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The Origin of Gravity and Universe

By Markos Georgallides

Abstract- In prior Articles[68-70] was shown that all Particles are Quaternion having, their mass as the Real part and energy as their Imaginary part. Energy is the Work produced, i.e. a force acting on a Displacement in One-Two and or Three directions, and which is conserved. In order that this *Motion is conserved as Displacement* in all directions, then this Displacement must be kept, *Quantized*, in a Finite Space differently is annihilated. In Mechanics the only-possible motion in a Finite-Space, is the Periodic excitation and the Revolving motion. Oscillation or Displacement is the Removal of a point A to another point B, not coinciding with point A. Vibration is the Periodic motion of a point A to another point B and vice versa. Line-segment AB is the Material-Point, *the dipole*[$\oplus\leftrightarrow\ominus$] *of the Material geometry*, in-where Point A is the Positive $\oplus$ and Point B is the Negative $\ominus$. Material Points, Segments etc. consist the Physical Structures.

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The Origin of Gravity and Universe

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In the finite-Space, *cave* r, of the Material-point *is stored the Work*, *or the motion*, produced by the eternal rotation of opposites, which Work becomes from the *Angular-Momentum Vector* $\overline{\mathbf{B}}$ *,* which is equal to the *Golden-ratio-Spin,* and is stored in the r cave fix-ends *as a* r – *Stationary Wave* with the infinite *Golden-ratio-frequencies* $\mathbf{f_P}$, $[\mathbf{f_1}..\mathbf{f_n} \rightarrow \mathbf{f_\infty}] \equiv \mathbf{B_P} \equiv$ The Box $\mathbf{B_P} \equiv$ *The moving Energy-Storage*. The Golden ratio frequencies are $\rightarrow \mathbf{f_n} = (\frac{n\sigma}{8\,r^2}).\overline{\mathbf{B}} \equiv \frac{(1+\sqrt{5}\,]\,).\sigma}{4\pi r} = \frac{E}{h}$.

Gravity is the minimum energy becoming from the in-storages acceleration a = v²/r ≡ 9,8076941 *Photon is a Material-point* ,a Box$\mathbf{B_P}$, *with the fix-ends Inward-caver*, *which is the Energy Storage* $\mathbf{B_P}$, and *Outward caver* as *an Electromagnetic Radiation* on wavelength $\lambda = cT = c/\mathbf{f_P}$ *which carries* Box $\mathbf{B_P}$. *Electromagnetic Radiation follows* the*Golden-ratio-frequency*, $\mathbf{f_P}$,of *Photon, produced in Box* from the *Centripetal-Centrifugal forces* equal to main *Stresses* $\pm\,\sigma$.
This is the Why Golden-ratio-frequency $\mathbf{f_P}$ exists in nature from the micro to the macro scale.

Energy as motion defines In-Box the minimum *Resonance-Golden-ratio-frequency* $\mathbf{f_R} = \mathbf{f_1}$ which *follows Kepler constant for microcosm* and frequency $\mathbf{f_R}$ defines in Outer-Box the *Electromagnetic Radiation* which is the *Conveyer*, *the carrier* of energy-cave r, *All above Physical Structures Vibrate, oscillating under the action of the Inherent forces and are the Instruments that the→Golden-ratio-frequency* uses←to Kick-Start *everything in this world*.

I. Introductory Summary

Quaternion is a Mould, a form, where exists Segment AB with points A and B, and their Inherent-forces. These forces exist in Material-Point only, because of the eternal rotation of the ⊕ constituent around the ⊖ constituent [⊕↻↺⊖] and thus creating an *Angular-momentum-Vector*, $\overline{\mathbf{B}}$,an *Angular-velocity-Vector* $\overline{w}$, and the Work produced equal to→ $W = 2L = \overline{\mathbf{B}}.\overline{w} = J \cdot w^2 \leftarrow$ consisting the First-Energy-Store. In Material -Point $\overleftrightarrow{AB}$, this Energy-Store as a *Stationary Wave* with, n, lobes, which Outwards becomes $\overleftrightarrow{AB}$, *under conditions*, an *Electromagnetic Radiation*, i.e. it is the only way of transporting motion ≡ energy. Energy of all these *Moving-Energy-Stores* is dependent on the *Golden -ratio- frequency* of cave $\overleftrightarrow{AB}$, (not intensity).This *Electromagnetic Radiation* while travelling interacts with another matter by Emitting and Spreading Energy as Stretching [⊕↔⊖]-[$\bar{v}.\nabla i$] and Bending [⊕↻↺⊖]-[$\bar{v}.\nabla i$]following the Breakage-principle. For compound monads as atoms are, these move in the same or opposite directions as the bonds shrink or stretch while, the bending occurs when different, *two,* atoms move downward and Upward away from the axis-lobe. *All above exist in Photon.*

In [64-70] is analyzed The How Energy from Chaos [$\pm s^2\nabla i$] ≡ MFMF Field becomes Spin S≡ $\pm\ \Lambda\nabla i \equiv \overline{\mathbf{B}}$ of the Discrete Elementary monads which are the constituents of the Breakage-Principle as is, [Space ↔Anti space – Energy ≡ motion] ≡ [⊕↔⊖]-[$\bar{v}.\nabla i$], or, [⊕↻↺⊖]-[$\bar{v}.\nabla i$],

In [65-70]is analyzed, The Spin S≡ $\overline{\mathbf{B}}$ of monads and their Energy Stores as frequencies, $\mathbf{f_n} = (\frac{n\sigma}{8\,r^2}).\overline{\mathbf{B}}$

In [66-70]are analyzed The Energy-Stores in monads which are the n *loops* → $W_{n(n+1)} = [\frac{4\pi r^2 f1}{3}].n.(n+1)$ $\mathbf{f_1} = \frac{(1+\sqrt{5}\,]\,).\sigma}{4\pi r} = \frac{E}{h}$ and n = 1,2,3,4… n = $w^2 = [2\pi f\,]^2 \ldots \infty$, Body [$\mathbf{B_P} \equiv$ EM-R ≡ $\mathbf{f_{1=N}}, \mathbf{f_2}, \mathbf{f_3}, \mathbf{f_D}, , \mathbf{f_n}$].

In [70] is analyzed, Energy-Structure of Atoms-Photons, where Kinetic-Energy as Electromagnetic wave moves Outward the cave, following Breakage-Principle which is → {(+)EF⊥(-)MF →$\lambda = \frac{c}{f} \equiv$ E-loop}.

One of the most important concept in geometry is, *distance*, which is the Quanta in geometry, while in Material-Geometry the composition of opposite, *the Material-point*, which is the Quanta in Chemistry and Physics. *As in Algebra* Zero, 0, is the *Master-key* number for all Positive and Negative numbers and this because their sum and multiplication becomes zero, *and the same* on any coordinate-system where ± axes pass from zero, *Exists also Apriori in Geometry the Material-Point* in where the Rolling of the Positive ⊕, constituent on the Negative ⊖,

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constituent, creates the Neutral Material point which Equilibrium , and consists the *First – Discrete - Energy-monad* which occupies, *Discrete Value and Direction*, in contradiction to the point which is, nothing, *Dimensionless* and *without any Direction*. Material-point was proved to be the *First Energy monad* because occupies a Space, *a Cave ≡ Store*, in where exists an Eternal intrinsic rotation with a constant Angular-velocity $\bar{w}$ and an Angular-momentum vector $\bar{B}$. This Angular – momentum is identical with *Spin*, which is trapped in caves`s loops and which are in Phase with each other. From the definition of Work, *Work = Force* x *Displacement = Energy,* results the where this Energy as, *Momentum Vector*$\bar{B}$≡ *Spin ≡ Energy,* is stored in this, r cave.

Is was proved, the, r, cave, IS, *Outward a Stationary Box*, *Inward a Stationary Wave*, with infinite Frequencies $f_1 \ldots f_n \rightarrow f_\infty$ and with Energy, $E = h.f_n = \frac{h(1+\sqrt{5})}{4\pi}$. $[\frac{\sigma}{r}] = (\frac{n\sigma}{8\,r^2})$.Spin$\bar{B} = W_d = v^2\ [\frac{h}{2\pi}]$. and the outward Electromagnetic Radiation in Storage $B_P$as $[B_P \equiv cT \equiv$ EM-R $\equiv f_{1=N}, f_2, f_3, f_D, , f_n\ ]$.

Photon is a Particle and also an Electromagnetic Wave with above properties and because Material-Point originates from Cycloidal-motion, *Changes Outward to a Rotating Box* and this of Space –Anti-space. *Monad in Mechanics and Physics* is → The Material-point = *the discrete continuity* $|\{\oplus+\ominus\}| =$ *The Quantum*through mould of Space –Anti-space in itself, *which is the material dipole in inner monad Structure and is Identical with the Electromagnetic cycloidal field of Energy monads. This is* the Energy distance, ds ≡ $|\oplus\circlearrowright\circlearrowleft\ominus|$, *the deep concept of Material-geometry.*

Energy monads presuppose Energy-Space Base (*the caves beyond Planck`s length, Gravity`s and Spaces levels*) the [PNS] Space Anti-Space as work → $W = \int P.ds = 0$, which is the cause of Spaces existence and the motion of particles. Since are also Quantized, then this property is encountered in Stationary waves where energy, E, is proportional to angular velocity w. This property of particles, *Angular momentum*≡ The *Spin*, becomes from the Intrinsic, *Inward*, *cycloidal wave motion* , where is then produced centrifugal acceleration which causes the external motion *as outward waves as Photon*. [43]

The varying lever arms, on cycloid-evolute is the cause of vibrations and which cause the EM-waves and Spin. Common-circle of radius, r_c, is the common source of vibration excitation for the Space, Anti –space, considered as rotating with angular velocity, w, and then their relative motion becomes the, Rolling of Space, ABC, on Anti-space $A_E B_E C_E$ and since also this relative motion is applied on STPL[Six Triple Points Line] Mechanism, then D_A, P_A , points on it are the corresponding linear links of vibrations and Poles of rotation. [STPL] is a *Geometrical Mechanism* that produces and composite all opposite Space and Anti - space Points to *Material-points* → Waves ← the three velocity - Breakages $\{[s^2 = \pm (\bar{w}.r)^2, [\nabla i] = 2(wr)^2]$ of [MFMF] mechanism under $\bar{v} = \bar{c}$ thrust }, and through it becoming, *The Fermions* →$[\pm\bar{v}.s^2]$and *The Bosons* → $[\bar{v}.\nabla i = [\bar{v}.2(\bar{w}.r)^2] = [\bar{v}.2s^2\ ]$, [35] It was shown [33-36] that Un-clashed Fragments through center, O, consist the Medium-Field Material-Fragment → $[\ \pm s^2\ ] =$ [MFMF] ≡*The Chaos*, as base for all motions, and Gravity as force $[\nabla i]$, whilethe clashed with the constant velocity, $\bar{c}$, consist the Dark matter $[\ \pm \bar{c}.s\ ]$ and the Dark energy $[\bar{c}.\nabla i]$, *declaring that* → Antimatter-Galaxies and Antimatter – Asteroids can exist only as Dark-matter or and Dark-Energy and Not as Antimatter light, - c, alone, or from → velocity - Breakages, $[\ \pm s^2 = \pm (wr)^2]$ and $[\ \nabla i = 2(wr)^2\ ]$, where then become Waves {*The distance* ds = $|AA_E|$*is the Work embedded in monads and it is what is vibrated* }with the Vibrating equations of motion, to become,

A → Particles , with Inherent Vibration occupying distancer = ds = $|AA_E|$,
B → Gravity-Field-Energy without Vibration, the only Stationary-rotating material-points.
C → Dark-matter-Energy constituents as below,
A. $[\ \pm\bar{v}.s^2]$ → Fermions, *Quarks and Leptons*, and → $[\bar{v}.\nabla i]$ → Bosons,
B. $[\ \pm s^2]$ → [MFMF] Field ≡ *The Energy - Chaos*, and the binder Field is $[\ \nabla i\ ]$ → Gravity force,
C. $[\ \pm\bar{c}.s^2\ ]$ → Dark matter, and the binder Gravity force $[\nabla i]$, $[\bar{c}.\nabla i]$ → The Expanding Dark energy, which both are moving with light velocity, c, causing the universe to grow.

From above in, A, *and,* C, *case → Energy as velocity,* $\bar{v}$*, exists in the Discrete monads,* $\pm\bar{v}.s^2$ *and* $\pm\bar{c}.s^2$. B*, case, → is the transportation of Energy,* from Chaos*, to the Stationary-pointy-Material points,* Dark Energy DE ≡ $[\bar{c}.\nabla i]$ (©) → Acting on the Five Constituents → $\{(\nabla i),(+s^2),(-s^2),(+cs^2),(-cs^2)\}$ gives $[\ \pm s^2\ ]$ → MFMF Field $[\bar{c}.(\pm s^2)\ ]$ → DM-DE Field, of, Dark matter and Anti-matter. $[\ \pm\bar{v}.s^2\ ]$ → Fermions $[\ \nabla i\ ]$ → G_f= Gravity-Force in DM-DE Stationary Field . $[\bar{v}.\nabla i\ ]$ → Bosons, $[\ \bar{c}.\nabla i\ ]$ ≡ DE → Dark Energy c x (©)$[\nabla i\ ]$ → Gravity Force DE ≡ $[\bar{c}.\nabla i]$ $=\bar{c}[\nabla i]$ = The Travelling-Energy with, c, velocity.
In all above is proved that issue Kepler-Orbit-laws, denoting that Macrocosm and Microcosm Obey Newton`s Laws of motion in all Scales.

Photon isa Material-point, the moving Storage or box $B_P \equiv [B_P \equiv$ c /$f_1 \equiv$ EM-R $\equiv f_{1=N}, f_2, f_3, f_D, , f_n\ ]$ with the fix-ends *of a standing wave Inward-caver* the Energy–StorageB_P, and *Outward-cave*r as an Inverse-Electromagnetic-Radiation on wavelength $\lambda = cT = c / f$, which I-E&M-Radiation *carries* the *Energy-Storage* B_P, *as the wings of an insect which carry their body*.[70]

In [68] is shown that Motion may be *Linear or Rotational* for any displacement ,r, so exists a constant-work → $k = \bar{v}x\bar{v}.\bar{r} = v^2.r.\ \bar{n}.$→ $k = v^2.\ r = (wr)^2.r = [\frac{2\pi}{T}r]^2.r = \frac{4\pi^2 r^2}{T^2}\ r = \frac{4\pi^2 r^3}{T^2} = 4\pi^2.\frac{r^3}{T^2} = 4\pi^2.r^3.f^2{}_p$ ← It was shown that Photon is a Material-point, a box B_P , with the fix-ends inward-cave r, called the Energy-Storage-Box B_P and Outward cave r as an Electromagnetic Radiation on wavelength $\lambda = cT$, which carries the Energy-Box B_P. Conservation of energy is the Placing of frequency f_p in a cave r.

