

What a Wavefunction is

Chidi Idika — June 26, 2013

Quantum theory treats rigorously of observables while the term “observer” is hardly itself a rigorous notion. We argue that the uncertainty principle must be understood in the Gödel sense that: any given *observer* constitutes own practical definition of “*the unobservable*” (if superposition) or namely length scale, phase space, fundamental frequency etc. Conversely, *the observable* is definable strictly only in inverse-observer values as, that is, the “wave function collapse” or respectively, inverse-length, phase-point, harmonics. One has thus a picture of the observer that in being participant is also non-local as in Gödel’s “consistency-is-undecidable” or Planck’s “the-constant-is-the-uncertainty” or indeed Einstein’s “speed-of-light-is-information-speed-limit”. Definitive of these three cases, we assert, is Peano’s (and Noether’s?) notion of *the constant* (our “observer”) as being for any gamut of events the *meta-state* (“conserved current”). Meaning now, it is the *observer* per se, and *not* his *observables*, which should constitute violation of Bell’s inequality—say, as the infinitesimal/imaginary axis or as the dimensionless/infinite-dimensional etc. We posit: any given observer signifies the *virtual exchange* of standard model or *space-time* of GR or just the *metric* (norm)—defined by the singular trait that it is the *de facto* “superposition” i.e. natural *unit* and natural *limit* of physical information. Observables emerge quite directly thus as the perturbations if “decoherence” or “spontaneous symmetry breaking” of the observer. Now this status of/or the observer we call rather *the entity* as against hitherto *the uncertainty*; difference is that we have an ontic as the uncertainty per se. For a prediction we show here an exact value demonstrating man as the *entity* or “natural unit” for quantum gravity. The idea is that in being to ourselves the most authentic sample of the term *observer* we should also represent to ourselves the purest sample possible of the term *wave function*.

Introduction:

Perhaps no one concept in all of modern science embodies better the question of whether information or matter is at the heart of nature than does the concept of the *wave function* in Quantum Mechanics. In tackling the question “*It from Bit or Bit from It?*” we shall therefore more or less restrict ourselves to discussing the wave function.

Now being a non-physicist, a major question arises whether this writer understands in the first place the subject matter, but the answer to that question we will not pre-empt. The mode of presentation of quantum theory as contained by this paper must be at best informal and at the worst deviant or plain erroneous. However, our aim here is not so much to do quantum physics as it is to suggest a useful direction of inquiry. Perhaps on a more explanatory note one might as well title this paper “Understanding Uncertainty as the Entity; Essential Quantum Gravity”.

In Brief:

The Axioms:

We put forward four axioms as forming the kernel of our argument in this whole discuss namely:

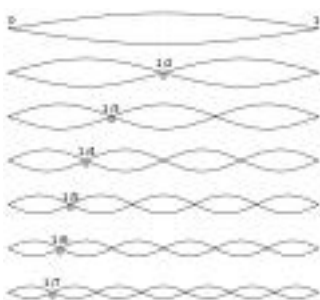
- (1.) An equality is an entity (think of this as the invariance or “conservation law” and as signifying the *observer*)
- (2.) An entity is *not* an observable whatsoever (it is the superposition or “connectedness” or “wave function” etc. of all things else)
- (3.) Observables represent inequalities (perturbations; amplitudes; proportions; states) thereof.

(4.) There can thus be one and only one valid i.e. de facto entity (every other is hypothetical).

Think of the above set of axioms as only a physical analogue of Peano's¹ own set of axioms in foundational mathematics namely (but not necessarily in same sequence):

- (a.) Zero is a natural number.
- (b.) Every natural number has a successor in the natural numbers.
- (c.) Zero is not the successor of any natural number.
- (d.) If the successor of two natural numbers is the same, then the two original numbers are the same.
- (e.) If a set contains zero and the successor of every number is in the set, then the set contains the natural numbers.

Figure 1



Standing waves in a string — the fundamental mode and the first 6 overtones.

(courtesy: Wikipedia)

First, Our “Predictions”:

Now we will grant that man, meaning, oneself (whatever this may mean in physical parameters) is unarguably to be also one's first hand instance of the term observer i.e. one is to oneself the purest sample of our term *entity* (observer). Below we suggest then a schema for demonstrating in a general sense man as constituting the *entity* which non-locality we illustrate as the spherical coordinate system, perhaps a geometric equivalent of the standing wave or potential. This permits us at least nominally to illustrate his observables as the three dimensional point/particle (if wave packets or wavelets of Huygens) located in a potential.

