Defining Observer as the "Mass Gap" and Vice Versa Yields a Unique Quantum Gravity Scale

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Grant that neutrino absolute mass is the "mass gap"—modeled as the zero refractive index $n_o = (v_g/v_p)$; wherein, man as observer signifies the phase velocity v_p and the CMB is group velocity v_g. I argue now that as the *material* self-referential state n_o is then the material "wave function of the universe" (the Heisenberg cut). I show here that this will be in the material sense that n_o is the substantive mass-energy constant in place of conventional carbon-12 or c^2. Meaning now, it is the bona fide "Hoyle resonance state"; something otherwise termed the *natural unit*.

ABSTRACT EXTENDED:

I propose strictly thus that a material *self* i.e., a "wave function" n_o defines a space-time and vice versa. Specifically, it is that whose interference pattern or *beats* ("oscillations"; "curvatures") constitutes the *valid* observables—the observable "space" and "time". Overall, this permits us to adopt quite literally the Everett many-worlds or the "multiverse" picture. Basically here it is the complex form wherein the observer is the imaginary unit and the observables constitute the real axis.

(1. a.) INTRODUCTION:

I argue that the neutrino scale (and not the proton scale) is to be our bona fide quantum gravity scale. The justification for this is to be found in the fact that man is our working observer and as threshold mass "sterile" neutrino should signify the "mass gap" (i.e. man as the de facto quantum of observables). Mass gap is here modeled then as the *zero refractive index* $n_o = (v_g/v_p)$. Wherein, man as observer signifies the phase velocity v_p i.e. the *initial condition* (normal, norm, critical angle or "fundamental frequency") from which we are viewing entire nature as a Huygens' Principle model of speed of light namely, as $\pm c$. Let therefore the CMBR signify the maximal state of this wave evolution i.e., the group velocity v_g or "wavelength"—if the "black body *cavity*" proper. And let the observer signify the initial condition v_g namely the normal or norm. Then I claim that as signifying resonance between the initial and final states of evolution the "black body *radiation*" proper n_o should represent our bona fide *physical* model of the self-referential state if the so-called none-dispersive medium.

The key point thus is that the wave function proper n_o is not something one actually observes; it is the observer itself. It is something one may only actually *be* (or fail to be); it is the self in the term "self-reference". Its observables are then the self similarities. If we think of a self as a "fundamental frequency" then its "similarities" (observables) are the harmonics (interference pattern) or the nodes and antinodes.

One thinks thus of the exact self referencing state as the zero refractive index n_o (mass gap). Observables are in contrast *none-zero* refractive indices i.e., the seeming "dispersions"/interference patterns (±refractive indices) or "perturbations" of n_o. These dispersions may be deemed anomalous in the form of "gravitation" (space; λ_c) and normal in the form of "matter" (time; f_c). Altogether the normal cum the anomalous constitute the *beating* or "oscillation" of n_o. Distinct oscillation amplitudes or "mass-energy scales" are therefore distinct charge flavors, the neutrino's own frequency being the asymptotic—the beat *frequency* or mass gap.

This will mean that the further we advance off the mass gap proper n_o the less intensely or obviously self referential (recursive) are the observables. Rather, the more separate i.e. distinctive amplitudes they are. This would be effective "collapse" or decoherence or indeed, as third party, the damping of a resonance. This goes to say simply that we have left the resonance scale; we are no more the effective *self* or mass gap or natural unit.

But the trouble then is this: any effective *self* (something otherwise seen as the *natural unit* or zero point energy or cosmological constant or "resonance state") should be in fact the bona fide definition of "nothing" (non-information).

(1. b.) THE TROUBLE WITH "NOTHING":

"... there is no way to formalize the entire circumstance of human self-reference in a system of symbols devoid of an observer. But who or what is the observer?"
— L. H. Kauffman

In plain language, the trouble with proving that "nothing" (the mass gap) exists is that it is presumed often that to exist is to actually be "something"—the very opposite of "nothing". And therefore to be "nothing" is in fact to *not* exist. Yet I make the case that "nothing" does exist and not as the absence of "something". It exists as the observer in question.

Now, think of "*something"* as the excited energy state (say, the quanta or gauge) so that the "*nothing*" is its ground state or "gauge invariance" i.e., the *quantum* proper. We must grant thus that the quantum cannot be itself *quantized* for it is what quantizes; it is what does distinguish between any two or more quanta. It is by definition thus the self in the term *self-reference*. According to Gödel's theorem the quantum (self referencing state) is at once thus both the *formal system* in question and the recursively *un-decidable*. "Un-decidable" here could be taken to mean geometrically the continuum or asymptotic or "conserved current" of Noether's theorem. And all this may well be modeled simply by the zero refractive index.