A Photon during Motion in [MFMF] Chaos, collides with other Photons by means of Cross-Product and produces a constant Work which is stored *into the Only-Four* Energy –Geometrical-Shapes, of the motion which are the Conic-sections. The Interior motion is kept in its Wavelength-Tank $2r = n\lambda$ while the Linear motion is continued by the Propagating Electromagnetic-Wave → as Energy-conveyer, i.e. The stored energy in the loop is → $W_1 = v^2[\frac{h}{2\pi}] = 4\pi^2.r^3.f^2{}_p$, and is dependent on velocity, v, and on Planck`s constant h, or *on loop*, r, *and frequency*, f_p. It is proved that $k = g$ = Gravity acceleration. *Photon is quaternion and when colliding with other particles the Complex frequency Response* H(w) *is given by the Imaginary - Part as H(w)* = -i.[1/2ζ]*only, while the Real - Part is zero.*

a. *Kinetic Energy*, *motion*, *in Orbits* becomes from the, *Piezoelectric-effect*, where Orbit is subject to a Mechanical-stress, $\sigma = \pm \frac{4\pi r}{(1+\sqrt{5})}.f_p$, *becoming from the Centripetal-acceleration* $\bar{a}_P$ *of the Planet* and thus is appeareda Positive charge at the *Nucleus* and a Negative-charge at the *Planet*, so is created an electric-signal with a given frequencyf_p. The two faces at N and P are connected by the in-between *Energy-Vectors* $\bar{B} = \frac{\pi r^3 \sigma}{8}[1+\sqrt{5}] \equiv$ Spin, of the Gravity-field-Material-Points $[\nabla i] = [\oplus \circlearrowright \circlearrowleft \ominus]$.

b. *Orbit* or, *Negative – Energy-Rim in monad Atom,* is the Stable and Stationary Granular - lattice-Energy-Disk, which is kept in the Plane-Orbit of motion*, Ellipse area* πab*, in Gravity–field*, and in a way is *Opposite* to that which *follows the Central motion*, i.e. the Gravity-Force-Vectors $\bar{B}$ of Material-points-Spin$[\oplus \circlearrowright \circlearrowleft \ominus]$ *-is packet into the Orbit-Rim as the Energy-Granular-Conveyer* for the interactions between*,* Nucleus N and the orbiting object, *the* Planet P*,* and consists the quanta, *the minimum constant energy*, MCE, of rotational motion → $[\oplus \circlearrowright \circlearrowleft \ominus]$ ← and equal tog. It is proved that MCE = g, is the same in atoms and galaxies and in microcosm and macrocosm.

c. *Energy Changes in Reactions* [The Breakage Principle is as Matter ($+s^2$), Antimatter ($-s^2$) and as Energy part, $2L = \pm 2s^2$, replacing the two conservation laws of Energy and mass]. When a *Chemical reaction* occurs , then Bonds in the *Reactant* Break, while new Bonds Form in the *Product*, issuing≫Reactants± Energy → Products, as example *The Hydrogen* reacting with *Oxygen* to form water as $2H_2(g) + O_2(g) \rightarrow 2H_2O\ (g)$

In this reaction, the bond between the two Hydrogen atoms in the H_2 molecule will break as the same will the bond between the Oxygen atoms in the O_2 molecule. *Breaking and Formulation of Bonds* is as *Absorbing or Releasing energy*. *A Proton* p, in nucleus and an *electron* e, form a neutron N and a neutrino, v, or $p + e^- \rightarrow N + v$ issuing ≫ Reactants → Products± Energy In Atoms-Orbits issues the same Energy-Principles, beginning from the lowest Energy-point of the energy-path with $r > 0$.

Question ?? How and When lowest-Energy-point changes to r→ 0.

d. *Black Holes* Follow Kepler laws where , *On any moving Particle when is Tangentially-colliding* or *under any angle* φ *with a Material-Point executing Circular motion*, the Total Energy is Negative*,* the Particle follows constant Elliptical-Energy-Orbits on the same semi major axis as, $1 = C.f_n{}^2.a^3$, and of the same constant Energy .C = 1/k is a State-space-constant for min-energy g . Semi major axis ,a, is related to energy as → a = GMm / 2E, where energy E is related to axis a , in inverse way in each Energy-Path independently of any other reaction, but only when in *State-Space* . i.e. for very large Energies ,semi major axis tents to a Negative-Energy-Point , which is the beginning of the Black hole in microcosm and macrocosm. *For axis* a → 0, *then* $f_n \rightarrow \infty$, which is Black-hole.

II. The {N} Energy - Storagesof the Moving –Monads

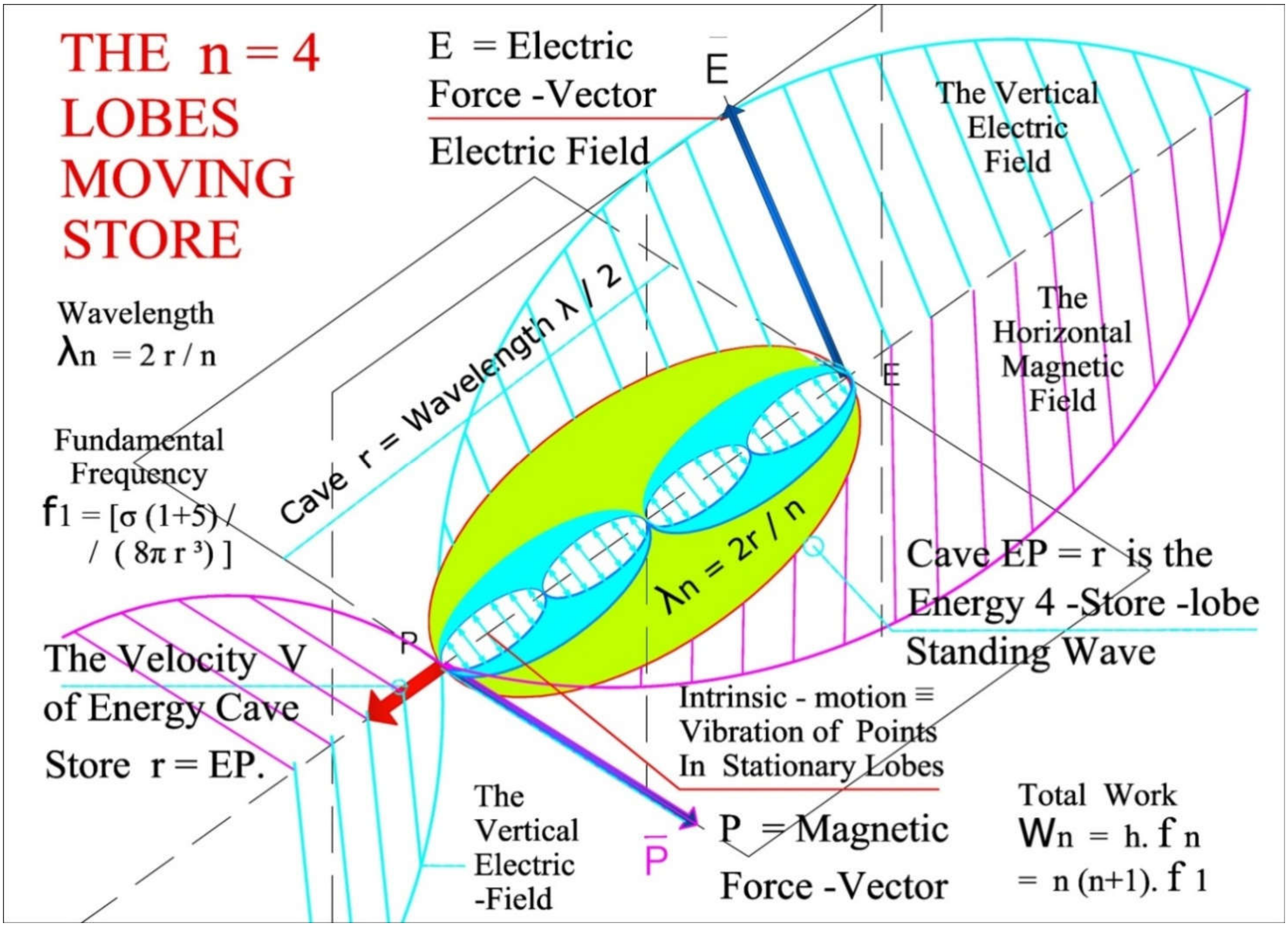

Figure 1: The Photon as a n-Lobes *Energy-Store* ≡ Particle ≡ [nλ=2r] *and* E-M *Wave* ≡ [λ=cf]

In Store, r, Wavelength $\lambda_n=\frac{2r}{n}$, Fundamental-frequency $f_1=[\frac{\sigma(1+\sqrt{5})}{4\pi r}]$, Work = Energy = h.$f_1$

The Energy-Storage length E-P= λ/2, and is composed of 4 Lobes with $\lambda_4=\frac{2r}{4}$, $f_4=\frac{4v}{2r}$ = 4f_o , $W_4=\frac{h}{2r}v_4$

for → Total-Work W = $[\frac{4\pi r^2 f1}{3}]$.n.(n+1) or W = $\frac{80.\pi r^2 f1}{3}$, $v_4=\lambda_4.f_4$ =4.$\lambda_4.f_o$

n = 1 → f_1 = 1 . $[\frac{\sigma(1+\sqrt{5})}{4\pi r}]$, Wavelength $\lambda_1=\frac{2r}{1}$, Energy $W_1=[\frac{4\pi r^2}{3}].f_1$ = 1.$\frac{(1+\sqrt{5})\sigma r}{3}$

n = 2 → f_2 = 2 . $[\frac{\sigma(1+\sqrt{5})}{4\pi r}]$, Wavelength $\lambda_2=\frac{2r}{2}$, Energy $W_2=[\frac{4\pi r^2}{3}].f_2$ = 2.$\frac{(1+\sqrt{5})\sigma r}{3}$

n = 3 → f_3 = 3 . $[\frac{\sigma(1+\sqrt{5})}{4\pi r}]$, Wavelength $\lambda_3=\frac{2r}{3}$, Energy $W_3=[\frac{4\pi r^2}{3}].f_3$ = 3.$\frac{(1+\sqrt{5})\sigma r}{3}$

n = 4 → f_4 = 4 . $[\frac{\sigma(1+\sqrt{5})}{4\pi r}]$, Wavelength $\lambda_4=\frac{2r}{4}$, Energy $W_4=[\frac{4\pi r^2}{3}].f_4$ = 4.$\frac{(1+\sqrt{5})\sigma r}{3}$

In figure r = λ/2 = EP is the *Energy-Storage- monad* → {[B_P ≡ EM-R ≡ $f_{1=N}$, $f_2, f_3, f_D,, f_n$] with wavelength $\lambda_N=\frac{\sigma.(1+\sqrt{5})}{4\pi r}$ = $\frac{n.\bar{B}}{4\pi r^2}$, velocity $\bar{v}$ = w.r}, following the *Breakage-Principle* for monads which is Quaternion $\bar{z}$ = [s + $\bar{v}\nabla$ior → s² - |$\bar{s}$|² + 2|s|².∇i← →[εE² + μB²] ≡ *The monad EP* as,

Matter(+) ≡ Magnetic-field → [μB²]

Antimatter(-) ≡ Electric-field →[εE²]

Energy (+↔ -)≡ Motion in n lobes → [$\partial E/\partial t$, $\partial H/\partial t$] i.e.

The stationary-cave-lobes, as motion in the B_P≡r = n [λ/2]Energy-Storage.

Energy-Storage-monads are consisted of the above *three-constituents* all-together, or each-one of them Work ratio

$$W_n / W_1 = f_n / f_1 = n\,(n+1)\,.[v_n/v_1] = n\,(n+1)\frac{\lambda_n f_n}{\lambda_1 f_1} = n\,(n+1)\frac{n\lambda_n f_n}{2r.f_1} = n^2(n+1)\frac{\lambda_n}{2r} = n\,(n+1)$$

i.e. n.λ_n = 2.r or

The Work, W, *produced from the Wave-Energy-Pattern with wavelengths* $\boldsymbol{\lambda_n}$, *and created from all Points of the Periodic Oscillation in any Cave,* r, *is Stored into the,* n, *Integer and Energy - Lobes of cave* r. From Mechanics, the *Only - Possible motions* are, *the Periodic excitation*, and *the Revolving motion* therefore all *Moving - Energy - Stores travel* as *a Wave and Not* as a *Particle* . The n, Energy tanks, the N Antinodes in its Store $2\lambda = r = h/p \equiv [\mathbf{f_1}, \mathbf{f_2}, \mathbf{f_n} \equiv$ n lobes] follows the *Stationary-Wave-Nodes-Principle, i.e. The Glue-Bond-Stress Rotation of opposites on Small - circles creates* Integer number of lobes*, which is the Wave-Nodes-Principle of the moving-energy-stores* , one of which is the Photon.

III. Monads from the Stationary Chaos:→ *Wave Energy - Pattern*

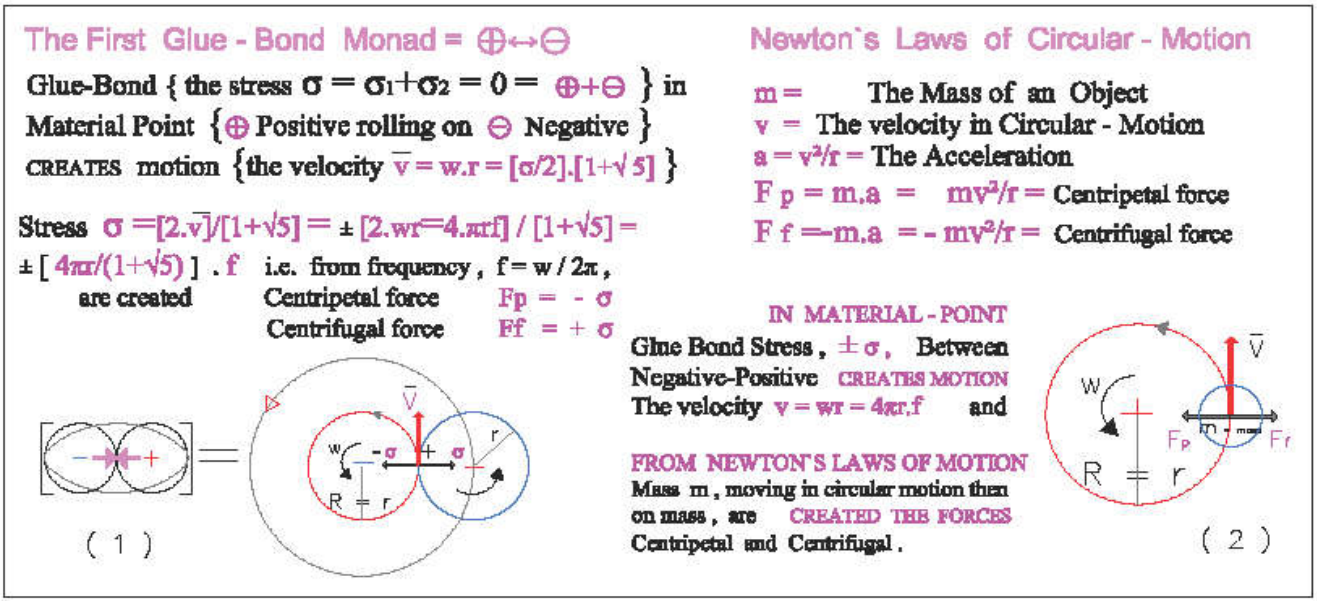

Figure 2: The *Glue-Bond* of opposites in Material-Point *Create the Centripetal-Centrifugal forces*

In (1)The Glue-Bond pair of opposites [⊖⊕] in MFMF Field, *Creates Rotation* with angular velocity w = v/r, and velocity v = w.r = $\frac{2\pi r}{T}$ = 2πr . f = $[\frac{\sigma}{2}].(1+\sqrt{5})$, and or *the golden-ratio frequency* f = $\frac{(1+\sqrt{5}]).\sigma}{4\pi r}$, with Period T = $\frac{4\pi r}{\sigma(1+\sqrt{5})}$ where ± σ, are the two equal and opposite, Centripetal $\mathbf{F_p}$ and Centrifugal $\mathbf{F_f}$ Glue-bond forces.

