variant source), [URL1e](#) (GSJ secondary source).
- [11] 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 will**. Wiki-like Research Gate preprint. DOI: [10.13140/RG.2.2.22592.58887](https://doi.org/10.13140/RG.2.2.22592.58887). [URL1a](#) (Research Gate source), [URL1b](#) (Academia source), [URL1c](#) (Vixra source), [URL1d](#) (GSJournal source).
- [12] Andrei-Lucian Drăgoi (April 2019). (LFs and gravity – working paper – variant 1.0 – 7 pages – 13.04.2019) **Life forms, “hybrid” causality, gravity and hierarchical parallel universes**. Research Gate preprint. DOI: [10.13140/RG.2.2.19089.28009](https://doi.org/10.13140/RG.2.2.19089.28009). URLs: [URL1a](#) (Research Gate source), [URL1b](#) (Academia source), [URL1c](#) (Vixra source), [URL1d](#) (GSJournal source).
- [13] Andrei-Lucian Drăgoi (January 2019). (eSR – short version – 4 pages – 3.01.2018) **An extended Special relativity (eSR) containing a set of universal equivalence principles and predicting a quantized spacetime**. Research Gate preprint. DOI: [10.13140/RG.2.2.29665.35686](https://doi.org/10.13140/RG.2.2.29665.35686). [URL](#) (Research Gate source).
- [14] Andrei-Lucian Drăgoi (December 2018). (eSR – version 1.0 – 6 pages – 20.12.2018) **An extended Special relativity (eSR) containing a set of universal equivalence principles and predicting a quantized spacetime**. Research Gate preprint. DOI: [10.13140/RG.2.2.10208.53764](https://doi.org/10.13140/RG.2.2.10208.53764). [URL](#) (Research Gate source).
- [15] Andrei-Lucian Drăgoi (December 2018). (eZEH article-like preprint – version 1.0 – 8 pages -12.12.2018) **An extended zero-energy hypothesis predicting the existence of negative-energy gravitons and possibly explaining the accelerated expansion of our universe**. Research Gate preprint. DOI: [10.13140/RG.2.2.36245.99044](https://doi.org/10.13140/RG.2.2.36245.99044). [URL](#) (Research Gate source).
- [16] Andrei-Lucian Drăgoi (August 2018). (IP-GP – version 1.0 – 15 pages – 14.08.2018) **On the intrinsic paradox of the geometric point definition (solved using the Included Middle Logic) as the main cause of Euclid’s postulate “inaccuracy”, allowing the existence not only of non-Euclidean geometries but also of a new “t-metamathematics” used to redefine the basics of General relativity, Quantum field theory, Superstring theories and M-theory**. Research Gate preprint. DOI: [10.13140/RG.2.2.32439.42405](https://doi.org/10.13140/RG.2.2.32439.42405). [URL](#) (Research Gate source).
- [17] Andrei-Lucian Drăgoi (August 2018). (eZEH – version 1.0 – 10 pages – 2.08.2018) **An extended zero-energy hypothesis: on some possible quantum implications of a zero-energy universe, including the existence of negative-energy spin-1 gravitons (as the main spacetime “creators”) and a (macrocosmic) black-hole (bh) Casimir effect (bhCE) which may explain the accelerated expansion of our universe**. Research Gate preprint. DOI: [10.13140/RG.2.2.31515.36642](https://doi.org/10.13140/RG.2.2.31515.36642). [URL](#) (Research Gate source).
- [18] Andrei-Lucian Drăgoi (September 2017). (FSC-TS – preprint – version 7.2 – 28 pages – 15.09.2017) **On a plausible triple electro-gravito-informational significance of the fine structure constant and its implications in a plausible four fields unification pattern at Planck scale and the existence of life forms in our universe**. Research Gate preprint. DOI: [10.13140/RG.2.2.13114.39365](https://doi.org/10.13140/RG.2.2.13114.39365). [URL](#) (Research Gate source).