A crucial thing right away is the understanding that *life, mind* or entity or simply “observer” is the meaning we give herein to modern notions like quantum scale, space-time, virtual particle, spin zero, Higgs field² etc. And this is in line with our thesis that any given observer is the valid radiation gauge^{3,4} (the ground state) such that all observable matter and phenomena evolve from thence i.e. all symmetries break forth from thence and otherwise may be defined extinct only by agency of this unit. In other words, we think of the *self* as the most natural of units.

One finds thus that analogous of a combined Newton's and Coulomb's inverse square law we can have that:

$$h_0 (e^- e^+) / (\epsilon_0)^2 = \hbar_0 \dots\dots\dots(1.)$$

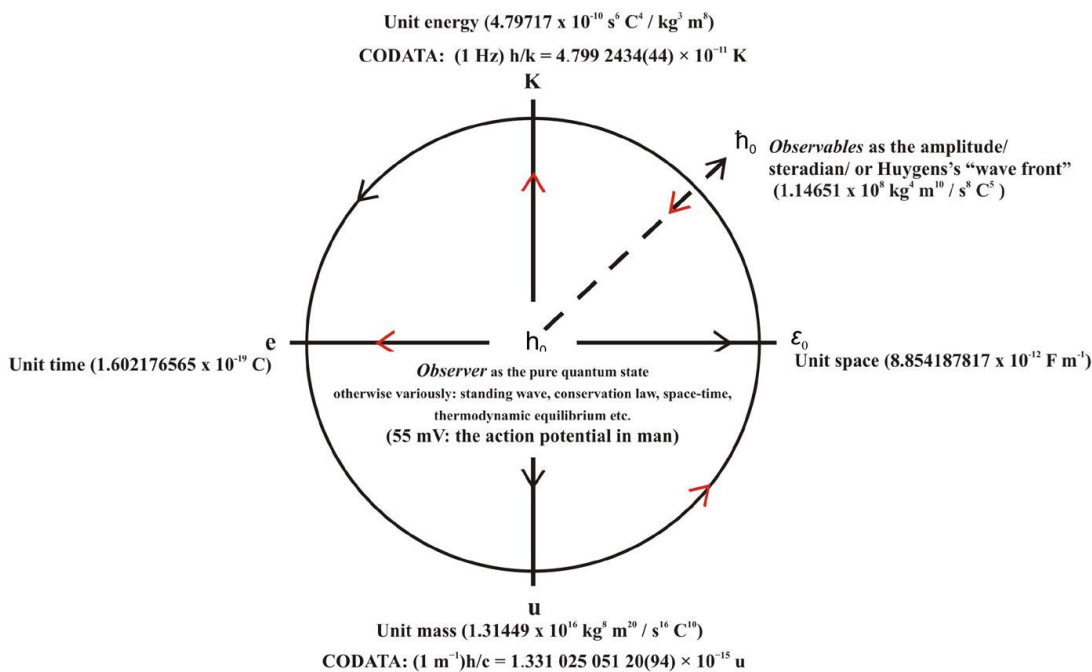
wherein, h_0 is the threshold potential of the action potential^{5,6} in man (as representing perhaps man as the *de facto* observer) and which we shall call herein after simply the action potential, e is the elementary charge (or unit time), ϵ_0 is the electric constant (or

unit space) and one can say that \hbar_0 is at once representative of the reduced Planck constant or reduced Compton wavelength these as signifying in a wave-particle model Newton's gravitational force. And \hbar_0 is in fact our present notion of the so-called Higgs particle or more literally Huygens's *wave front*. Incidentally one can say that at the calculated value of $1.14651 \times 10^8 \text{ kg}^4 \text{ m}^{10} / \text{s}^8 \text{ C}^5$ this value is rather quantitatively close to the LHC^{7,8} reported value of 1.25 GeV. Detailed dimension analysis may further explain our claims here and may indeed relate the two.

The singular and simplest claim (or prediction) one can make based on the data indicated by equation (1) is that man " h_0 " is to be the effective Planck constant, (or Newtonian constant, or Einstein's etc indeed the effective universal constant or "natural unit") for quantum gravity (we have herein adopted the symbol h_0 to encapsulate sort of a notional free-size only ad hoc Planck constant and this reflects in our version of the h-bar).