In (2) Mass, m, of an object rotating with velocity, $\bar{\mathbf{v}}$, in a cave of radius, r, creates a pair of equal and opposite forces the Centripetal $\mathbf{F_p}$and Centrifugal $\mathbf{F_f}$.

Newton`s, First - Law states that, *Any change in motion involves an acceleration, a*.

In circular motion, for an object of mass, m, acceleration is equal to, a = $\frac{v^2}{r}$ and force, F, acted is F = m a = $\mathbf{m}\,\frac{v^2}{r}$, which is the Centripetal force $\mathbf{F_p}$.

From Newton`s Third-Law, *All forces in the universe occur in equal but opposite directed pairs*, then For any *Centripetal force*, $\mathbf{F_p}$, there is a force of equal magnitude but of opposite direction, the *Centrifugal force*, $\mathbf{F_f}$, which acts back on the object, *without specifying the nature, or origin of forces*.

In Material-point, [⊕⊖], *both forces exist apriori*, as the Glue-Bond between the two opposites which is the main Stress σ = ± $\frac{2.v}{(1+\sqrt{5})}$, and since v = w.r = 2πr/ T = (2π.r) .f = $\frac{(1+\sqrt{5}]).\sigma}{2}$, dependent on, σ, only where r = the radius of the Energy cave ≡ *Store*(*the inner monad discrete Chaos*). f = the frequency of this rotation where, *then*

$$\sigma = \pm \frac{4\pi r}{(1+\sqrt{5})} \cdot \mathbf{f} \text{ or } \rightarrow f = \frac{\sigma\,(1+\sqrt{5}])}{4\pi r} \qquad \text{(a)}$$

i.e. a relation between the Glue-Bond, σ, and the frequency, f, of the rotation, or,

In *Chaos* where r = r → 0 between the ⊕, ⊖, Opposites, exists a Stress, σ, The Centripetal $\mathbf{F_p}$, and Centrifugal force, $\mathbf{F_f}$, which nature is only the frequency in a complete rotation, and from Planck`s equation E = h.f

$= \frac{\mathbf{h(1+\sqrt{5}\,]).\sigma}}{\mathbf{4\pi r}} = \frac{\mathbf{h(1+\sqrt{5}\,])}}{\mathbf{4\pi}}.\ [\frac{\sigma}{r}]$, and then *from Chaos* r = r → 0, *becomes the Monad*, [⊕⊖], which is *the Neutral – Material – Point*. A wide analysis in [59].

IV. The Spin of Monads

a) Introduction

The intrinsic rotation of an elementary particle is called *Spin*, and is the amount of the quantized *Angular momentum* which is conserved as Potential or Kinetic Energy and *vice versa.* Is proved that *Spin is vector*, $\overline{\mathbf{B}}$, which interacts with magnetic fields and have an effect on bulk properties. The Glue-Bond motion in Material point (*The Rolling of the Positive on Negative*) may be either on Great-circles, or on Small circles in the two Semi-spherical of the Stationary [⊖] constituent. Motion of the [⊕] constituent on each Semi-Spherical of the [⊖] constituent, is in the opposite Direction, *and this accidentally because such is the Geometry of Space*, so this Property defines, Spin to be either Clockwise or Anti- clockwise, that is to say Positive [+] or Negative [-] *which is the Symmetry in Opposites* and where the Total Energy is L =[B/2].w.[70]

The Geometrical construction of the Particle`s Spin is shown in Figure.3.

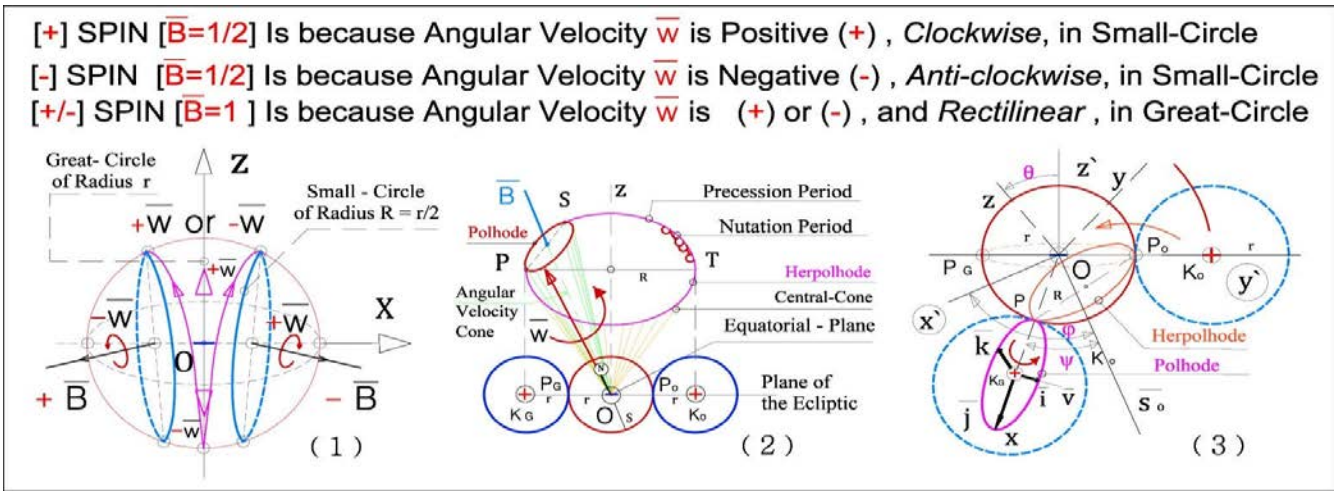

Figure 3: The How and Why, *Spin* is equal to 1 and ½

In (1) The Glue-Bond pair of opposites [⊖⊕] of the *Rectilinear motion for both,* the *Great circles* and *the Small circles,* creates on the *Stress-common-curve* rotation on circle of radius, r, with velocity v = w.r $= \frac{2\pi}{T}.r = 2\pi r.\ f = [\frac{\sigma}{2}].(1+\sqrt{5})$, where frequency $f = \frac{(1+\sqrt{5}\,]).\sigma}{4\pi r}$, Period $T = \frac{4\pi r}{\sigma(1+\sqrt{5})}$ and ±σ, are the two equal and opposite Centripetal, $\mathbf{F_p}$, Centrifugal, $\mathbf{F_f}$ forces. The Energy is → E = h.f$= \frac{(1+\sqrt{5}\,]).\sigma h}{4\pi r}$ *in Zero Wave-note ,* which is the *Golden ratio of* σ in the Material-Point. In (1) The Glue-Bond pair of opposites [⊖⊕] in the *Left Direction of Small circles*, creates rotation on circle of radius, R, with velocity v = w.2r $= \frac{2\pi}{T}.2r = 4\pi r.\ f = [\frac{\sigma}{2}].(1+\sqrt{5})$, where frequency $f = \frac{(1+\sqrt{5}\,]).\sigma}{8\pi r}$, Period $T = \frac{8\pi r}{\sigma(1+\sqrt{5})}$ and ± σ are the two equal and opposite Centripetal,$\mathbf{F_p}$, Centrifugal,$\mathbf{F_f}$forces . Energy is → E = h.f $= \frac{(1+\sqrt{5}\,]).\sigma h}{8\pi r}$in One Wave-note.

In (1) The Glue-Bond pair of opposites [⊖⊕] in the Right Direction of Small circles , creates rotation on circle of radius, R, with velocity v = w.2r $= \frac{2\pi}{T}.2r = 4\pi r.\ f = [\frac{\sigma}{2}].(1+\sqrt{5})$, where frequency $f = \frac{(1+\sqrt{5}\,]).\sigma}{8\pi r}$, Period T $= \frac{8\pi r}{\sigma(1+\sqrt{5})}$and ± σ are the two equal and opposite paradox Centripetal,$\mathbf{F_p}$, Centrifugal, $\mathbf{F_f}$forces. Energy is → E = h.f $= \frac{(1+\sqrt{5}\,]).\sigma h}{8\pi r}$ in One Wave-note.

In (2) The hollow-Cone of 90º, between angular-momentum-vector$\overline{\mathbf{B}}$and angular-velocity-vector$\overline{\mathbf{w}}$ when illuminated by a circularly polarized light beam, then any changes in Spin ≡$\overline{\mathbf{B}}$ of the-Polhode Cone POT and the exchange of Linear and Angular momentum between Electromagnetic fields and material media are shown as the profiles of the phase and the angular – velocity - vector in the POT cone cross-sectional plane, i.e. Space can be eternally twisted but cannot disappear. [70]

Measurements of Physical-Properties such as Position, Momentum, Spin and Polarization, performed on Entanglement particles gives rise to seemingly paradoxical effects considering systems as whole and the ERP paradox. The answer is given in Figure 3-(2) where is showed each Property of Material-point.

V. The Photon

Electromagnetic waves are created by the vibration of an electric charge.

In Material-point, the eternal rotation of the ⊕ constituent around the ⊖ constituent creates the, n, Energy-lobes in a tank $r = n\frac{\lambda}{2}$ or $\lambda = \frac{2r}{n}$ since the velocity of the wave is $\bar{\mathbf{v}} = f \times \lambda$. The frequency is $f = \frac{n.\bar{v}}{2.r}$ where n is a positive integer number as in Figure-1.

Because in lobes the inner particles are the [+], [-] constituents of Space and Anti-space, the maximum amplitude of each constituent is related with its position and each amplitude oscillates periodically as the wave equation

$$x = \mathbf{v_o}.\ \mathbf{sin\ wt} = A.\sin\left[\sqrt{\mathbf{(a/Am).t}} + \pi/2\right], \quad \text{.....(1)} \quad \text{where}$$

a. Velocity → $|\bar{\mathbf{v}}| = w.r/2 = \frac{2\pi}{2T}.r = 4\pi r.$, and $\mathbf{f_n} = \frac{n.v}{4r} = \frac{n\sigma}{8r}[1+\sqrt{5}]$,

b. Angular velocity→ $|\bar{\mathbf{w}}| = \frac{\sigma}{2r}[1+\sqrt{5}]$ and *Fundamental frequency* $f = \frac{(1+\sqrt{5}\,).\sigma}{4\pi r}$ in cave, r.

and then, *Wave propagate in Golden-ratio,* GR, as in a magnetic-device the arced pattern*, by travelling from the North to the South Pole and thus creating* GR *Inner-Electromagnetic-Displacement-current* $\rightarrow \boldsymbol{\partial E/\partial t}$, $\boldsymbol{\partial H/\partial t} \leftarrow$*and when reduced to one line as ,* $E \rightarrow \mathbf{\partial E/\partial t} \rightarrow H \rightarrow \mathbf{\partial B/\partial t} \rightarrow \mathbf{H}$.

This vibration of opposites creates a wave which has both an Electric, E, and an Magnetic component, H, perpendicular each other and is as

$$[E^2 + H^2] = 2.(2r).c.\mathbf{sin\ 2\varphi} \text{..... (2)}$$

and existstheSkin-effect .

This happens because of the difference in density *on Stress-common-curve* $\rho = \sigma$ instead – of$\rho = 0$.

This Property in Material-point Launches The Inner-Electromagnetic-Wave $[E^2 + H^2] = 2(2r).c.\mathbf{sin\ 2\varphi}$, of wavelength λ, *Outward λ*, as *The Outer Electromagnetic-Wave*→$\{[\varepsilon E^2 + \mu B^2] = 2.\lambda c.\sin.2\varphi\}$ ← and allows all the *Energy-Wave-Storages* to Propagate any Distance in Vacuum without dissipation.

This Inner-motion ≡ Work W, from the Wave-Energy-Pattern with Wavelengths $\boldsymbol{\lambda_n}$, is created from all ±Points of the Periodic Oscillation in any caver, and is stored in the n lobes as motion. This motion is conserved and is transported through vacuum at the speed of light c . Since Medium-Field Material-Fragment → [± s^2] = [MFMF] ≡*The Chaos*, is the base for all motions, *then issues,*

Motion of Photons: All motions create Work which is conserved, Motion presupposes velocity vector $\bar{\mathbf{v}}$ which, *when it is in motion collides with other velocity vectors* , creating a Constant Work k. Motion may be *Linear or Rotational* for any displacement, r, so exists constant-work → $k = \bar{\mathbf{v}} \times \bar{\mathbf{v}}.\bar{\mathbf{r}} = v^2.r$.

Constant-Work $k = v^2.\ r = (wr)^2.r = [\frac{2\pi}{T}\mathbf{r}]^2.r = \frac{4\pi^2\,r^2}{T^2}\,r = \frac{4\pi^2\,r^3}{T^2} = 4\pi^2.r^3.\mathbf{f^2_p}$ →The Kepler Laws *i.e. Photon during Motion in* [MFMF] *Chaos collides with other* Photons*, by means of Cross-Product produces a constant Work which is stored into the* Only-Four *Energy-Geometrical-Shapes, of the motion , the Conic-sections. The Interior motion is kept in its Wavelength-Box*$2r = n\lambda$, *and the Linear motion is continued by the Propagating Electromagnetic-Wave≡ the conveyer.*

The mechanism of *Energy-transport through a Medium* involves the *Absorption and the Reemission* of the wave-energy by the atoms of the material. Since Quanta of Energy occupy a finite space $\lambda = 2r$, as motion, then an electromagnetic wave impinging upon the atoms of a material, its energy is absorbed by the atoms of the material, and since Energy ≡ motion then occurs *Resonance*, and electrons within the atoms undergo vibrations. After a short period of vibrational-motion, the vibrating electrons create a *New Electromagnetic wave* with the same frequency as the first one and thus delaymotion through the medium. Because energy is related to wavelength λ, then once the energy of EM-wave is reemitted then it travels through a small region of space between atoms and once it reaches the next atom the EM-wave is absorbed and transformed into electron vibrations and then reemitted as an Electromagnetic-wave.

The actual *speed of an Electromagnetic-wave through a material-medium*, due to the Absorption and Reemission-process, is dependent upon the *optical-density* of the medium, or when their atoms are closely packed upon their, *material -density*. i.e.

Photon is an Energy-store r, in a Stationary-wave of wavelength n λ = 2r, consisted of n stationary lobes filled in λ with inner motion the Electromagnetic-Displacement-current, while is Outward Propagating with light speed as Energy-store λ = 2r / n, [+] Electric-field as Space, [-] Magnetic-field as Anti-space.