- [19] Andrei-Lucian Drăgoi (May 2017). (version 1.1 – 12 pages – 5.06.2017) **A preonic toy model of all known elementary particles based on 1D and 2D branes**. Research Gate preprint. DOI: [10.13140/RG.2.2.26817.97123](https://doi.org/10.13140/RG.2.2.26817.97123). [URL](#).
- [20] Andrei-Lucian Drăgoi (May 2017). (version 2.3 – 12 pages – 6.06.2017) **A cyclic toy model of the universe based on a quantized spacetime predesigned for life (technical essay)**. Research Gate preprint – Version: 2.3, In Progress. DOI: [10.13140/RG.2.2.22391.83369](https://doi.org/10.13140/RG.2.2.22391.83369). [URL](#) (Research Gate source).
- [21] Andrei-Lucian Drăgoi (April 2017). (version 2.0 – 28 pages – 9.05.2017) **A cyclic toy model of the universe predesigned for life, based on preonic quantized branes and a very strong 2D gravitational field as a candidate for a unified primordial field**. Research Gate preprint – Version: 2.0, In Progress. DOI: [10.13140/RG.2.2.24084.30087](https://doi.org/10.13140/RG.2.2.24084.30087). [URL](#) (Research Gate source).
- [22] Andrei-Lucian Drăgoi (February 2017). (BIDUM 3.2 full – Part A – 18 pages – last update on: 23.02.2017) **A Bio-Info-Digital Universe (toy-)Model – towards a transdisciplinary TOE centered on life phenomenon – Part A**. Research Gate preprint. DOI: [10.13140/RG.2.2.23869.26082](https://doi.org/10.13140/RG.2.2.23869.26082). [URL](#) (Research Gate source)
- [23] Andrei-Lucian Drăgoi (February 2017). (BIDUM 3.2 full – Part B – 20 pages – last update on: 23.02.2017) **A Bio-Info-Digital Universe (toy-)Model – towards a transdisciplinary TOE centered on life phenomenon – Part B**. Research Gate preprint . DOI: [10.13140/RG.2.2.35013.65760/1](https://doi.org/10.13140/RG.2.2.35013.65760/1). [URL](#) (Research Gate source).
- [24] Andrei-Lucian Drăgoi (September 2016). (BIDUM 3.1 beta version – 24 pages – data) **A toy model of the universe based on a large numbers hypothesis inspired by Edward Teller – towards a TOE centered on life phenomenon**. Research Gate preprint. DOI: (see other related DOIs [10.13140/RG.2.2.23869.26082](https://doi.org/10.13140/RG.2.2.23869.26082) <sup>[URL2]</sup> and [10.13140/RG.2.2.35013.65760/1](https://doi.org/10.13140/RG.2.2.35013.65760/1) <sup>[URL2]</sup>). [URL](#) (Research Gate source).
- [25] Andrei-Lucian Drăgoi (May 2018). (DVTM – PSIJ – Short Research Article – 30.05.2018 – 19 pages) **(Toy-model) A Simple “Digital” Vacuum Composed of Space Voxels with Quantized Energetic States** (Physical Science International Journal, ISSN: 2348-0130, Vol.: 18, Issue.: 1). DOI: [10.9734/PSIJ/2018/41391](https://doi.org/10.9734/PSIJ/2018/41391). [URL0](#) (original source); [URL1](#) (Research Gate source);
- [26] Andrei-Lucian Drăgoi (July 2017). (PSIJ – Short Research Article – 29.07.2017) **On a Plausible Triple Electro-gravito-informational Significance of the Fine Structure Constant** (Physical Science International Journal, ISSN: 2348-0130, Vol. 15, Issue 3). DOI: [10.9734/PSIJ/2017/34613](https://doi.org/10.9734/PSIJ/2017/34613) ([URL-CrossRef.org](#)). [URL0](#) (original source); [URL1](#) (Research Gate source);