Now, note also the general relationship in figure 2 below. The idea is that movement in any one direction of our spherical coordinate reflects instantly in every other direction such that any point we choose within this sphere has *unique* value in every other direction, which situation amounts to what we may call symmetry:

FIGURE 2: the observer as a standing wave/spherical coordinate



It may be said for formality that we derived h_0 thus:

$$\epsilon_0/e = h_0 \dots \dots \dots (2.)$$

But the calculated value namely $5.52635 \times 10^7 \text{ s}^2 \text{ C} / \text{kg} \text{ m}^3$ seems not to fit or predict as perfectly as does the measured value of the threshold of the action potential in man namely 55mV. One is left to choose which value proves more predictive or practical. You may refer to the appendix for details of how we have derived the other values.

A Physical Model:

We ask the reader now to think of wave speed, any given wave speed, as signifying Heisenberg’s “momentum” while the harmonics or wavelets of Huygens’s [principle]^{9,10} signify the “position” notion of Heisenberg’s. It follows then the uncertainty principle as outlined by Heisenberg¹¹ arises as the condition in wave mechanics that (1.) It takes necessarily a self-same wave (the standing wave) to interfere and give rise to the “positions”. (2.) If we take it that this self-sameness is represented by the fundamental/wave speed as but the length scale (constant of proportionality; invariance) and *de facto* observer then it follows that this fundamental cannot possibly in the same instance that it is the length scale also be a graduation mark (the inverse length; wavelet) i.e. own measurement result. In fact this may be so in *theory* only for modeling purposes but it cannot actually be so in fact for to assume a particular length scale as active i.e. *de facto* is to presume every other alternative only latent, and vice versa.

In other words, if we think of the observable-ness of a number as a thing represented by the successor function of Peano’s axioms then by definition the very *constant* (say the number “zero” or “one”) of Peano’s is NOT the successor of any number and accordingly is not an observable. It is that from which ultimately all succession *status* flow.

So perhaps here is only demonstrating in a new idiom altogether Godel’s¹² incompleteness theorem.

Accordingly, we deem that the point of Noether’s theorem¹³ is that we may regard any given observer as the “conserved current” and his observables as the “continuous symmetry” or vice versa (in which reverse case we would in fact only be outlining the so-called conserved current as but a sine function i.e. as per se the invariance/fundamental frequency/period).

The corollary in wave mechanics is that the speed of light or, for any wave packet the fundamental or “group velocity”, is the limit on physical speed/information. Put conversely, events are physical observables only by the extent they are inverse length i.e. harmonics of the relevant fundamental/wave speed (which fundamental is namely then the *observer*).

This line of thought is how now we make sense of the sequel data that:

$$c / \hbar_0 = E_h, \text{ noting that the base of } \hbar_0 \text{ is } h_0 \dots \dots \dots (3.)$$

wherein then h_0 is the fundamental frequency (indeed the period or “standing wave”) as defining Huygens wave speed or in general the phase-space signified in this instance by the action potential in man, and then \hbar_0 is Huygens’s wave front (or think, the “antinode”; phase velocity), while c is “group velocity” of/or any particle’s velocity as representing Huygens’s envelope (think, velocity now as a scalar quantity if the “node”), but it is important to see that the difference between these two is essentially dependent on the phase-space assumed as fundamental i.e. the idea of which phase state constitutes the “constant” or namely period. Then E_h represents Huygens’ wavelet. We deem that the value E_h in this particular instance signifies the electron volt per Hartree energy (CODATA page 81). As the wavelet it suggests what has been tagged perhaps spontaneous symmetry breaking for it emerges as a resultant between any two or more wave states namely here c and \hbar_0 above.

From this perspective it is easier to imagine that it is the interactions/interference [of Huygens’s principle] that gives rise to the wavelets (harmonics) and that in turn it is these wavelets that imply cumulatively the so-called exclusion principle of Pauli, and which is for us now the very attribute that Heisenberg has called “position” vis-à-vis any fundamental (observer) as effectively the norm/metric or “momentum” of Heisenberg’s.

Once we can think of any observer as both quantitatively and qualitatively only a number basis (a Peano’s “constant”) then the Einstein principle of equivalence (as well as the efficacy of the statistical methods of QM) may be explained by the log identity:

$$\log_b(x) = \frac{\log_k(x)}{\log_k(b)} \dots\dots\dots(4.)$$

We are not then talking here simply of Einstein’s mass-energy as a distinct conservation law. We are talking of any given observer as a distinct conservation.