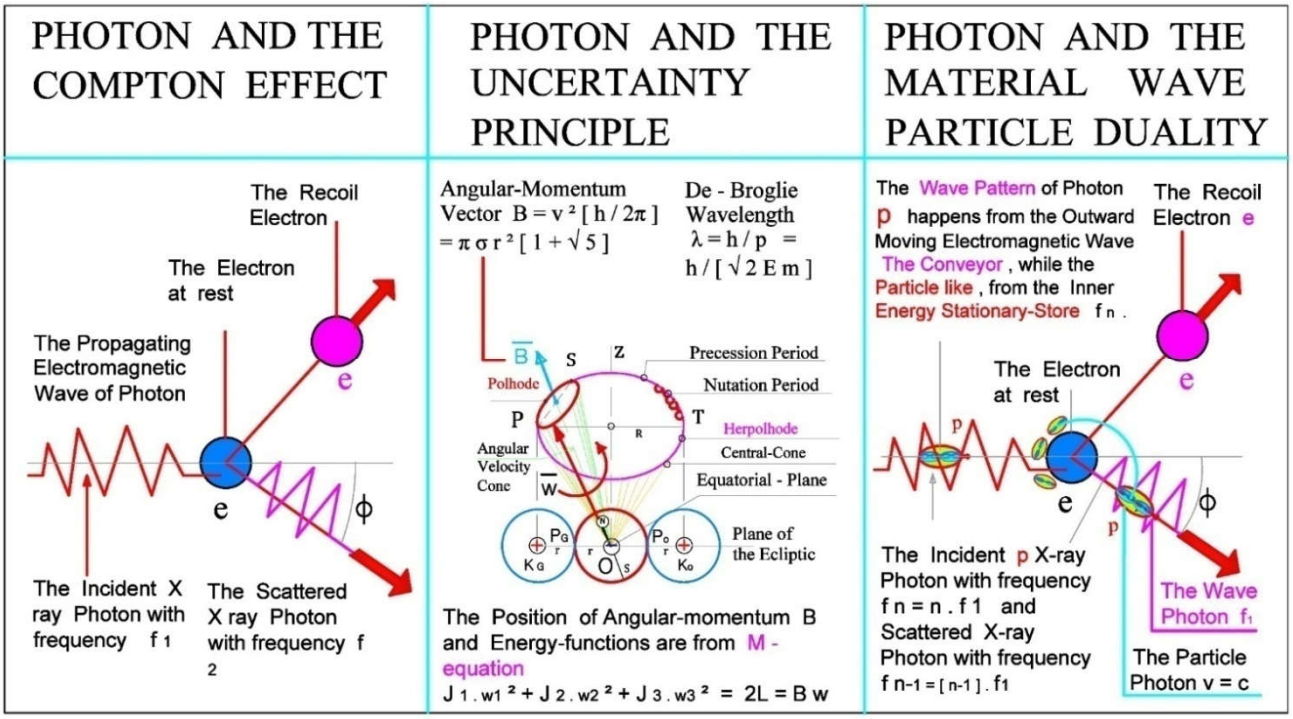

Figure 4: The Wave [$\mathbf{f_1} = (E^2 + H^2)$] - Particle [$\bar{\mathbf{v}} = \bar{\mathbf{c}} = \lambda f$] → Duality

1. The experiment of A-Compton, *light behaves as a wave*, is consisted on an X-ray Photon of frequency $\mathbf{f_1}$ which collides with a stationary electron and Scattered with frequency $\mathbf{f_2} < \mathbf{f_1}$ which is energy loss.
2. The Uncertainty Principle for the Wave-Particle accepts each particle with a definite momentum can be described by a Wave-function, which created the suspicious of finding a Particle in the biggest envelope of the wave . *Instead of it momentum* B*rotates into the, Angular – Velocity-cone.*
3. The Material Wave-Particle Duality: All moving Energy-Storages are *Standing –Waves*-Particles as *all Quantum-Particles*, and their *Propagating-Energy as Electromagnetic-Wave* is their Conveyer.

In Energy-Storages issues the *Stability of Equilibrium* and this is Energy-Rims ≡ Orbitals, also.

a. *Compton Effect*

The moving stores which are the EM-Waves are consisted of three parts,

1. The Energy-store $r = n.\frac{\lambda}{2}$, is consisted of, n, energy lobes in the Stationary –Wave of cave, r, as the *Golden-ratio-frequency* $\mathbf{f_n} = \frac{\mathbf{n\sigma}}{\mathbf{8r}}[1+\sqrt{\mathbf{5}}]$, and consists the Massive-energy-part of Photon, p.
2. The Vertical Electric-field E is perpendicular to r axis and consists the Space-energy-part of Photon.
3. The Horizontal Magnetic-field P perpendicular to r axis and field E , both being always in Phase and consists the Anti-space-energy-part of Photon.

b. *Wave-Particle duality and Uncertainty Principles*:

All quantum objects and Photon, exhibit Wave-like and Particle-like properties such as diffraction and interference on the length scale of their wavelength. Experiments confirm that the Photon is not a short pulse of Electromagnetic radiation because it does not spread-out as it propagates, nor does it divide when it encounters a beam splitter. Because Photon is a *Material-point* is absorbed or emitted as a whole by arbitrary smaller than its wavelength or even point-like electrons or small-systems. It was shown [66] that Photon which is an *Energy-Storage-monad* is consisted of *two-real-constituents*,*and one Energy.*

That imaginary-constituent which creates the Electromagnetic field, *is resulting from the local and Energy–cave*, by launching The Inner-Electromagnetic-Wave of monad λ = 2r / n outward the λ.

c. *Material Wave-Particle Duality*

The Recoiled-electron position can be resolved to the New position as well as the Scattered Photon of the Energy-storage by its new frequency. Momentum equal to Spin is not changed because issues the law of energy-conservation. Electromagnetic energy is supplemented by the incoming wavelength $\lambda = 2r/n$, or by angle φ. The Storage r, modifies the Intrinsic-radiation and avoids spontaneous emission.[68] A photon with $E \perp B$ wave when entering a transparent material, Photon is absorbed by an atom and the reemitted, because wave vector would not be preserved , by the material and there would be scattering .

Light Storage $r \equiv E \perp H$, using electromagnetically-induced transparency, interaction between photon and an Ensemble of atoms *is tuned*, *to the group velocity of the photon reduced to zero* and to the remaining $\mathbf{B_P}$-Storage-field within the interaction zone. The excitation is not purely photonic, but instead has been mapped smoothly from a single photon to an ensemble of EB-Storage atoms. Photon is regenerated by its Intrinsic Electromagnetic $\mathbf{B_P}$-wave $E \perp B$ and is indistinguishable from the input one, *exactly the same*.

The interpretation that the Photon has been stored within the material is false, on the contrary Storage is the $\mathbf{B_P}$-Energy-tank with n, frequencies, $\mathbf{f_n}$ in Photon, and the Electromagnetic Radiation E, B, is the conveyer → *the carrier*. When Photon interacts E, B radiation is emitted and light behaves as $\mathbf{B_P}$-particle.

i.*The Moving – Energy - Stores*

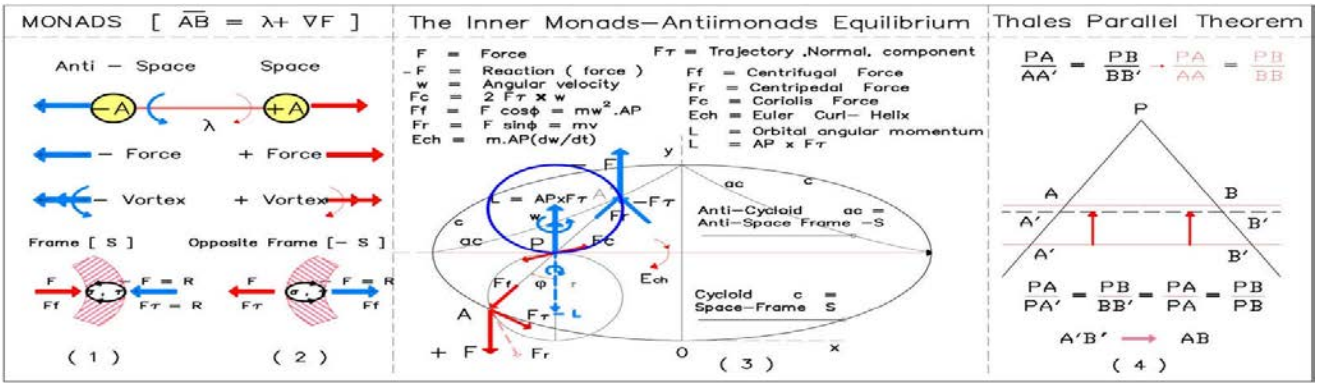

Figure 5: The inner structure of a *Stationary Wavelength* $\lambda = 2\pi r$ executing a *Free vibration,* and under Equilibrium of forces *in Cycloid, Anti-cycloid*

[-A≡⊖↔ A≡⊕] ≡ Monads ----Equilibrium of Plane Cycloidal-motion ---Thales Extrema-theorem

In (1-2). Normal stresses on area, S, from force, P, become → a moving Velocity-vector $\bar{\mathbf{v}}$.

In (3). For Cycloid (+) exists the equilibrium Orbital Evolute ≡ Anti-cycloid (-) with $\rho = \frac{\mathbf{v}}{\sqrt{\mathbf{g/4r}}}$

Motion happens on ρ, between Space (+ Point A) and Anti-space (- Point A`), and energy $L = \bar{\mathbf{B}}.\bar{\mathbf{w}}/2$, and the eternal rotation of Spin = $\vec{\mathbf{B}}$ with its equilibrium Anti-Spin = $\vec{\mathbf{B}}$ or $\bar{\mathbf{B}}$.

In (4). Thales Extrema theorem for Proportion with Zero denominator are the Infinite Vectors.

The moving Energy-Stores, r, with the Energy-Wavelength $\boldsymbol{\lambda_n} = \frac{\mathbf{2r}}{\mathbf{n}}$, acquire the Fundamental frequency $\mathbf{f_1} = [\frac{\sigma(1+\sqrt{5})}{4\pi r}]$ with one lobe n=1, and carry the inner-motion as Work = Energy = h.$\mathbf{f_1}$.

ii. *Material Points and Energy Fields: [QUANTA] . W = 2L = $\bar{\boldsymbol{B}}.\bar{\boldsymbol{w}}$*

The Quantization of Energy in space is the stationary Electromagnetic wave in monad and quantization of Space ds is the work W in breakage $s^2 = \lambda = 2r$, the Energy-Space Quanta. From work equation $W = [\lambda , \pm \Lambda\nabla i]$ where, λ = the Wavelength of quaternion=monad and $\pm \Lambda\nabla i = \Lambda = pv = M.\bar{\mathbf{c}} = [\lambda|\Lambda|].\bar{\mathbf{c}} = (\lambda m).\bar{\mathbf{c}} = (\lambda m).\bar{\mathbf{w}}.r = \bar{\mathbf{w}}.[\lambda(m.r)] = \bar{\mathbf{w}}.[\lambda(\bar{\mathbf{v}})] = \bar{\mathbf{w}}.[(cT).\bar{\mathbf{v}}]$ = the Energy, $\bar{\mathbf{w}}$, is the angular velocity vector ,$\bar{\mathbf{c}} = \bar{\mathbf{B}}$ is the spin, c the constant velocity equal to that of light ,$\bar{\mathbf{v}}$ is the velocity of monad, T is the period in wavelength`s monad. As before Monads become from relationc. $\mathbf{L_s} = \mathbf{L_v}$,

Quantization of Energy confined in a monad say ($\bar{\mathbf{v}}$), (it is the inner structure of monad) is the Stationary wave of the Real part $|\lambda|$ of $\bar{\mathbf{v}}$, due to the Electric Displacement field ($|\bar{\mathbf{v}}| = \varepsilon.E + P$), alternately in terms of The Electric field $E = (\partial P/\partial t)$ and The Magnetic field $P = (\partial E/\partial t)$, ε is the Permittivity as a measure of how much the wavelength opposes E-field .Object in mechanics, is the Quantized Material point (1) at Euclidean point (2), which is now Breakage $\pm [(\bar{\mathbf{w}}.r)^2]$ magnitude, in the Rest, Homogenously,Quantized mass-less Field $\{\pm [(\bar{\mathbf{w}}.r)^2]\}$ and consists the

required coordinate System and the base for all motions and forces. This Rest-Space-System (the Base) is [MFMF] Field with the less space distance ds = $|\bar{\mathbf{w}}.\bar{\mathbf{r}}|^2$ extended beyond Planck`s length, and is the Space Quanta.

Object in mechanics may be also the Quantized Energy as wavelength λ=(1)-(2) in [Medium-Field Material Fragment →[± s²] = $|\bar{\mathbf{w}}.\bar{\mathbf{r}}|^2$ = [MFMF] Field ←] which is a standing wave in cavity (1)-(2) with scalar breakage {|+($\bar{\mathbf{w}}$.r)²|↔|-($\bar{\mathbf{w}}$.r)²|} as medium (1)-(2) field, and (J1= $\bar{\mathbf{v}}$) the Energy as velocity at point (1) and carried to point (2) by following the isochrones cycloid motion from point (1) to (2). Velocity, $\bar{\mathbf{v}}$, during shifting , and because A=0, is analyzed into two transverse velocity vectors $\bar{\mathbf{v}}$1,$\bar{\mathbf{v}}$2, which undergo vibrations and causes two waves which are the two Quantized Electric and Magnetic isochrones components, and this because follow cycloid trajectories or The Energy Quanta, in Space Quanta.

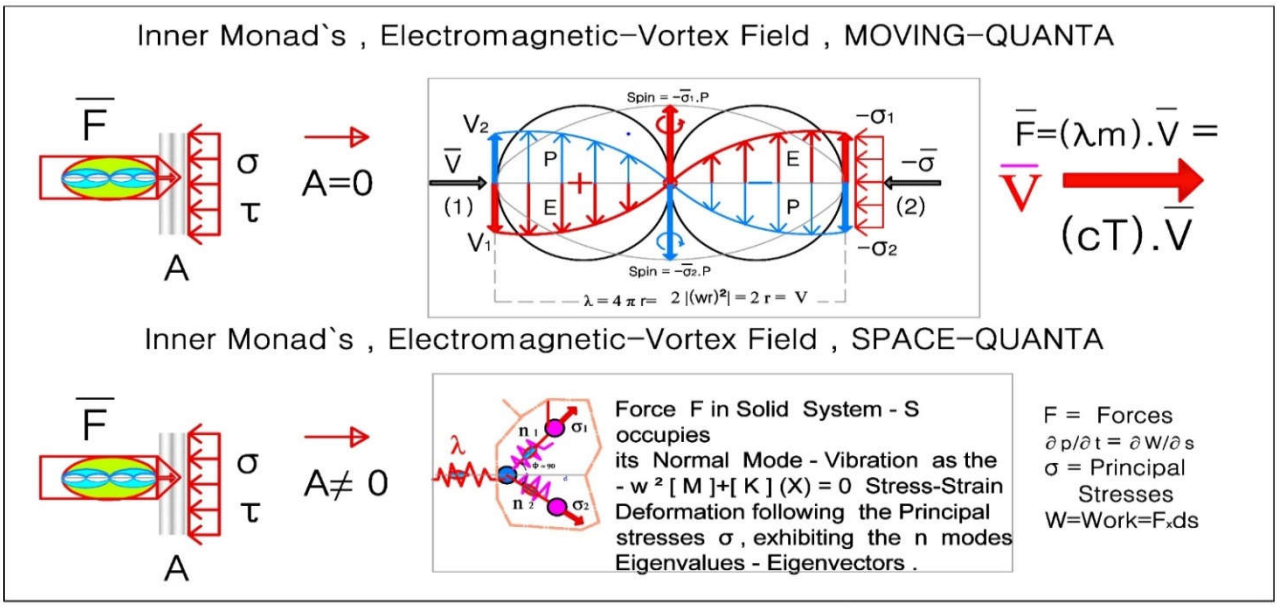

Figure 6: The Energy-Space, *Stress-Strain* in wave length λ=2πr, of a moving Photon

1. For area A = 0, *the Force* F *which is an Energy-Space-cave*, is manifested into the transverse Principal stresses, σ, τ, and then as *an Moving-Storage*(1)-(2) is transported as Velocity-Vector $\bar{\mathbf{v}}$, as F = σ.A → $\bar{\mathbf{p}}$ vector = M.$\bar{\mathbf{v}}$ = (m λ).$\bar{\mathbf{v}}$ = (m.c/f).$\bar{\mathbf{v}}$ = [c.T].$\bar{\mathbf{v}}$ =(m/f).c.$\bar{\mathbf{v}}$*i.e. a Velocity-Vector*$\bar{\mathbf{v}}$.
2. For area A > 0, *Force* F *which is an Energy-Space-cave*, resolves as Electromagnetic-*Radiation* in Principal stresses $\pm\boldsymbol{\sigma_1}$, $\pm\boldsymbol{\sigma_2}$, $\pm\boldsymbol{\sigma_3}$, which *is the Passage* through which *Forces travel* in moving Solid.
3. For area A <0, *because Force* F *is an Energy-Space-cave which at first passes from the Zero area*

A=0 *and becomes velocity-vector* $\bar{\mathbf{v}}$, this velocity-vector $\bar{\mathbf{v}}$ is entering any trough and transformed to an Energy-Rim, as are the Orbits of electrons . Because Photon is one of the moving-energy-stores when enters a cave $\mathbf{L_s}$, the cave becomes an Discrete-Energy-Packet which is Rim $\mathbf{L_v}$.