In other words, granted that the only way to demonstrate invariance is to actually vary but in varying remain the same, it should follow as a theorem that the quintessential invariance is the standing wave (the self-referential state). Suffice it to say that what modern physics calls the natural unit, in so far as by this is meant the point of resonance between all observables, it is no more than the substantive "nothing". I make the case that this is the observer per se i.e., the self-referencing state.

It follows that a demonstration of "nothing" can come in two possible modes namely, either we (1.) *be* the self-referential state in question—in which case our proof comes as subjective experience for it is that state of *be-ing* the formal system in question. An otherwise more objective but then indirect or "third party" method would be to (2.) *demonstrate* that some element which is acting (say, the formal system or quantum proper) is actually also the "nothing" in question. But then, as we already noted, this smacks of paradox.

The point thus is that we will need to see entanglement or entropy or "entanglement entropy" [...] not quite as disorder but as the unit of measure of *both* order and disorder. This unit has then the particular physical trait that it is *neither* order nor disorder; it is rather the "nothing-in-particular" or, maximally, *both* order and disorder.

This would be the *observer* as the quantum of gravitation i.e., the quantum of *both* the observables and the un-observables (i.e., of matter and antimatter alike or of time and space alike etc). This simply is the observer as by definition the complementarities principle: think, the "*beat frequency*" (or unitary matrix) n_o on which basis we must specify "oscillation" (information or evolution) of any kind.

It is my proposal here that n_o would be what it means to be qualitatively *un-decidable* if, and only if, the effective *formal system* be in general the reference phase v_p (in particular h_o). Put differently, n_o is the only objective i.e. existential proof one can have of h_o when oneself actually is h_o. So n_o we might as well call the wave function. And in fact it must be same typically seen as the "mass gap".

In other words, any information or "modulation" presumes a "modulus". Meaning, the *being* comes before the *knowing*. The former is what specifies the latter. Like the Maxwellian demon the being is what distinguishes between any two physical elements. Yet by definition the being must be the nothing-in-particular.

This is because to become "something" (i.e., an observable) a being will need yet another being to actually distinguish it...in pain of infinite regress. The way out of this regress is that there is no Wigner's friend [1]; there can be only one *de facto* observer (wave function). It simply is the norm (quantum) of observables.

Perhaps the foregoing will be adequately illustrated wave mechanically by a Peculiar situation in the physics of refraction [2] thus,

> ""The critical angle can be calculated by taking the inverse-sine of the ratio of the indices of refraction. The ratio of n_r/n_i is a value less than 1.0. In fact, for the equation to even give a correct answer, the ratio of n_r/n_i must be less than 1.0. Since TIR only occurs if the refractive medium is less dense than the incident medium, the value of n_i must be greater than the value of n_r. If at any time the values for the numerator and denominator become accidentally switched, the critical angle value cannot be calculated. Mathematically, this would involve finding the inverse-sine of a number greater than 1.00 - which is not possible. Physically, this would involve finding the critical angle for a situation in which the light is traveling from the less dense medium into the more dense medium - which again, is not possible." "

Succinctly, we must adopt our *self* as the norm of gravitation; we must see our *self* as the "mass gap" (or black hole or wave function or space-time) proper and hence as the quantum gravity scale.

In fact this will amount to applying maximally the Carter, Dicke and Hoyle anticipations [3]]. Namely here, the observer simply is the singularity in question.

NEUTRINO SCALE AS "PLANCK SCALE":

"Only by rotating into the realm of possibility *[the imaginary axis]* do we enter the domain of the self."
—L. H. Kauffman. Italics mine.

One must *actually* adopt a single initial condition out of many—indeed the infinitely many. That adopted becomes sort of a *preferred frame* namely, the "natural unit". One might indeed ask, if the laws of physics were not somewhat special within it why then is science looking for

the natural unit? We leave this to semantics. Suffice it to say the observer is herein our *natural unit*. This will be in the material sense that neutrino scale is our bona fide natural unit/quantum gravity scale.

Our method below is to replace in the traditional equations of Planck unit the proton or other parameters with as much of neutrino parameters as we can. It turns out that the more we can effectively do so the more quantum-gravity is not exactly a time or space in the past or in the future but rather simply the norm—the observer and its dynamics. Quantum gravity becomes thus the all-or-none model.