Every Observer a Heisenberg Cut, Key[note], Stationary Action:

Let us attempt now to secure a purely physical analogue of the mathematical notion of a constant/equality. And as signifying the superposition we assert that equality need not be a correlation. It is like in optics the *point of view* (vis-à-vis his observables as the *perspective*). And so is energy. This is much like saying that the “energy” adopted as the zero point energy or “ground state” out of all possible so-called energy levels should represent automatically the constant factor of Weber-Fechner law¹⁴ between an absolute stimulus (initial state) and the just noticeable change (final state). Same status thermodynamics calls entropy? And which we have called the Markov property. Meaning that an “observer” is like the so-called standard error patently a handedness (i.e. in being a particular sensory modality it is a blanket on “events” not its core sensitivity; which is why the eye is “deaf” and the ear is “blind”). Think of it this way: the purest “path” (sensitivity; irritability) connecting between any two states (i.e. phases points, wave packets) is by definition the de facto wave speed (phase-space; “superposition”). This must be only Snell’s law once we allow that all observers are actually participant as the effective “wave speed” (isomorphism, phase-space) or “measurement” in QM.

Here then is the gist. Any given observer represents as it were the third law proper of Newton’s between 0 and 1(action and reaction) as is the Heisenberg cut¹⁵ between the quantum versus the classical elements or as is the Equivalence principle of Einstein’s between gravitational versus inertial frames. The fact in Heisenberg terms that this divide may be placed arbitrarily (same as when we do not know where exactly to place it) is analogous to the Einstein notion that it is (in the form of Newton’s gravitational frame) *fictitious*. And then the fact in GR that there is in principle NOT a preferred frame of reference is tantamount to our thesis now that the observer is as the phase-space non-trivial—i.e. the “uncertainty” per se or “length scale”. Any given observer is simply thus only the *normal mode* of D’Alambert’s, and the truth is one can start the violin vibrating from any one mode at all. In statistics this would be perhaps the so-called Markov property. In music it is the principle we know as key[note]. The point is: the observer is at last not any one physical attribute in particular, on the contrary the de facto observer will be by all observable extents the *de facto* nothing-in-particular (or “all-things”). This is an uncertainty principle as also a distinct “conservation law” (entity) or vice versa.

We assume thus that the de facto observer (think, *gauge* of a radiation or *source* of an inverse square law) doubles as the point-at-infinity i.e. namely the “renormalization”.³ And in this scheme it does not then matter much which observer/*universal constant* is the operative one for such will be merely the key[note] in a totally Pythagorean sense.

Implicit to this perspective is that a wave function “collapse” or “decoherence” is no more than a *modulation* (be it amplitude, frequency, phase or pulse modulation etc) of the phase-space and it is the only way to keep the music playing or even to compose a seemingly new (“spontaneous”) music.

In any case the uncertainty proper or the pure quantum state should be understood as the effective divide or “phase-space” between any two physical traits, wave/corpuscular nature, mass/energy, space/time, quantum/classical and in the limits between a conscious/unconscious —a picture rather true of Schrodinger’s cat.

This for us is simply now explainable as the status of any given observer as at once the unit and limit of *all* physical information (one’s physical extension of the all-or-none notion in physiology). Otherwise what thermodynamics calls an isolated system.^{16,17}

And this now is not so strange. The electron or Boltzmann constant for instance is seen as at once a piece of observable information (a finite knowledge) and yet as something that is same in all space and time (an infinite extent). By upholding validity of the electron or Boltzmann constant (and indeed of any other universal constant), which let us assume now represents Peano’s number “zero”, we are making in effect the same claim as Peano’s fifth axiom thus: given that *P* is a property and zero has *P* and that whenever a natural number has *P* its successor also has *P*, it follows that all natural numbers have *P*. This fifth axiom of Peano may be considered then the essential quantum theory. As it turns out, the way science progresses is that if we then see a number that per adventure does not possess the property *P* we consider it completely “defined” only when either we identify another “zero” to which it belongs implying it is another kind of *P* altogether (i.e. it is a new “particle” or “charge” or “color”) or we assume it to be another “zero” altogether (so it is a new “universal constant” or “charge conservation law”). The issue is all information or “physical observables” belong necessarily *inside* some unit-cum-limit of information (i.e. inside some dynamics/kinematics schema, so to merge the two is to operate in fact a Peano “successor function”, perhaps what Spekkens¹⁸ has called a causal structure).

But then [the reason uncertainty principle does not play out as a macro phenomenon must be that] it does not really matter if a symmetry breaking be seen as elastic or plastic (i.e. as relative or absolute; spontaneous or caused) for by our present thesis there can be one and only one valid Higgs field or “standing wave”. Meaning, only a selfsame wave may interfere.