Question: When maximum velocity occurs in Common circle ??.

From Fig-5 maximum velocity occurs when the two velocities $\bar{\mathbf{c}}$, $\bar{\mathbf{v}}$ are perpendicular between them, where then dispersion follows Pythagoras theorem and the consultant Quantized Space, r, becomes r =$\sqrt{\mathbf{v^2+c^2}}$. The total Rotating energy is → ± $\bar{\mathbf{\Lambda}}$ = $\bar{\mathbf{p}}$.r = (M.c).r = (M.c).$\sqrt{\mathbf{v^2+c^2}}$ and [± $\bar{\mathbf{\Lambda}}$]² = p².r² = M ².c².(v²+c²) = (M².v²).c² + M².$\mathbf{c^4}$ = [p².c²] + M ².$\mathbf{c^4}$ = [p.c] ² + [$\mathbf{m_o}$.c²] ², which is the known relativistic energy - momentum equation of Lorentz transformations equation.

The mechanism of Energy Transport as ($\bar{\mathbf{v}}$) through its quantized wavelength |λ = $\bar{\mathbf{v}}$.T|, is a property of any standing wave, into the Medium |λ| = (1)-(2), and involves the Absorption and Reemission of the wave quantized energy J =(J1)=(J2) by the two neighbor edges (1) and (2) of the medium. The Absorption of energy causes, J1, within edge (1) to undergo vibrations as [ds1²/dt²] = - (g/4r).s which causes a new wave with the same frequency (because f=E/h) as the first wave but delaying the motion through the medium until Reemission by travelling, J1 to J2, through this small region of space between edges (1) and (2) and once the energy of wave is reemitted by its neighbor edge (2) then mechanism is recycled. This mechanism is succeeded by the intrinsic property of the waves (→ quaternion`s, monads, vectors, Tensors) which is, the Stationary wave nature of Spaces, and works as follows, →

It was shown in [27] that on dipole AB = [(λm), Λ] under the influence of Space Anti-Space forces dP = $\mathbf{P_B}$-$\mathbf{P_A}$ are created from forces dP// Space lines the Static Force Field, E, from forces dP⊥ Space lines the Static Force Field ,P, where P ⊥ E , which then experience on any moving dipole AB with velocity $\bar{\mathbf{v}}$, a total force F = $\mathbf{F_E}$+ $\mathbf{F_P}$= (λm).E+(λm).$\bar{\mathbf{v}}$xP which combination of the two types result in a helical motion ,with stability demand → E = - ($\bar{\mathbf{v}}$xP) = - ($\bar{\mathbf{v}}$. P) ⊥ *which is the alternative conservation of momentum* $\Lambda^2/2(\lambda m)$, *in the two perpendicular fields* E , P.

In case (λm) = q , then total force F = $\mathbf{F_E}$ + $\mathbf{F_P}$= q.E + q.$\bar{\mathbf{v}}$ x P = q.[E + $\bar{\mathbf{v}}$ x P]

which is Lorentz force in the Electromagnetic crossed fields E *and* P *with electric charge* q= λm *and are the two beyond Gravity Fields, interpreting the fundamental cause (effect) of motion, in small and large scales.*

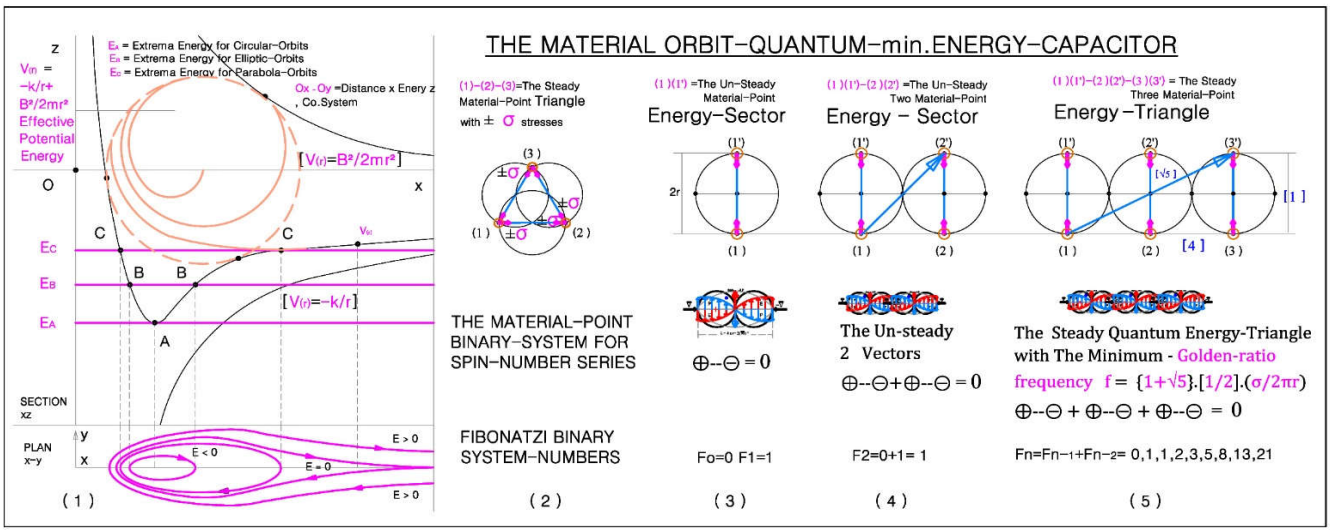

Figure 7: The minimum-energy, Quantum, in any Central-motion, and on the Material-point

The *Golden-ratio-frequency* $\mathbf{f_n}$, Quanta on Vector, Plane and Triangle.

1. In (1) is the Graph of *Effective-Potential-energy* in a Central-motion becoming from Kepler constant k = $4\pi^2.r^3.\mathbf{f_P}^2$, or $1 = [\frac{4\pi^2}{k}]r^3.\mathbf{f_P}^2$ or → $1 = c.\ r^3.\mathbf{f_P}^2$.
2. In (2) is the Graph of the *minimum-Quantum-energy* of the Triangle Pointy-Material-Stationary Energy-Point in *Gravity field* and equal to the Gravity-acceleration g.
3. In (3)-(4)-(5) is the Graph of the *minimum-Quantum-energy in* the *Sector*, two Sectors ≡ *Plane*, *Triangle of* Pointy-Material-Steady-point in Gravity field .Because of the *Golden-ratio-frequency relation* $\mathbf{f_n} = [\frac{(1+\sqrt{5})}{2}]\ \frac{\mathbf{n}.\sigma}{2\pi r}$, predicts the *Ubiquity of the Golden-ratio* in Nature from the microcosm to the macrocosm, *the macro scale*.

iii. *Gravity Force* $\boldsymbol{F_G}$, *Gravity field* $\boldsymbol{F_{FG}}$

The *standing wave in cavity*(1)-(2) with scalar breakage $|\pm(\bar{\mathbf{w}}.r)^2|$ *as medium* (1)-(2)= $|(+\bar{\mathbf{w}}.r)^2 \leftrightarrow (-\bar{\mathbf{w}}.r)^2|$ *Field, and Energy* [Λx∇i] = (J1) =2.$(\bar{\mathbf{w}}.r)^2$ *as velocity* $\bar{\mathbf{v}}$ *only at point* (1), [and this because Work as Force is ,*in extreme case where zero area* (A=0) and becomes velocity $\bar{\mathbf{v}}$], *need the same time*(different velocities and different energy on (1) are isochrones)*and this because are following cycloid trajectories in medium* (1)-(2)) *to reach edge* (2). *Energy* (J1) *as velocity vector,* $\bar{\mathbf{v}}$, *is the* cross product *of two velocity vectors* $\bar{\mathbf{v}}1$,$\bar{\mathbf{v}}2$*or* → $\bar{\mathbf{v}}$ =$\bar{\mathbf{v}}1$x$\bar{\mathbf{v}}2$,*with head at point* (1) *and analyzed , in a perpendicular to* (1)-(2) *directional plane, into the two orthogonal velocity vectors* $\bar{\mathbf{v}}1$, $\bar{\mathbf{v}}2$ *which heads are at point* (1).

Energy J1 *is carried to point* (2) *by following the cycloid motion* (1)-(2). Fig-15(3)

During contracting (shifting), *velocity vectors* $\bar{\mathbf{v}}1$, $\bar{\mathbf{v}}2$, *being vectors undergo vibrations (expand as oscillation) which causes two waves that represent the two Electric* E, *and Magnetic* B, *perpendicular components* (*The combination of vibration* (O) *and oscillation* (↔) *is what determines the frequency rate, the cyclic pattern of scalar waves*) *until reaching point (2) which is the Reemission of the wave and it is the new head of velocity,* $\bar{\mathbf{v}}$, *where then mechanism is recycled.*

These scalar waves are standing waves that flash on and off. Since wavelength, λ, as distance (1)-(2) is equal to product velocity (v).period (T) then λ = $\bar{\mathbf{v}}$ T = $\bar{\mathbf{v}}$ f = 2r / n, since r = n.(λ/2).

Medium in cavity λ = (1)-(2), *is breakage* $|\pm(\bar{\mathbf{w}}.r)^2|$ *and Energy* (J1) *is the momentum* $\bar{\mathbf{B}}$= *the Spinas velocity vector* $\bar{\mathbf{v}} = 2(\bar{\mathbf{w}}.r)^2$, *so this velocity vector fits to the scalar magnitude* $[|(\bar{\mathbf{w}}.r)^2| = (1)\text{-}(2)]$ *which is the force in all Inertial systems and is called* GRAVITY *or Momentum* GM . *Because any particle of mass, m* = $2(wr)^2$ *tied to a fix point* (1) *executes a Simple harmonic motion in Medium* (1)-(2) which is *breakage* $|\pm(\bar{\mathbf{w}}.r)^2|$, *then* GM = $2(\bar{\mathbf{w}}.r)^2$, *is a Force or acceleration, and it is the intrinsic Electromagnetic Stationary velocity vector. The Magnetic field , which is binding points of this Homogenous- Isotropic, Rest and mass-less nature field of chains of Spins*, *is tuning the chains of Spins to a minimum Quantum-Energy-state,* with the characteristic *Golden-frequencies* of the Spin chains $\mathbf{f_n} = \frac{\mathbf{n}.(1+\sqrt{5}\,]\,).\boldsymbol{\sigma}}{\mathbf{4\pi r}}$ The tension σ , comes from $\bar{\mathbf{B}}$ interactions between Spins, causing them to magnetically-resonate.

Because Gravity-Force $\mathbf{F_G}$ becomes from the in-storages acceleration a = v^2/r of MFMF material-points and force [∇i] is stationary because from the pointy-rotation $[-s^2\circlearrowright\circlearrowleft s^2+]$, then $\mathbf{F_G}$ *for Planck length* is, *Gravity force*

$$[\nabla i] \equiv \mathbf{F_G} \equiv \mathbf{m_G} g = g.\nabla[\tfrac{\sigma}{c^2}]^2.r = \mathbf{m_G}\tfrac{\mathbf{v^2}}{\mathbf{r}} = Jw^2.\mathbf{g_G} = [\tfrac{\pi r^4}{2}]\, w^2.\tfrac{\mathbf{v^2}}{\mathbf{r}} = \tfrac{\mathbf{v^2}}{\mathbf{r}}[\tfrac{\pi r^4}{2}]\tfrac{\mathbf{v^2}}{\mathbf{r^2}} = [\tfrac{\pi r v^4}{2}] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (s)$$

and from relation, Spin S = $\bar{\mathbf{B}} = \frac{\mathbf{h}\sqrt{3}}{\mathbf{4\pi}}$ then, $\mathbf{F_G} \equiv [\frac{\pi v^4}{2}]\frac{n\pi}{2h(1+\sqrt{5}\,)}\bar{\mathbf{B}} = [\frac{n\pi^2}{4h(1+\sqrt{5}\,)}]\bar{\mathbf{B}}\mathbf{v^4}$ and, *Gravity-force* → $\mathbf{F_G} \equiv \frac{n\pi\sqrt{3}}{16(1+\sqrt{5}\,)}\mathbf{v^4} = \frac{n\pi\sqrt{3}}{(1+\sqrt{5}\,)}(\frac{v}{2})^4$, *which is the Black-hole-gravity-equation related to the Inner velocity* v, *and to its* n, *lobes*.

From equation (s), Gravity-Acceleration is,

$$\mathbf{g_G} = s[\tfrac{\pi r v^4}{2}] = [\tfrac{3{,}1415926\left([\sqrt{5}+1].\sqrt[4]{2}.10^{-35}\right).(299793458)^4}{2}]\,e^3 = 6{,}044981.\mathbf{10^{-35}}.80{,}776078.\mathbf{10^{32}}.20{,}085536 = \mathbf{g_G} = 9{,}8076941,$$

where $1/\mathbf{m_G}$ = s = mass-coefficient $[\sqrt{5}+1].\sqrt[4]{2}.\mathbf{e^3}$ i.e.

Bodies produce Gravity {*the change of Spin-direction of* M-P-Dipole $[\oplus s^2\circlearrowright\circlearrowleft\ominus s^2]$*in* MFMF *field*} *from stationary force*[∇i]= ± s^2, *and because Gravity* ≡ *acceleration not by the change of velocity vector but by the changing of the direction of the Spin* $\bar{\mathbf{B}}$of the above Spin-chains-dipole $[\oplus s^2\circlearrowright\circlearrowleft\ominus s^2]$.

Remarks:

1. Spin chains of the Material-points occupy the characteristic frequency $\mathbf{f_n} = \frac{\mathbf{n}.(1+\sqrt{5}\,]\,).\boldsymbol{\sigma}}{\mathbf{4\pi r}}$ which is the Golden-ratio of magnitude, σ. What this means in Material-geometry ???

   In Figure-7, The Work produced by the eternal rotation of $[\oplus\circlearrowleft\ominus]$ is W = h.$\mathbf{f_n}$,dependent on stress σ only of cave r, and the *Quantum* ≡ *critical quantity* ≡ $\mathbf{f_n} \equiv [\frac{1+\sqrt{5}}{2}]\frac{\sigma}{2\pi r}$ →*The Golden-ratio of cave,* r.