PLANCK TEMPERATURE AND PLANCK CHARGE

Firstly, we adopt here the CMB temperature (thermodynamic temperature) as the Planck temperature. If thermodynamic temperature is not in effect the temperature of *all* times and space, including that before the big bang, then what possibly could be? More so, we conventionally explain the whole big bang model by temperature evolution. Secondly, we adopt as Planck charge the neutrino absolute mass/stationary state ($n_o/4\pi$), it is simply the barest handedness of nature. "Charge" might here be generalized to mean simply handedness. The argument then is that in any scheme the given observer is the substantive handedness (norm) of nature and by same token it is the natural unit of charge. Ultimately, the observer is the *natural unit* of physical information.

PLANCK LENGTH AS "SPACE" (λ_c):

Here firstly, we replace the Planck quantum with our neutrino frequency ($(n_o/4\pi)/h$). Secondly we replace Einstein's speed of light *c* basically with the wavelength associated with the CMBR say, its peak wavelength density $^{\lambda}$max.

$$\sqrt{\frac{\hbar G}{C^3}} = ((1.05829609 * 10^{12} \text{ hertz}) * \text{gravitational constant}) / (1.60200 * 10^{11} \text{ hertz})^3$$
$$= 1.3107067 * 10^{-16} \text{ m}^3 \text{ kg}^{-1} \quad \text{.....(1.)}$$

We could see thus Planck length as the barest charge density and which would mean in other words "space".

PLANCK MASS AS "TIME" (f_c):

Accordingly, we have here that

$$\sqrt{\frac{\hbar c}{G}} = ((1.05829609 * 10^{12} \text{ hertz}) * (1.60200 * 10^{11} \text{ hertz})) / \text{gravitational constant}$$
$$= 5.0400999 * 10^{16} \text{ kg m}^{-3} \quad \text{.....()}$$

We could interpret this value quite simply as signifying Einstein's c^2 in some charge density unit.

However, more instructive presently should be appreciating what is implied by the seeming reciprocity above of the Planck length and the Planck. It suggests an underlying symmetry or "gauge group" and which one suspects is embodied by the Planck time below.

PLANCK TIME AS "SPACE-TIME" (n_o):

Clearly this is the resonance state proper.

$\sqrt{\frac{\hbar G}{C^5}}$ = ((1.05829609 * 10^{12} hertz) * gravitational constant) / (1.60200 * 10^{11} hertz)^5
= 8.18169 x 10^{-28} m^3 s^2 kg^{-1}

The significant thing here is that it is the "modulus" or resonance state which we propose should be the authentic atomic mass-energy constant. The basic idea is that of a modulus (think, cosmological constant or energy density) i.e., the given observer h_o as the given "space-time"— at once the natural unit of space and natural unit of time wherein "space" is simply Planck length and "time" is simply Planck mass. Planck time is thus the most natural mass-energy scale or mass-energy conversion factor.

Meanwhile, by convention there are alternative relations for expressing Planck time. Let us now look at those alternative expressions of Planck time and see whether they do corroborate our claim of the neutrino scale as the authentic quantum gravity scale.

Planck length over speed of light would be presently,

(l_p/c) = (1.3107067 * 10^{-16} m^3 kg^{-1}) / the speed of light = 4.37204694 × 10^{-25} m^2 s kg^{-1} .....()

Or adopting as our "speed of light" perhaps that wave speed c_o given as product of the peak wavelength density and the peak frequency density of the cmb we have rather (7.71857525 × 10^{-25} m^2 s kg^{-1}). Or, still, with product of neutrino frequency and the CMB wavelength peak as the applicable wave speed c_8 we have rather (6.61242181 × 10^{-26} m^2 s kg^{-1}). See John Baez [...] on the the actual measured value of energy density of the vacuum by the Wilkinson Microwave Anisotropy Probe and others.

A third and final standard expression for Planck time is that, ($\hbar/m_pc^2$). We shall now merely replace the h-bar with our neutrino frequency n_v and also replace proton mass with our theoretical neutrino mass n_m thus,

(n_v/n_mc^2) = (1.05829609 * 10^{12} hertz) / ((7.80228499 * 10^{-39} kilograms) * (the speed of light)^2)
= 1.5091902 × 10^{33} m^{-2} kg^{-1} s

Substituting c_8 above with our preferred c_9 it is still surprisingly same (by my perhaps simple calculator). Thus,

(1.05829609 * 10^{12} hertz) / ((1.78473309 * 10^{-40} kg) * (1.98218858 * 10^9 m s^{-1})^2)
= 1.5091902 × 10^{33} m^{-2} kg^{-1} s

This third approach to defining the Planck time therefore says simply that Planck time is the inverse of Planck's constant itself. Now, considering that we have in the equation above "entirely" neutrino parameters it is a remarkably direct affirmation of our thesis that the neutrino should be the bona fide quantum of observables —the *mass gap*.