Put differently, in your present context as the participant observer per se, you *cannot* possibly differentiate between Higgs fields for it is something you may only BE, it is not a situation you may observe. Our idea here of Higgs field is as the observer proper or “phase-space” or wave speed h_0 i.e. as the conservation law or simply conserved current of Noether’s theorem vis-à-vis observables as the continuous symmetry. Our idea of Higgs particle is as the wave front h_0 , so then the wavelets (E_h) emerge from its dynamics.

Indeed the fact that the energy of wavelengths gets higher as wavelength gets shorter i.e. as one advance from the fundamental or “length scale” towards the harmonics/octave, must be tantamount to the requirement that the energy (think now, “non-locality”; “invariance” or so-called “superposition” attribute) of the Higgs field is higher when the field is zero than when it is nonzero. Implicit is that *total* energy is simply inertia (the constant of proportionality; momentum) vis-à-vis proportions (finitude) as per se the “forms of energy” i.e. the “locality” (a physical quality/identity is simply put a “position” notion).

In any case note that when we make here the minimal theoretical changes to Planck’s radiation equation ($E = hv$) and only restate it in the wavelength version ($E = hc/\lambda$) and also assume instead that h_0 is our “Planck’s constant” while relevant “frequency” is the speed of light and that the wavelength is h_0 then substituting we have that:

$$E = h_0 c / h_0 \dots\dots\dots(5)$$

Meaning we have energy *E* as some inverse-length whose value in this specific case is $0.143815 \text{ s}^5 \text{ C}^4 \text{ kg}^{-3} \text{ m}^{-8}$ representing possibly in CODATA pages 78 and 81 the second radiation constant or precisely $(1 \text{ m}^{-1})hc/k = 1.4387770 \times 10^{-2} \text{ K}$. Now compare with what one might call the first radiation constant or reduced Compton wave length (CODATA pages 74 and 78). See appendix.

Of Space, Time, and Space-time:

One suspects that at the deepest level we need necessarily not even be talking of a wave model. We only need the mathematical notion of equality (isomorphism)¹⁹ to signify the observer. This is granted that: “Inasmuch as mathematical entities are objects of categories, they are given only up to isomorphism. Their traditional set-theoretical constructions, aside from serving a useful purpose in showing consistency, are really irrelevant.”²⁰ Now compare this assertion with Feynman’s²¹ on the notion of energy (think, physical “isomorphism”): “...It is not a description of a mechanism, or anything concrete; it is just a strange fact that we can calculate some number and when we finish watching nature go through her tricks and calculate the number again, it is the same.”

Strictly speaking it is not energy or mass-energy that is to be the most fundamental of nature’s laws. The conservation law is (it gave us Planck’s radiation law to start with). Granted that for a conservation law to be not mere theory but physics it needs to be one way or some other an ontic. We must allow that the most pervasive of all conservation laws should be in fact a wave function, or vice versa. It is more importantly so than energy or mass-energy in that while you can arbitrarily define energy (zero point energy) and you should arbitrarily define your mass-energy by choosing your wave speed appropriately (going by Huygens’ principle), you cannot ultimately define your matter wave by choice; it is by definition the given observer as also the material ground state (the authentic natural unit; length scale). His observables in being the inverse-length are then like the “forms of energy”. In any case we argue now that the essential *formlessness* or a conservation law or “energy” should be the observer (in the guise either of a biologist’s “life” or Einstein’s “space-time” or QM’s “virtual exchange”).

Now space-time must be seen then to coexist with space and time as rather their genus or “life” or metric (norm), much like the virtual exchange of standard model coexists with the exchanging points; or [as an extension of Peano arithmetic] the imaginary unit coexists with the real numbers x versus y in a complex form $x+iy$. The dynamical implication must be same as we have called in QM the measurement problem namely the fact that the arrow of time i.e. the gamut of observables are specific to observer (measurement) or, conversely, that space is quantized. Making sense of the measurement problem and also synchronizing GR and QM must lie in realizing that any de facto observer is the de facto imaginary unit (or standing-ness; isomorphism; equilibrium, “key”) if in QM the “well-behaved-ness” namely \hbar_0 of any exchange. So any pair of observables as may be represented by the generic name of space and time signify merely the node versus antinode (or frequency versus wavelength or indeed “wavelets”) this being but the x versus y of a complex number or, say, the kinetic versus potential *forms* of an energy (or lagrangian or Laplacian). The critical point of note is that in practice (as in the utility of imaginary units) it is not exactly the imaginary *axis* but instead the imaginary *unit* that constitutes a solution i.e. a distinct/de facto observer or “measurement” (a Heisenberg cut). Barring this note every evolution/involution (universal gravitation) remains strictly only imaginary or “fictitious” i.e. in the realm of a superposition.