   In Figure-11 is shown that If cave r, is a Sector , a Circle, a Triangle, a Rectangle, or any other Shape, then *The Golden-ratio is formulated on the,* Sector, Circle, Triangle, Rectangle, or to any other Shape by following the Euclidean geometry of the *cave.* The golden ratio is of one-two- and three-dimensional chains .Golden ratio for *vectors* exists in velocity-vectors, for *two vectors* exists in Electromagnetic radiation vectors, *for three vectors*, *triangle and the circumscribed circle*, all shapes in triangles and the relation of triangles to the circle. For *four vectors* golden ratio is visualized as spiral shapes and for equal vectors *square*, is the Archimedes Spiral since σ is constant in Material-geometry, All geometrical shapes of the golden-ratio can be seen in Euclid geometry, Since Quaternion z = a + i$\boldsymbol{\nabla}$ does not occupy any mass so m =1.
2. The constant tensor $\mathbf{T_z}$ =Tensor (the length) of Quaternion-vector, z ≡ m, in Euclidean coordinates and which magnitude is $\mathbf{T_z} = \sqrt{\mathbf{y_1}^2 + \mathbf{y_2}^2 + \mathbf{y_3}^2 + \mathbf{y_n}^2}$ denotes the Energy-Space minimum relation. so, the Quantum Golden-quantity $[\frac{1+\sqrt{5}}{2}]$ issues, as the Material-cave coefficient.

   The Unity-Plane-Quaternion coefficient is $\sqrt[2]{\sqrt[2]{2}} = \sqrt[4]{2}$, or, $\overleftrightarrow{\mathbf{i}\perp\mathbf{j} \equiv \sqrt{2}} + \overleftrightarrow{\mathbf{k}\perp\sqrt{2} \equiv \sqrt[2]{\sqrt[2]{2}}} = \sqrt[4]{2}$ The Three dimensions-coefficients of Euler`s-Rotation-System is e. e. e = $\boldsymbol{e^3}$
3. The minimum Energy ≡ Force, *acceleration*, becomes from the Centrifugal acceleration with the inertial mass of the cave for the Quantum-critical-state which is proved to be the g Gravity-acceleration.

iv. *The Conic Sections and Planar – curves*

Menaechmus came to think of producing curves by cutting a cone *from the circle definition which is,* → *Since the center* O *of a circle is of equal distance to all points in Plane of the circumference the same also to all Centers* $\mathbf{O_n}$ *from center* O *which are online* $\mathbf{OO_n}$ and *Perpendicular to this Plane* ← In figure-8, Line$\mathbf{OO_n}$is the generator axis of a right-angled cone and all the shapes of the curve produced by cutting a right-cone by a plane obliquely inclined to its axis is a conic section. In circle [O,OP] with only one center issues for point P, OP + PO = 2R is constant, while in ellipse [$\mathbf{O_1P}$,$\mathbf{PO_2}$] of two centers $\mathbf{O_1}$, $\mathbf{O_2}$ issues for point P, P$\mathbf{O_1}$+ P$\mathbf{O_2}$= major-axis, is

constant. This property allows Central-motion to be seen as a Geometrical problem of Proportions on Points and lines [44].

In [70] was shown that $\bar{\mathbf{M}} = [\bar{\mathbf{r}}x\bar{\mathbf{p}}] = \frac{d\bar{B}}{dt} \rightarrow$ *the Theorem of Equal-Areas* and Kepler`s 1st Law, i.e. Momentum $\bar{\mathbf{p}}$, of a force $\bar{\mathbf{P}}$, to a constant center O, of radius $\bar{\mathbf{r}}$, is equal to the change of the angular -momentum $\bar{\mathbf{B}}$ at time t, related to the same center O, and its trajectory lies on the same Plane.

a. *The Geometrical Central motion*

Huygens and Johannes Bernoulli came to think of producing the Shortest-Time curve between Two points on a vertical Plane *by a point acted only by gravity and which is, → To find the Path - curve or surface for which a given variation has a Stationary value*,

Stationary or Extrema is the maximum or minimum between two points (1) and (2) ←

It was proved that this curve is the Cycloid as in Figure -5(3). From Geometry of Figure - 8, Equality

$$\mathbf{A_1}O = p/e = AP + OP.\mathbf{cos}\,\boldsymbol{\varphi} = r/e + r.\,\mathbf{cos}\,\boldsymbol{\varphi} \text{ and } p = r + r\,e.\mathbf{cos}\,\boldsymbol{\varphi} = r\,(1 + e.\mathbf{cos}\,\boldsymbol{\varphi}) \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where , p = a constant parameter, r = the orbit radius from O.

$$\text{Inversing (1) then} \rightarrow \frac{1}{r} = \frac{1+e.\cos\varphi}{p} \text{ and Derivative} \rightarrow \frac{d^2 1/r}{d\varphi^2} = -\frac{e.\cos\varphi}{p}, \rightarrow \frac{d^2 1/r}{d\varphi^2} + \frac{1}{r} = \frac{1}{p} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Integrating (2) is the acceleration at point P and equal to → $a = -\frac{4A^2}{r^2}\frac{1}{p}$ ..... (3)

where the constant area O, P, $\mathbf{P_1} = A = \frac{1}{2}.r^2.\frac{d\varphi}{dt}$, and for ellipse the Area = ($\pi \mathbf{a_e b_e}$).

For ellipse $\mathbf{a^2_P} = p\,.\mathbf{b_P}$, or $\frac{1}{p} = \frac{a_P}{b^2_P}$ and period of rotation T, then the Constant area *for a period T* is

$$A = (\pi \mathbf{a_P b_P}) / T \text{ and (3) becomes } a = -\frac{4\pi^2.}{T^2 r^2}\mathbf{a^2_P b^2_P}\frac{a_P}{b^2_P} = -[\frac{4\pi^2}{T^2}\mathbf{a^3_P}]\frac{1}{r^2} = -[\frac{4\pi^2}{T^2}]\frac{a^3_P}{r^2} = -k\frac{1}{r^2} \quad \ldots\ldots\ldots\ldots\ldots (4)$$

or acceleration $a = -[\frac{4\pi^2}{T^2}]\frac{a^3_P}{r^2} = -k\frac{1}{r^2}$, *where* $k = [\frac{4\pi^2 a^3_P}{T^2}] = 4\pi^2.\mathbf{a^3_P}.f^2 \rightarrow$ a constant .....(4a)

Equation (4a) is Kepler`s second Planetary law, *Spotting constant* k, to be a function of the Orbit ≡ $\mathbf{a^3_P}$≡ the Semi-major axis ≡ Space and as a function of Time, T, or the frequency, $\mathbf{f_P}$, of orbiting.

This significant property can be used also in atom`s structure .

For circular motion $\mathbf{a^3_e} = r$, and (4a) becomes $a = -[\frac{4\pi^2}{T^2}]\frac{r^3}{r^2} = -[\frac{4\pi^2 r}{T^2}] = 4\pi^2.r.f^2$ and $k = [\frac{4\pi^2 r^3}{T^2}] = 4\pi^2.r^3\mathbf{f_e}^2$ i.e.

1. Kepler`s First law of Orbits : All Planets move in Elliptical orbits , with the sun at one focus.
2. Kepler`s Second law of Areas : A line that connects a Planet to the sun sweeps out equal areas in equal times.
3. Kepler`s Third law of Periods : The square of the period of any Planet is proportional to the cube of the semimajor axis of its orbit.
4. Kepler`s constant $k = 4\pi^2 r^3(1/T)^2$: The constant k , is Not-Only constant during the motion of a Planet, because being also $k \cong r^3.(1/T)^2$ = constant for all Planets
5. Spotting on Kepler`s constant k : During the Central-Plane -motion of a Planet ≡ Momentum $\bar{\mathbf{B}}$ and a Sun ≡ focus O, the coefficient $r^3.(1/T)^2 = r^3.\mathbf{f_P}^2$ is Constant.

Applying above property to Caves ≡ Energy-Storages ≡ Orbits, then since $r^3.\mathbf{f_P}^2 = C$ = Constant, then change of r, follows change of $\mathbf{f_P}$, or Electromagnetic-wave $\mathbf{E_1} = [\frac{4\pi r^2}{3}].\mathbf{f_1} = C$ is absorbed or emitted.

Remark :

1. In [54] , was shown The Periodic Table of Particles with the 118 Elements and The Proposed New elements are becoming from the completion of the Open-Rim (7) . A New Rim (8) is consisted of 50 Positions which are filled with Protons with 218 Elements. The New is following Pascal`s-Triangle-Array where Rims are numbers contained in the Prior ones and so then, follow the Positions in each Orbital and so for Electrons as the Base for Protons.

Since, Caves≡ Energy-Storages≡ Orbits≡ Stationary-lobes≡ Energy-Rims≡ $r^3.\mathbf{f_P}^2 = \mathbf{E_n} = n.[\frac{4\pi r^2}{3}].\mathbf{f_1} = C$

Therefore, *Atoms Wheel-Rim,* the Protons-Neutrons in Nucleus and Electrons in Orbital-Positions, *is an Energy - Rim for each Energy-Orbit of electrons. Because in this Energy-Rim is placed the minimum energy which is equal to* g, becoming from $\mathbf{f_n} \equiv [\frac{1+\sqrt{5}}{2}]\frac{\sigma}{2\pi r}$ →The Golden-ratio of cave, r, *therefore, all microcosm,* atoms and subatomic particles

Planck-scale till reaching the Material-point, *and macrocosm,* Galaxies, Dark-matter and Dark-energy, Black-holes, the far extension universe *follows the Archimedes-Spiral and the Golden-ratio relation* $\mathbf{f_n}$, *of the Material-point*. Fig-11

2. It was shown that all particles have the same acceleration, g, in our gravitational field with frequency unchanged, and → velocity, $d\bar{\mathbf{v}}$, with wavelength, $\boldsymbol{\lambda}$, to be changed← so light being a particle also is deviated in gravity field and, *Inertial mass* is equal to the *Gravitational mass* which is the Necessary and Sufficient Condition only in Mass of Material-point where c.T = $\boldsymbol{\lambda}$, of this Isochronous motion.
3. The Spotting on Kepler`s constant k.

Question: Since the Central-Plane-motion of point P=*Planet* ≡Momentum $\bar{\mathbf{B}}$, *and a Sun* ≡ Focus O is a Conic–section, to find of producing the *Shortest - closed-Surface on any Plane*, such that *Energy*≡ *motion, to be minimum-constant* ≡ *The closed-Surface of the two points and which is*→ *To find the Energy -Path-closed-Curve of the two Points which Surface is of a Constant-Energy.* Constant is nota maximum or minimum magnitude between the two points P and O, instead it is a Fixed sum from rotation≡ [⊕↻↺⊖]≡ motion, trapped in a *closed-curve* ←

It was proved that this *closed-curve* is the Energy-curve of, Constant k = $4\pi^2.r^3.\mathbf{f_P}^2$, as in Figure-8, *It is proved that the minimum-Quantized-energy in Material-point is the Centrifugal-acceleration and it is the Gravity-acceleration which is equal to* g.

From relation, c.$\mathbf{L_s}$ = $\mathbf{L_v}$, the *Light-velocity*-moving-Store3.$\mathbf{10^8}$m/s, *enters* cave 1.$\mathbf{10^{-42}}$m *and becomes equal to* 3.$\mathbf{10^{-34}}$ m²/s *which is the Plane* - Energy-Cave - *Rim. i.e.* the moving-Energy-Store *of light as velocity,* v, *Enters in* Stationary Energy-cave1.$\mathbf{10^{-42}}$m, *and becomes the Constant* –Stationary-Energy- *Plane - cave* and equal to 3.$\mathbf{10^{-34}}$m²/s.

The Energy-quantity k is constant in Planck`s scale cave $\mathbf{10^{-34}}$ m and exists, in Plane Rims, becoming from the continuous *Central - Rotation of masses* in scales. It is shown in, *Kepler`s third law*, that this constant is k = $[\frac{\mathbf{4\pi^2 r^3}}{\mathbf{T}^2}]$ =$4\pi^2.r^3$ $\mathbf{f_P}^2$, where for the Sun-Earth-Rim Semi-major-axis , r = 15.$\mathbf{10^{10}}$ m, and the period T = 1 year the Energy in this *Plane-Sun-Earth Rim* is k = 3.$\mathbf{10^{-34}}$ = [3.$\mathbf{10^8}$].$\mathbf{10^{-42}}$ y²/m³.

b.*The Two Material-points Problem*

From classical mechanics and for Two bodies of mass $\mathbf{m_1}$, $\mathbf{m_2}$, of Polar radius $\mathbf{r_1}$, $\mathbf{r_2}$, from a Center of mass coordinate system lying on line 1 – 2, exist,

1. The interacting via a Gravitational force, is mathematically equivalent to the single body motion and has the absolute value

$$F = k\,(\mathbf{m_1}.\,\mathbf{m_2}) / (\mathbf{r_1} + \mathbf{r_2})^2 \qquad \text{.....(1)}$$

where k = a constant

2. By setting $\mathbf{m`_1} = [\frac{\mathbf{m_1}}{(1+\mathbf{m_2}/\mathbf{m_1})^2}]$ , then $\mathbf{F_{21}} = k\frac{\mathbf{m`_1}.\mathbf{m_2}.}{\mathbf{r_2}^2}$ .....(2)
3. By setting $\mathbf{m`_2} = [\frac{\mathbf{m_2}}{(1+\mathbf{m_1}/\mathbf{m_2})^2}]$ , then $\mathbf{F_{12}} = k\frac{\mathbf{m`_2}.\mathbf{m_1}.}{\mathbf{r_1}^2}$ .....(3) i.e.

motion is exactly as, An attractive force $\mathbf{m`_1}$*exists at the center of mass, and mass* $\mathbf{m_2}$ *is revolving in elliptic trajectory around this point of mass*.

From the mass proportion is seen that, the center of mass is on line (1-2) and very close to the big mass a property of the Central - Rotation of masses issuing in our Solar-system.

4. If motion of any point P is expressed in orthogonal coordinates as x = a $\mathbf{cos\,ft}$, y = b$\mathbf{sin\,ft}$, to show the Orbit of P, where a, b, f, are constants.

From relation $\mathbf{cos\,ft} = \frac{\mathbf{x}}{\mathbf{a}}$, $\mathbf{sin\,ft} = \frac{\mathbf{y}}{\mathbf{b}}$, using Pythagoras theorem gives ellipse $\mathbf{cos^2\,ft} + \mathbf{sin^2\,ft} = 1 = \frac{\mathbf{x^2}}{\mathbf{a^2}} + \frac{\mathbf{y^2}}{\mathbf{b^2}}$ If X, Y are the components of forces then,

X = m$\frac{\mathbf{d^2x}}{\mathbf{dt^2}}$ = - m.af². $\mathbf{cos\,ft}$ = - mf².x and Y= m$\frac{\mathbf{d^2y}}{\mathbf{dt^2}}$ = - m.bf². $\mathbf{sin\,ft}$ = - m.f².y and by division

X: Y = x : y *i.e. the Force is directed to the center of rotation and is proportional to the distance*.

For rotational motion after t`, moment of time mass is at the same position issuing, $\mathbf{cos\,f\,`t}$ = $\mathbf{cos\,ft}$ and $\mathbf{sin\,f\,`t}$ = $\mathbf{sin\,ft}$, so t` - t = k$\frac{\mathbf{2\pi}}{\mathbf{f}}$ = T, where k is an integer and T = $\frac{\mathbf{2\pi}}{\mathbf{f}}$, which is the Period of the rotation. In times t, radius r, sweeps out the same area $\mathbf{S_n}$ and , $\mathbf{S_n}$= π ab /T = π ab f /2π = (ab / 2) . f → *is constant* since f = (2.$\mathbf{S_n}$)/ab, *is constant*, *Kepler Law*.