OF COMPTON WAVELENGTH AND COMPTON FREQUENCY OF THE NEUTRINO:

If the neutrino is by definition mass (even if only in the sense of being the natural unit) then it should have Compton wavelength of sort. It turns out eventually that Planck's constant is by Compton frequency f_c of the neutrino thus,

$((n_m c^2)/n_v) = f_c = \hbar$ .....()

Wherein, n_m is absolute mass of the neutrino, n_v is frequency of the neutrino.

And correspondingly, speed of light is by Compton wavelength λ_c of the neutrino thus,

$(n_v / (n_m c)) = \lambda_c = c$ .....()

Technically here, we have the neutrino as the authentic "photon" of Compton's Effect. Indeed we can express the elementary charge proper as the neutrino beat frequency. This frequency would be then its natural axis of evolution as a wave function except it is Compton shifted. It will seem that at threshold we have thus,

$$hc \approx \frac{n_0}{4\pi} = (cmb\ peak\ frequency - frequency\ value\ of\ n_0)$$
$$= \frac{n_0/4\pi}{h} \approx \frac{e}{h} \qquad \ldots\ldots\ldots(\quad)$$

This same may be called simply then the neutrino stationary wave in analogy with the electron volt (eV). Indeed, as is natural with beats, this frequency should be "scalable" to account for various spans of phenomena as signifying its spectrum of constructive/destructive interferences (its normal/anomalous dispersions).

(3.a) OF DARK ENERGY, ASYMPTOTIC FREEDOM, COLLAPSE AND CONSCIOUSNESS (OBSERVABLES AS A *RELATIVE INTENSITY* SCALE):

Now, let us picture the observer comparatively as the initial condition I_o in a decibel style relative intensity scale $((I/I_o) \log_4 = B)$. This must be akin to thinking of observables as by definition Doppler Effects *B*. Implied here is the familiar QM tenet that there is in principle no way of determining before actual "measurement" what exactly is the true i.e., pre-Doppler Effect tones. The true tones or "unknowable" may represent then the modern notion of dark matter or dark energy so that actual observable matter constitutes the relative intensity proper *B*.

In addition to possibly resolving the dark energy (or dark matter) problem in cosmology the relative intensity scheme also offers us a physical way to approach the phenomenon of subjective experience. Namely, one will need to be the particular observer in question I_o to actually have first hand information what exact timbre of tone or observable(s) this observer observes. Otherwise such information can only be indirect and truncated as in a wave function "collapse". In a collapse we have the observable but no more the original observer (wave function). One suggests that to have these *both* concurrently is to suffer subjective experience perhaps termed psychologically qualia or consciousness and physically the action, [4], [5], [6].

The phenomenon we call intuitively our "attention" illustrates that the actual observation at any point in time is less than (perhaps is even the minima of) total observables. If one thought of the mind as a wave function (as correctly this writer thinks we should) then every

information or event actually disturbs it in the Markovian sense that it renormalizes i.e., it *shift* its attention. Its *norm* encodes then its attention.

Meanwhile, if left all by itself a mind would then be entirely self-contained in a process we call thought. The events in a thought are entirely inaccessible other than to the mind (wave function) in question. So we may think of this mode as its stationary state (eigenmode; maxima). It is thus *entirely* subjective or indeed a singularity, just like a black hole or a black body cavity or a standing wave. From the *outside* of a singularity events within it are not accessible.

Now, any piece of information (interaction) coming from *outside* a wave function or "black hole" necessarily collapses or decoheres it. That is, it shifts it off its stationary state. The more shock is the in-coming interaction (information) the more momentarily collapsed or decohered is the wave function or thought.

In due cause(for indeed the action potential has a refraction period) the mind or wave function settles back to a mode we might see as a more or less time dependent mode. In the strict sense of the observer then the in-coming event shifted its *attention* or consciousness (just as a collision shifts the wavelength of Compton's virtual particle); in the case of the cosmos any interaction "renormalizes" it. That is, it changes it to another quantum I_o (namely, another threshold ; observer) in the relative intensity scheme. Now in the sense that it signifies the observer (i.e., the norm, threshold, vacuum energy or cosmological constant) proper gravitation will be non-renormalizable; we simply need adopt the substantive "observer".