A Glimpse of Gravitation:

As to how this may apply specifically to Newton’s gravitation we may consider \hbar_0 as only redefining the Newtonian gravitational *force* (g) or Einstein’s “curvature” of space-time. It is basically the wave vector of/ or a wave packet or “matter wave”. That is, it represents interaction between matter not merely as “mass” but with all the *qualitative* (and quantitative) attributes accounted for. Meaning that \hbar_0 is now the superposition and signifies Newtonian G . To this end let us note the following data:

$\hbar_0^2 / \hbar_0 = x \dots \dots \dots (6.)$

wherein x has the value $2.63844 \times 10^{-11} \text{ s}^4 \text{ C}^3 \text{ kg}^{-2} \text{ m}^{-6}$

and then inserting x ,

$$G / x = k \dots \dots \dots (7.)$$

Wherein G is Newton's constant. And k has the value $25.2946 \text{ kg}^3 \text{ m}^9 \text{ s}^{-2} \text{ C}^{-3}$.

But inverting we have that,

$$x / G = \text{inverse } k \dots \dots \dots (8.)$$

or precisely $39.5341 \times 10^{-2} \text{ s}^2 \text{ C}^3 \text{ kg}^{-3} \text{ m}^{-9}$.

One takes the last two solutions to be same as the Hartree per electron volt (E_h) before. This may suggest in line with the practice in so-called Planck units that E_h is probably a point of effective equality of sort between G , c and now h_0 as our de facto "Planck constant". One implies that E_h has the attributes of a thermodynamic potential or so-called wave packet but we must remind ourselves that this would be strictly as measured by h_0 as the pure quantum state/phase-space (if the thermodynamic equilibrium or namely *entity*). Now compare E_h with quotient of the speed of light over the action potential giving us $5.45077 \times 10^9 \text{ s C kg}^{-1} \text{ m}^{-1}$ (in the appendix).

One has bordered about what may appear as rather petty data just to show that even with minimal mathematics, as one has been capable (or incapable) of, these data hover way too consistently for us to ignore the possible significance of h_0 to a practical (emphasis on "practical") theory of quantum gravity. Whatever is ones persuasion these data will require both singly and jointly an interpretation at least consistent with *both* the standard model and GR, more so when we accede that h_0 is rooted in human physiology or biology in general. It does not seem that science has ever had a unit that is at once so fundamental and anthropic as this suggests.

In general it seems we may picture h_0 as by definition an undulation (perturbation) i.e as the dynamics (*vis-à-vis* h_0 as the kinematics) whose instantaneous state or "position(s)" defines distinct physical event/observables/species/traits i.e. distinct physical dimensions or evolutions/extinctions thereof. It would certainly be a revolutionary kind of "Higgs particle" (h_0) that has man h_0 as the "Higgs field".

It From Bit or Bit From It?

We argue that the "*bit*" is by definition no more than the harmonics (perturbation or *amplitude* or inverse-length) of the "*it*" while by definition the "*it*" is in turn only the fundament frequency or namely *phase-space* of any spectrum/path/amplitude of "bits". And in being so the fundament is not in fact a frequency, it is rather by definition the period (i.e. wavelength) if "superposition". This little difference is most crucial. It follows we can now call a fundament the *entity*. The harmonics we call the observables (information) specific to it.

We propose presently that this entity version of the uncertainty principle is the more *useful* way of phrasing the situation for it gives us an *ontic* to work with as the uncertainty per se, in the person of the observer or his seeming "unconscious" (mind) while the conventional uncertainty principle version denies us a-priori any such—other than perhaps raw mathematics.

Now, I will dare say then that information (in the sense of a “meaning”) is not actual the physical material exchanged; information consists in the *interference pattern* that an exchange forms on/with the observer/exchange points (possibly why conventionally it is not directly the amplitude of a wave function that counts but the squares, and we add now also the *logs*, of the amplitude that counts). So consciousness (the mind) might as well be thought of as Huygens’s *wave fronts* or as the “phase velocity” from/on which Huygens’s *wavelets* (wave packets) emerge as per se *the information*.