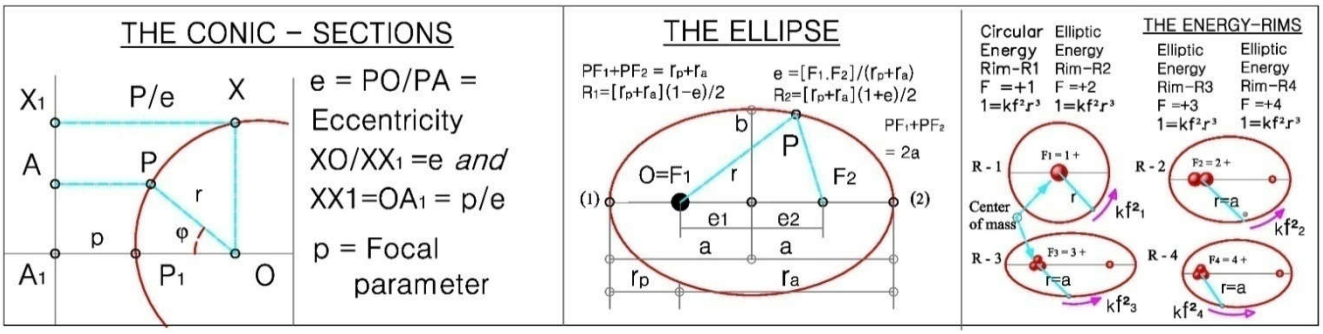

Figure 8: The Conic-sections as Planar and Atoms-curves, under Equilibrium of forces

1. The generation of the Conic-sections. O = The constant center of rotation, P = The movable Point on Orbit, p = The parameter of the conic, e = the eccentricity of the conic $0 \leq e \leq 1$
2. The Central Ellipse and Gravity relation for masses $\mathbf{m_P}$→ Planet, On - $\mathbf{m_S}$ → Sun.
3. The Energy-Rim $\mathbf{R_1}$ *is circle* because focus $\mathbf{F_1}$ is consisted of one center ,while the others for Focus $\mathbf{F_n}$ is of 2,3,4,,n.. centers due to ⊕ elements *are Ellipse* for every one ⊖mass$\mathbf{m_P}$.

Kepler`s constant Planets relation $\frac{T^2}{a^3}$=k= $[\frac{4\pi^2}{G.m}]$ = 2,97.$\mathbf{10^{-19}}$(s²/m³) , where G = 6,67.$\mathbf{10^{-11}}$(Nm²/Kg²) becomes from the Light-velocity-Storage,$\bar{\mathbf{v}}$, when, $\bar{\mathbf{v}}$, is entering the cave r =1.$\mathbf{10^{-42}}$m, where is produced the Energy *Plane-Cave-Rim* equal to$\mathbf{R_n}$ = 3.$\mathbf{10^{-34}}$m²/s.
Since also exists the relation k.$\mathbf{f_n}^2$.r³ = 1 where r = semi major axis a, *then*,

An Energy-Rim is a Plane-Surface representing a Constant-Energy becoming from the squared Frequency $\mathbf{f_n}^2$, *representing the Imaginary -Energy-Part of monad, and* $\mathbf{r_n}^3$ *representing the Real-Space-Part of monad* 1 = k.$\mathbf{f_n}^2$.r³. *All these Energy-Rims consist the Quantized-Plane-curves*

c. *Central motion and Gravity*

Kepler`s third law of harmonics suggested that , the ratio of the period of orbit squares (T²) to the mean radius of orbit cubed (R³) is the same value , k = 2,97.$\mathbf{10^{-19}}$ s²/m³ = T²/R³, for all the Planets that orbit the sun.

Centripetal force $\mathbf{C_F}$ = $\mathbf{m_P}$v² / R is the result of the Gravitational force that attracts the Planet towards the Sun and can be represented as *Gravity-force* → $\mathbf{G_F}$ = [G.$\mathbf{m_P m_S}$] / R² and is $\mathbf{C_F}$= $\mathbf{G_F}$.

Since the mean-velocity of a Planet is $\mathbf{v_P}$ = (2πR) / T then v² = (4π²R²) / T² and substituting to prior Centripetal force $\mathbf{m_P}$ [4π²R²]/RT² =[G.$\mathbf{m_P m_S}$] / R² and by cross-multiplication is transformed to T² / R³ = [$\mathbf{m_P}$4π²] / [G. $\mathbf{m_P m_S}$] and canceling the same from numerator and the denominator then

T² / R³ = [4π²] / [G.$\mathbf{m_S}$] or G.$\mathbf{m_S}$ = [4π².$\mathbf{f_P}^2$]R³ = w². R³ where $\mathbf{E_1}$=[$\frac{4\pi r^2}{3}$].$\mathbf{f_P}$ and k = R³.$\mathbf{f_P}^2$

The period T(s) for an elliptical orbit is $T = 2\pi\sqrt{\frac{a^3}{G[M1+M2]}}$ .....(1),

which is the same for all ellipse with the same semimajor-axis a. Inversely for calculating the distance, *in meters*, where a body has to orbit in order to have a given orbital period, *in second*, is

$$a = \sqrt[3]{\frac{G[M_1+M_2]T^2}{4\pi^2}} \quad \text{.....(2)}$$

where,
G = The gravitational constant = 6,67.$\mathbf{10^{-11}}$ Nm²/Kg², $\mathbf{M_1}$,$\mathbf{M_2}$ the masses of any two material-points.
From above relation is seen that *Energy – Rim -Shapes* C, are Discrete-Packets of *Energy-levels* i.e.

1. *Atraction* of opposite forces $\mathbf{F_o}$↔$\mathbf{F_P}$ at points O , P creates the Central motion and Kepler`s laws where *Orbits are Plane-curves representing a Constant-Energy becoming from the squared Periods* T², or Frequency $\mathbf{f_p}^2$, *representing the Imaginary-Energy-Part of monad and* $\mathbf{r_n}^3$ *representing the Real - Space -Part of monad* 1 = C.$\mathbf{f_n}^2$.r³. *These constants are the* Quantized-Curve-Rims.
2. Since both semimajor axis $\bar{\mathbf{a}}$, *the Position-vector*, and velocity $\bar{\mathbf{v}}$, *the Velocity-vector*, define the Orbital-Plane, then Angular-momentum-vector $\bar{\mathbf{L}}$, is perpendicular to $\bar{\mathbf{a}}$,$\bar{\mathbf{v}}$, and is $\bar{\mathbf{L}}\perp\bar{\mathbf{a}}.\bar{\mathbf{v}}$.

The magnitude $\bar{\mathbf{L}}$ = $\bar{\mathbf{a}}$ x $\bar{\mathbf{v}}$ = *constant for all central motions*

For circular orbits gravitational force $\mathbf{G_F}$ equals the centripetal force $\mathbf{C_F}$, so $\mathbf{C_F}$ = $\mathbf{G_F}$and $\mathbf{m_P}$v²/ R= [G.$\mathbf{m_P m_S}$] / R² and velocity

$v^2 = GM/R$ .....(1)

Substituting the expression into the formula for Kinetic energy then ,

$$\mathbf{K_E} = \frac{\mathbf{mv^2}}{\mathbf{2}} = \frac{\mathbf{m.GM}}{\mathbf{2.\ R}} = \frac{\mathbf{GMm}}{\mathbf{2.\ R}} \quad \text{.....(2)}$$

or $$\mathbf{K_E} = (1/2)\ (-\mathbf{P_E}) = -\frac{\mathbf{P_E}}{\mathbf{2}} \text{ and } -\mathbf{P_E} = 2.\mathbf{K_E} \quad \text{.....(3)}$$

The Total-energy $$E = \mathbf{K_E} + \mathbf{P_E} = \mathbf{K_E} - 2.\mathbf{K_E} = -\mathbf{K_E} \quad \text{.....(4)}$$

i.e. from (3), *The Potential-Energy is always Negative and Twice the Kinetic-energy,*
while from (4), *The Total - Energy of an Central - Orbiting - System is Negative.*

Conservation laws in Astronomy:

1. Newton`s second law tell us that acceleration on an object is proportional to the net force acting on it so objects move at constant velocity if no force acts on them. Because of conservation of Momentum the Interacting objects exchange momentum through equal and opposite forces $[\oplus \leftrightarrow \ominus] \equiv [\bar{\mathbf{v}}.\nabla i]$, therefore *constant*, $C = r^3.\mathbf{f_e}^2$, is a Quantized-Energy-Storage, *a Constant Energy-Plane-Rim*, in where Planets move at constant velocities without any force acting on them.
2. In [70], the Work produced In Material-Point $\overleftrightarrow{\mathbf{AB}}$ is equal to $\rightarrow W = 2L = \bar{\mathbf{B}}.\bar{\mathbf{w}} = J.w^2 \leftarrow$ consisting the First-Energy-Store which is a *Stationary Wave* with, n, lobes as, $\mathbf{W_{n(n+1)}} = [\frac{4\pi r^2 \mathbf{f1}}{3}].n.(n+1)$ and wavelength $\boldsymbol{\lambda_N} = \frac{\sigma.(1+\sqrt{5})}{4\pi r} = \frac{n.\bar{B}}{4\pi r^2}$, *i.e.* that which Happens in Material point , *Momentum as Work* is $\mathbf{W_{n(n+1)}}$ = *constant in n-lobe* , Happens to Planets orbiting the Sun, *so* Because of conservation of angular momentum in the *Constant Energy-Plane-Rim-Orbits*, Planets with no twisting forces are continually rotating and orbiting the sun. Energy is concentrated at the Trajectories ≡Rims≡ Orbits.
3. Energy = motion = Work, and makes the matter move. In [70] the Work produced In Material-Point is conserved but can travel from one object to another, or change in form. From figure-1 Energy ≡ motion is kept in the Storages r = n (λ/2), and is so conserved and transferred from one object to another, or change in form. The types of energy-forms are, The Rotational, *the eternal rotation of positive ⊕ around the negative ⊖*, The Kinetic, *motion*, The Potential, *stored motion*, The Radioactive , *wave motion*. *So*, objects get their energy = motion, from the *Primary-Material-Points* in-which motion exists Apriori , and is transformed from one type to another.
4. Angular momentum is the *Constant Energy-Plane-Rim-Orbits* of the System Sun-Planet. Only friction or atmospheric drag can change the orbit, and if an object gains orbital energy it moves to a more distant orbit with more energy. This is obvious from this Planet State-Space-constant $C = r^3.\mathbf{f_e}^2$, since frequency is increased.

The Kepler`s Planar constant Principle:

Planet :	Period of Rotation (y) :	Frequency (n) :	Semi-major axis (m) :	T^2 / R^3 (s^2/m^3) :	$k.\mathbf{f_n}^2.r^3 = 1$
Mercury	0,2410	4,1494	5,79 .$\mathbf{10^{10}}$	2 , 993	1
Venus	0,6150	1,6260	10,80 .$\mathbf{10^{10}}$	3 , 000	1
Earth	1,0000	1,0000	15,00 .$\mathbf{10^{10}}$	2 , 974	1
Mars	1,8800	0,5319	22,80 .$\mathbf{10^{10}}$	2 , 983	1
Jupiter	11,9000	0,0840	77,80 .$\mathbf{10^{10}}$	3 , 010	1
Saturn	29,3000	0,0341	143,00 .$\mathbf{10^{10}}$	2 , 984	1
Uranus	84,0000	0,0119	287,00 .$\mathbf{10^{10}}$	2 , 983	1
Neptune	165,3000	0,0060	450,00 .$\mathbf{10^{10}}$	2 , 992	1
Pluto	248,3000	0,0040	590,00 .$\mathbf{10^{10}}$	2 , 993	$\mathbf{10^{-42}} \equiv 1$

Each of the above Orbits consist an Energy-Plane- monad with a Constant –Quantized-energy.

We will show that above issues for Atom`s structure ,where Nucleus at focus is consisted of 1 , 2, 3, 4 n, [⊕] Protons which define the figure of (1) focus to be Circular-Rim and for (2) and more focus to be Ellipse-Rim. Each Proton in Atom creates only one Energy-Rim, and this,
Since Medium-Field Material-Fragment → [± s^2] = [MFMF] ≡ *The Chaos* , is the base for all motions.

v. *The Scales of The Universe*

All motions create Work which is conserved. Motion presupposes velocity vector $\bar{\mathbf{v}}$ which, *when it is in motion collides with other velocity vectors* and creates a Constant Work k. Motion may be *Linear, or Rotational* for any displacement, r, so exists The-Constant-Work → $k = \bar{\mathbf{v}}x\bar{\mathbf{v}}.\bar{\mathbf{r}} = v^2.\ r$ This Constant-Work is →

$$W = k = v^2.\ r = (w\ r)^2.r = [\frac{2\pi}{T}\mathbf{r}]^2.r = \frac{4\pi^2\,\mathbf{r}^2}{T^2}\,r = \frac{4\pi^2\,r^3}{T^2} = 4\pi^2.\ \frac{r^3}{T^2} = 4\pi^2.r^3.\mathbf{f}^2_{\mathbf{p}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(k)$$

Equation (k) is *Kepler-third-law,* denoting that Macrocosm and Microcosm *Obey Newton`s Laws of motion in all Scales*. *Photon* during Motion in[MFMF] *Chaos, collides with other* Photons*, by means of Vectors-Cross-Product, and produces a constant Work which is stored into the* Only-Four *E*nergy –Geometrical-Shapes*, of the motion,* which are the Conic-sections*. The Interior motion is kept in its Wavelength-Storage-Tank* 2r = nλ, *and the Linear motion is continued by the Propagating Electromagnetic-Wave which is the conveyer of the Storage.*

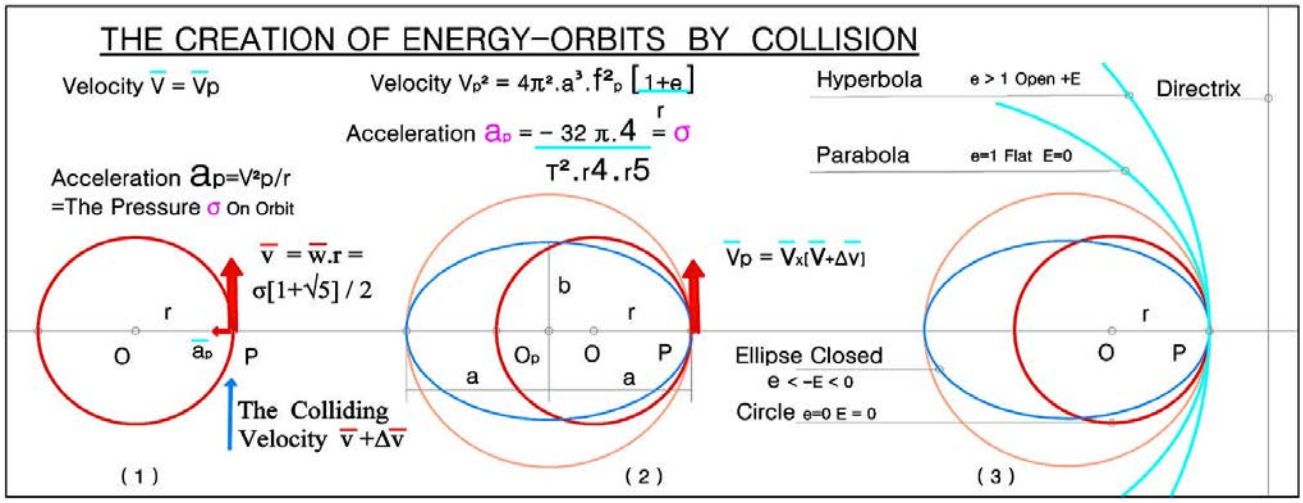

Figure 9: Velocities and Accelerations on, Planar and Atom*, Orbits after any Collision*

In (1) is presented the Circular motion where the constant velocity is equal to $v = \mathbf{v}_\mathbf{p} = wr$ and the Centripetal-acceleration $\mathbf{a}_\mathbf{p} = \frac{\mathbf{v}^2}{\mathbf{r}}$.