Perhaps the phenomenon of attention as illustrated above applies in cosmology as meaning that reality is in fact fractal. For instance, if one defined the nuclear *scale* of particle physics as the scale where we observe the acoustic experience of *beats* (mass or charge oscillation) *"B"* then by definition scale is relative—depending as it does on the threshold energy i.e. on the observer frequency I_o (the norm).

The bottom line is that for analysis purpose the quantum of observables must be deemed as by definition ad hoc as is the observer I_o in a relative intensity scale. Thus we can understand that,

$$\left(\frac{v_g}{v_p}\right)\log 4 = n_1 \ \ldots\ldots\ldots\ldots (9)$$

Wherein if v_g is the CMB radiation and v_p is mans' sensory threshold precisely threshold potential of the action potential in man, quoted at a value of 55 millivolts, then n_1 is the conventional nuclear magneton in Hz T^{-1} as signifying perhaps the scale of "beat frequency"—the decoupling or first order scattering. Note that if in the equation above we put v_g and v_p in the Hz unit then n_1 is the express equivalence of eV and Hartree energy.

And if instead of taking the $\log_4$ of the quotient we took the square root, as is the convention in determining the actual physical observable of the amplitude of a wave function, the result is roughly the same. This should illustrate that n_1 is strictly a harmonic (think in acoustics perhaps the "octave") i.e., the relative intensity as defined strictly by v_p as the keynote.

Now, this gives us a way to explain what has been called in the literature asymptotic freedom. It illustrates the case that charge (the observable) by definition is fractal. Meaning, it is

specified entirely by threshold (the observer; the quantum). And, more importantly, this threshold need not be seen as some absolutely fixed quantity; it is simply the observer (initial condition) I_o in a relative intensity scale so then it remains by definition the imaginary *axis*.

Overall, we must think of the observer materially as the wave function (standing wave; imaginary *unit*) n_o so that the observables are essentially its relative dispersions (its interference pattern) and strictly, altogether its *beating*. This simply would be the all-or-none model of nature. This model should eliminate the measurement problem and explain the so-called hard problem of consciousness— by giving us a way to *objectively* treat observables as observer-specific. And it should explain *quantum* gravity as "discrete" space-time, wherein *space-time* is simply the wave function i.e., the self-referencing state (observer).

In other words, to have observables deterministically we must as a tenet of our theory of quantum gravity firstly *be* (i.e., assume; adopt) the observer in question. The observer is by definition thus the mass gap or quantum of observables if the "preferred" frame.

Perhaps Einstein's assertion that there is no preferred frame assumes the classical observer who is located *within* some reference frame among his observables. We assume now the reverse: all observables are by definition located *within* the observer—the observer as the *natural unit* n_o of physical information.

CONCLUSION:
AGAIN, OUR AXIOM SET

a.) A wave function i.e., *zero* refractive index n_o is an observer (think of this globally as the norm, normal or *critical angle*).

b.) Observables are the interference pattern hence i.e., the normal versus anomalous dispersions thereof, this as implying specifically *none-zero* refractive indices.

c.) The *observer* is not therefore in same instance also an *observable*; it is rather the modulus ("entanglement"; space-time) by which is described the modulations ("observables"; space and time).

d.) There can be as any instance one and only one *de facto* observer (*it* then is the *self* in the term "self-reference"). Need we add that the observer is basically thus a Markov property? This is in that it is globally or comparatively speaking merely the initial condition.

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REFERENCES

[1] InformationPhilosopher, "Wigner's Friend," [Online]. Available: http://www.informationphilosopher.com/solutions/experiments/wigners_friend/. [Accessed 31 January 2017].

[2] "The critical angle," [Online]. Available: http://www.physicsclassroom.com/class/refrn/Lesson-3/The-Critical-Angle. [Accessed 30

September 2016].

[3] wikipeia.org, “Anthropic Principle,” wikipedia.org, 25 January 2015. [Online]. Available: https://en.wikipedia.org/wiki/Anthropic_principle#Variants. [Accessed 31 January 2017].

[4] H. Stapp, “draft of entry in the "Blackwell Companion to Consciousness",” The Blackwell , [Online]. Available: www-physics.lbl.gov/~stapp/BCC.pdf. [Accessed 02 Frebruary 2017].

[5] “Quantum Approaches to Consciousness,” Stanford Encyclopaedia of Philosophy, 12 June 2015. [Online]. Available: https://plato.stanford.edu/entries/qt-consciousness/. [Accessed 02 February 2017].

[6] Wikipedia.org, “Hard problem of consciousness,” wikipedia.org, 1 february 2017. [Online]. Available: https://en.wikipedia.org/wiki/Hard_problem_of_consciousness. [Accessed 02 February 2017].