And nothing should be lost if we generalize these definitions of the *it* and the *bit* to mean the same as “space” (think, Newton’s “absolute time” or G) and “time” (Newton’s gravitational force “g” or “relative space”). But then Einstein’s space-time takes an inverse meaning to what it has in GR (where it is understood that the presence of mass does curve space-time, or vice versa). Space-time means simply now the evolution i.e. interference (superposition) of space and time. The idea again is that space-time (simultaneity or equality by any name) is simply the uncertainty or cut-off i.e. the observer per se and which *observer* per se as the phase-space is a non-trivial attribute. This may sound like a wild claim but then it is much like stating the conventional wisdom in QM that free space is agog with energy fluctuations and the accompanying creations and annihilation of particles, or indeed vice versa. The simplification now is that free space is the imaginary unit/axis (otherwise known in physiology as perhaps the “unconscious”; in thermodynamics as the “entropy”; in cosmology as the “interior” of a black hole vis-à-vis its event horizon; in black body radiation perhaps the “Planck constant” vis-à-vis the so-called “first” or “second” radiation constant; in Compton’s/Born’s collisions perhaps the “Compton wavelength”/“center of mass” vis-à-vis the reduced Compton wavelength/surface of a particle; and etc. For every “equilibrium” there is an amplitude, and vice versa. This is intuitive Noether¹³)

One must note now that in so far as in a *virtual exchange* schema (wherein there is no net movement) *any* one side may be considered arbitrarily the positive side of a Kramer-Kronig relation i.e. as per se the valid *information* or “amplitude” of the perturbation one finds then that the John Wheeler program by assuming a-priori what side constitutes information and what does not is sure to fall into a kind of cyclic thought or the Zeno effect (for it would be a case of assuming that which is to be defined, a *petitio principia*, under some guise of pragmatism or anthropic principle.).

It is the kernel of our argument that as a remedy to this trap the axioms/theorems of Peano, Godel and Noether (and in the applied form perhaps of Huygens’, Pythagoras, Gauss, Hamilton, Laplace, Newton’s [third law especially] etc) altogether need to be understood wholesale as pure and simply the barest of natural laws; the theory of everything (if you like) say in the form of our axioms below:

- (1.) An *equality* is an entity (think of this as the invariance or “conservation law” and as per se *the observer*)
- (2.) The entity is *not an observable* whatsoever (it is the superposition or “connectedness” of all things else)
- (3.) Observables represent *inequalities* (perturbations; amplitudes; proportions) thereof.
- (4.) There can thus be one and only one *valid* (i.e. de facto) entity (every other would be hypothetical).

END NOTES:

Some More “Hovering” Data:

Basically we suggest now as a sequel to the de Broglie hypothesis that: momentum = equilibrium state if “energy” per se or “length scale” = a conservation law = Peano’s “constant” = any given (*de facto*) observer namely here h_0 . So h_0 must constitute the effective standing wave or “superposition” or “Compton wavelength” (i.e. the so-called rest mass-energy). Implicit is that the “Compton shifts” i.e. the so-called quantum decoherence or evolving interference patterns of the observer proper (the spontaneous symmetry breaking as it were) defines the observables or *inverse-length* or wavelets of Huygens’s or ultimately the speciation(s)/traits of/or Darwin’s evolution of species.

Suffice it to say now that in accord with the wave equation:

$$c = f\lambda \dots\dots\dots(9.)$$

and the de Broglie equation (in four-vector):

$$P = \hbar K \dots\dots\dots(10.)$$

we claim now that it should be valid that:

$$h_0 = \hbar_0 K \dots\dots\dots(11.)$$

Here we may see K as a wave packet (a four-vector inverse length; a wave number or envelope.) The important sense is that h_0 is the effective length scale (wave speed) such that K is in fact an inverse length (wavelength; wave number or wave vector) while \hbar_0 is the “frequency”, or vice versa. Given now that K is the unknown this expression becomes:

$$h_0 / \hbar_0 = K \dots\dots\dots(12.)$$

The value of K is precisely thus: $4.79717 \times 10^{-10} \text{ s}^6 \text{ C}^4 / \text{kg}^3 \text{ m}^8$. We interpret “K” then as representing CODATA (1 Hz)h/k = $4.799\ 2434(44) \times 10^{-11} \text{ K}$. Also note the result when instead we take h_0 as the base of \hbar_0 , then $K = 2.08456 \times 10^9 \text{ kg}^3 \text{ m}^8 / \text{s}^6 \text{ C}^4$ possibly indicative of CODATA: (1 K)k/h = $2.083\ 6618(19) \times 10^{10} \text{ Hz}$ namely the Boltzmann constant in Hz. Here we do away indirectly with the proverbial speed of light; our phase-space (coherence, wave speed or “pure quantum state”) is simply h_0 .

And then to get the reciprocal of K given that the inverse of a log operation is exponentiation we have that:

$$(\hbar_0)^2 = u \dots\dots\dots(13.)$$

In which here u is precisely: $1.31449 \times 10^{16} \text{ kg}^8 \text{ m}^{20} / \text{s}^{16} \text{ C}^{10}$. We may take “u” then as representing or at least replacing as a prediction the CODATA value: $(1 \text{ m}^{-1})h/c = 1.331\ 025\ 051\ 20(94) \times 10^{-15} \text{ u}$

Generally speaking, “ h_0 ” is the *observer* as defining any *entity* (pure quantum state/scale) or a “life” or “space-time” or “thermodynamic equilibrium” generally a “conservation law”. Accordingly \hbar_0 is the “time” and K is the “space” —these latter two as meaning any *two* observable traits/symmetry/charges/species i.e. any differences (inequality) of/or traits as measured by the given observer (space-time). In other words, an entity (observer) is by definition a unique unit of measure of such differences (the entropy).

Clearly this function of being at once the unit-and-limit is the essential utility of such as Planck’s h, Newton’s G, Einstein’s C, indeed any universal constant (they are related only in so far as for specific purposes one must be found to be more natural i.e. *de facto* than the other). This same property by which an element is at once the *unit and limits* of whatever dynamics is what we mean here simply by the term *observer*.

To bring out this so-called relativistic (mass-energy) or “conservation law” attribute of our specific observer now namely h_0 let us note immediately also the following sequence of supporting data:

$$C / h = 4.52444e+41 / \text{kg m} \dots\dots\dots(14.)$$

Wherein c and h are respectively speed of light and Planck's constant (CODATA page 81). Meanwhile:

$$h_0 / h = 8.30054e+31 / \text{s C} \dots\dots\dots(15.)$$

wherein h_0 is our man value (the action potential in man). And then:

$$C / h_0 = 5.45077e+09 \text{ s C} / \text{kg m} \dots\dots\dots(16.)$$

Note meanwhile that this value suggests to be a rephrasing or correction of Einstein's c^2 in the mass-energy equation $E = mc^2$ such that we have now as the more *natural* value to man h_0 more like the *root* and not the *square* of speed of light. You may otherwise consider this as representing instead the square of value of the Hartree energy in eV per E_h . (See again CODATA page 81).

To start with we can consider it as relating c , h , G and now man h_0 that:

$$G / h_0 = 3.83810083 \times 10^{16} \text{ m}^{-2} \text{ kg}^{-3} \text{ s}^3 \text{ A} \dots\dots\dots(17.)$$

“G” being here in the $(\text{GeV} / c^2)^{-2}$ unit is defined in CODATA as $(G / \hbar c)$.

These relationship require investigation. Crucial in any case must be the fact that going strictly by the indicated dimensions, equation (16.) is sort of the conversion factor if “unification” of equations (14.) and (15.). So what is significance of the value $3.83810083 \times 10^{16} \text{ m}^{-2} \text{ kg}^{-3} \text{ s}^3 \text{ A}$? Possibly the reduced Compton wavelength of the electron (or more precisely its reciprocal) or rather the so-called first radiation constant, see CODATA page 74 and 78. This is granted our man value h_0 is the effective “universal wave function” i.e. “Planck constant” for the so-called classical scale. Now as heightening this suspicion note that:

$$(3.83810083 \times 10^{16} \text{ m}^{-2} \text{ kg}^{-3} \text{ s}^3 \text{ A}) / 1.14651 \times 10^8 \text{ kg}^4 \text{ m}^{10} \text{ s}^{-8} \text{ C}^{-5} \\ = 3.34763833722 \times 10^8 \dots\dots\dots(18.)$$

this solution being suggestive of the reciprocal of speed of light (CODATA page 81) when the denominator is h_0 from equation (1.).

It seems then we must regard significance in GR of the speed of light not strictly as an exclusive attribute of light as defined by man but as being the physical status of any phase-space (any given *observer*). Otherwise we have a problem agreeing with a bat for instance (which perhaps “sees” more clearly via echolocation) what exactly we mean by “light” much less its speed.

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