In (2) is presented the Elliptical motion after collision , where the acceleration is increased,

The velocity is equal to $\mathbf{v}^2_\mathbf{p} = 4\ \pi^2 a^3.\ \mathbf{f}_\mathbf{p}{}^2[\frac{1+e}{r}]$ and the Centripetal-acceleration equal to $\mathbf{a}_\mathbf{p} = -\frac{32C^2a^2}{r^5} = -\frac{32\pi a^4[1]}{T^2 r^4\ [r^5]}$, and for $r = a \rightarrow \mathbf{a}_\mathbf{p} = -\frac{32\,\pi}{T^2\,r^5}$, where $C = \frac{dS}{dt} = r^2 d\varphi/2 = \text{constant}$

In (3) are presented the Circular , Elliptical , Parabola, Hyperbola motion after collision , where acceleration is increased. The velocity is equal to $\mathbf{v}^2_\mathbf{p} = 4\pi^2\ \frac{a^3}{T^2}\ [\frac{1+e}{r}] = 4\pi^2 a^3 \mathbf{f}_\mathbf{p}{}^2[\frac{1+e}{r}] = k\ [\ \frac{2}{r} - \frac{1-e^2}{p}]$ and the Centripetal-acceleration $\mathbf{a}_\mathbf{p} = \frac{d^2r}{dt^2}\ \frac{4\,c^2}{z^3}$, *where* $k = \frac{4C^2}{p} = \text{constant}$, $\frac{d^2r}{dt^2} =$ Natural acceleration

a. *The Conservative System, Mechanical-energy and Shapes*

Conservative System is that, when the Total energy $E = \mathbf{K_E} + \mathbf{P_E}$, is constant , where $\mathbf{K_E} =$ the Kinetic energy and $\mathbf{P_E} =$ the Potential energy and $\mathbf{K_E} + \mathbf{P_E} =$ constant or $\frac{d}{dt}[\mathbf{K_E} + \mathbf{P_E}] = 0$, from the conservation of energy can be written $E = \mathbf{K_1} + \mathbf{P_1} = \mathbf{K_2} + \mathbf{P_2}$, where, 1, 2, represent two instances of time.

If at time, 2, is the time corresponding to *the maximum displacement* of the mass then velocity of the mass is zero and $\mathbf{K_2} = 0$, where $\mathbf{K_1} + 0 = 0 + \mathbf{P_2}$.

If the System is undergoing harmonic motion, *the motion is repeated in equal intervals of time* t, and x(t) = x(t + w), then $\mathbf{K_1}$ and $\mathbf{P_2}$ are maximum values and issues $\mathbf{K_{max}} = \mathbf{P_{max}}$.

Summing the Kinetic and Potential energy we have

$$\dot{\mathbf{x}}^2/2 + P(x) = E = \textit{constant} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

and solving for $\dot{\mathbf{x}} = y$ then

$$y = \dot{x} = \pm\sqrt{2[E - P(x)]} \quad \ldots\ldots(2)$$

where trajectories must be symmetric about the x-axis,

$$\ddot{x} = f(x) \quad \ldots\ldots(3)$$

or $\ddot{x} = \dot{x}\,(d\dot{x}/dt) = f(x)$ and (3) is written

$$\dot{x}\, d\dot{x} - f(x).dx = 0 \quad \ldots\ldots(4)$$

By integrating $\frac{\dot{x}^2}{2} - \int_0^x f(x)dx = E$ and by comparison with (1) then $P(x) = -\int_0^x f(x)dx$ and $f(x) = -dP/dx$ i.e. *for a conservative System the Force is equal to the negative gradient of the Potential-energy*, and is

$$\frac{dy}{dx} = \frac{f(x)}{y} \quad \ldots\ldots(5)$$

Equations note that, at the equilibrium points the slope of the potential energy curve P(x) = 0. It can be shown that the minima of P(x) are stable equilibrium while, positions corresponding to the maxima of P(x) and are positions of unstable equilibrium. Since the trajectories maybe closed curves as this happens in orbitals, the period associated with them is $T = 2\int_{x1}^{x2} dx/\sqrt{2[E - P(x)]}$ where x_1 , x_2, are extreme points of the trajectory on the x-axis.

In Figure-8, mass m, at point P, is orbiting with velocity vector $\bar{v}$, analyzed into the radial $\overline{v_1}$, and the tangential $\overline{v_2}$, both perpendicular to PF_1 , PF_2. Since sum $PF_1 + PF_2 = 2a =$ constant , therefore $v_1 + v_2 = 0$, and $v_1 = -v_2$, i.e. the two velocities are of equal magnitude and opposite sign and ,velocity on tangent at P is the external bisector of PF_1 , PF_2 vectors.

The Kinetic energy breaks into two parts as

$$K_E = mv_1^2/2 + mv_2^2/2 \quad \ldots\ldots (a),$$

and the magnitude of the Angular-momentum $L = r.\,m\, v_2$, and in terms of L, $K_E = \frac{1}{2}mv_1^2 + \frac{L^2}{2mr^2}$ and adding the Negative Potential energy $P_E = -G\frac{Mm}{r}$, then Total energy $E = K_E + P_E$,

$$E = \frac{1}{2}mv_1^2 + \frac{L^2}{2mr^2} - G\frac{Mm}{r} \quad \ldots\ldots(b)$$

Turning points r_p, *perihelion*, r_a, *aphelion*, are the distances of closest approach and further recession, where $v_1 = 0$, $v_2 = 0$, and (b) becomes $\frac{L^2}{2mr^2} - G\frac{Mm}{r} = E$ or → $r^2 + G\frac{Mm}{E}r - \frac{L^2}{2mE} = 0$, an equation with the two roots r_p and r_a , as $(r - r_p).(r - r_a) = 0$, or $r^2 - (r_p + r_a).r + (r_p r_a) = 0$ *where is*

Sum of roots $[r_p + r_a] = -G\frac{Mm}{E} = 2a$ from where $\frac{2E}{m} = \frac{GM}{a}$, and

Product of roots $[r_p . r_a] = -\frac{L^2}{2mE}$ from where L = r.mv , v = L/r.m , $E = \frac{1}{2}m[\frac{L}{rm}]^2 = \frac{L^2}{2mr^2}$

The turning points are related to the axes of the ellipse by $r_p + r_a = 2a$, and $r_p . r_a = b^2 = -\frac{L^2}{2mE}$ so,

Energy on Orbit $E = \frac{GMm}{2a}$, Angular-momentum $L^2 = -2m.E.b^2$ ....(c)

From Kepler laws, the area, S, swept out by the line $PF_1 = r$ is $dS = r^2.d\theta/2$ and the rate of swept is $\frac{dS}{dt} = (r^2/2).(d\theta/dt) = \frac{1}{2}r^2 w = \frac{1}{2}r\,(r\,w) = \frac{L}{2m}$, since $r\,w = v$ and $m\,r^2 w = L\,.\,f^2{}_n$

Since L is a constant according to Kepler second law radius r, sweeps out equal areas during equal intervals of time and for the total area → $\pi ab = S = \int \frac{L}{2m}dt = \frac{LT}{2m}$, and T is the period of rotation.

From above $S^2 = \frac{L^2T^2}{4m^2} = \pi^2a^2\,[\,b = \pi a(\frac{L^2}{2mE})]$, or $\frac{T^2}{a^2} = \frac{4\pi^2 m}{2E} = \frac{4\pi^2}{2E/m} = \frac{4\pi^2 a}{GM}$ and → $\frac{T^2}{a^3} = \frac{4\pi^2}{GM} =$ *constant*

From relation $\frac{T^2}{a^3} = \frac{4\pi^2}{GM} = k = \frac{1}{f^2{}_n . a^3}$ becomes → $1 = k\,.f^2{}_n . a^3 = \frac{4\pi^2}{GM}.f^2{}_n . a^3$ ....(d)

From Web $r^2(\theta) = [\frac{L^2/m}{E \pm \sqrt{E^2 - kL^2/m})\sin 2(\theta - \theta_0)}]$ ....(e)

which is an ellipse.

Equation (e) denotes Ellipses and circle, having a constant Energy-Shape when are given the Geometrical parameters related to the Physical parameters, Angular momentum (L), Total energy (E).

For a central gravitational force, the Potential-energy $P_E = -GMm/r$ and,

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$$\theta(r) = \int d\boldsymbol{\theta} = \pm\frac{l}{\sqrt{2m}}\int_0^r \frac{dr/r^2}{\sqrt{E\,r^2 + GMmr - L^2/2m}} \quad \ldots\ldots(f)$$

Placing $a = -L^2/2m$, $b = GMm$, $c = E$, then, $\int_0^r \frac{dr/r}{\sqrt{a + br + c\,r^2}} = \frac{1}{\sqrt{-a}}\sin^{-1}\left(\frac{br+2a}{r\sqrt{b^2 - 4ac}}\right)$ .....(f1)

and $\theta - \boldsymbol{\theta_0} = \pm\sin^{-1}\left(\frac{GMm^2 - L^2}{GMm^2 r}\right)$ and eccentricity $e = \sqrt{1 + 2EL^2/G^2M^2m^3}$ .....(f2)

where $\boldsymbol{\theta_0}$ is a constant of integration. Solving for r then $r = \frac{L^2/GMm^2}{1 \pm e\sin(\theta - \theta_0)} = \frac{L^2/GMm^2}{1 + e.\cos\theta}$ at periapse .....(f3)

creates only one Energy-Rim .

The Velocity Related to the distance [r] *of the Planet* [the Orbiter] *to the Sun* [the Focus]:

From Fig-8, the velocity equation in a Central motion is $v^2 = 4C^2.\left[\frac{e^2\sin^2\varphi}{p} + \frac{1}{r^2}\right]$.....(f4)

where constant $C = \frac{\pi ab}{T} = \pi\, ab\, \mathbf{f_p} = \frac{dS}{dt} = r^2 d\varphi/2$ = The covered orbiting area per time second, and $\frac{d(1/r)}{d\varphi} = -\frac{e\sin\varphi}{p}$.

From (1) $r = \frac{p}{1 + e\cos\varphi}$ and velocity is,

$$v^2 = 4C^2.\left[\frac{e^2\sin^2\varphi}{p^2} + \frac{1 + e^2\cos^2\varphi + 2e\cos\varphi}{p^2}\right] = \frac{4C^2}{p^2}[e^2 + 1 + 2e\boldsymbol{\cos\varphi}] = \frac{4C^2}{p}\left[\frac{e^2+1}{p} + \frac{2}{r} - \frac{2}{p}\right] = \frac{4C^2}{p}\left[\frac{2}{r} - \frac{1-e^2}{p}\right] \quad \ldots\ldots(f5),$$

and for ellipse issuing $2a = \mathbf{r_{\varphi=0}} + \mathbf{r_{\varphi=a}} = \frac{p}{1+e} + \frac{p}{1-e} = \frac{2p}{1-e^2}$

therefore, $v^2 = \frac{4C^2}{p}\left[\frac{2}{r} - \frac{1-e^2}{p}\right] = v^2 = \frac{4C^2}{p}\left[\frac{2}{r} - \frac{1}{a}\right]$ .....(f6)

From (f6) , when Planet is at Perihelion, *near the Sun* $\frac{1}{r} = \frac{1+e}{p}$], and velocity at Perihelion is,

$v^2 = \frac{4C^2}{p}\left[\frac{2}{r} - \frac{1-e^2}{p}\right] = \frac{4C^2}{p}\left[\frac{2}{r} - \frac{1-e}{r}\right] = \frac{4C^2}{p}\left[\frac{1+e}{r}\right]$, where $\frac{4C^2}{p} = \frac{4(\pi ab/T)^2}{b^2/a} = 4\pi^2\frac{a^3}{T^2}$, *Kepler constant*, and

$$v^2 = 4\pi^2\frac{a^3}{T^2}\left[\frac{1+e}{r}\right] = 4\,\pi^2 a^3.\,\mathbf{f_p}^2\left[\frac{1+e}{r}\right] = K\left[\frac{1+e}{r}\right] \quad \ldots\ldots(f6)$$

The velocity at Perihelion.

For eccentricity $e < 1 \rightarrow v^2 = K\left[\frac{1+e}{r}\right] < K\frac{2}{r}$ *Planet follows Elliptic Orbit*

For eccentricity $e = 1 \rightarrow v^2 = K\left[\frac{1+e}{r}\right] = K\frac{2}{r}$ *Planet follows Parabolic Orbit*

For eccentricity $e > 1 \rightarrow v^2 = K\left[\frac{1+e}{r}\right] > K\frac{2}{r}$ *Planet follows Hyperbolic Orbit*

In a circular motion show that, velocity is proportional to the inverse square of radius r, and Newton –force, *acceleration*, the fifth, where $C = \frac{\pi ab}{T} = \frac{\pi a}{T}\left[\frac{1}{r^2}\right] = \frac{\pi a}{T\,r^2}$

From relation $r = 2a.\boldsymbol{\cos\varphi}$ is , $\boldsymbol{\cos\varphi} = \frac{r}{2a}$, $\frac{1}{r} = \frac{1}{2a\cos\varphi}$ and $\frac{d1/r}{d\varphi} = \frac{1}{r}\boldsymbol{\tan\varphi}$, and (f4) is

$$v^2 = 4C^2.[\boldsymbol{\tan^2\varphi} + 1] = \frac{4C^2}{r^2}\frac{1}{\cos^2\varphi} = \frac{16C^2a^2}{r^4} \quad \text{and} \quad \textit{velocity} v = \frac{4Ca}{r^2} \quad \ldots\ldots(f7)$$

Centripetal – acceleration $\mathbf{a_p} = \frac{v^2}{r} = -\frac{16C^2a^2}{r^4}.\frac{1}{a} = -\frac{16\,C^2a}{r^4}$ and equal to $\frac{a_p}{\cos\varphi}$, therefore ,

Centripetal – acceleration $\mathbf{a_p} = -\frac{32C^2a^2}{r^5} = -\frac{32\pi a^4[1]}{T^2 r^4\,[r^5]}$ and for r = a then $\mathbf{a_p} = -\frac{32\,\pi}{T^2\,r^5}$ .....(f8)

vi. *Orbital - Geometry and Orbital – Physics*

The Geometrical elements in orbit is the semimajor axis a , and eccentricity e.

For radius r, issues $\frac{2E}{m} = \frac{GM}{a}$ and solving for $a = \frac{GM\,m}{2\,E}$, and $e = \sqrt{1 + 2EL^2/G^2M^2m^3}$ .....(g)

For $\mathbf{r_p}(1 + e) = l^2 / GMm^2$ radius of Planet $\mathbf{r_p} = \frac{l^2}{(1+e)GMm^2}$ .....(g1)

The Physical parameters in orbit is Total energy $E = \mathbf{K_E} + \mathbf{P_E}$, and Angular-momentum $L = \bar{\mathbf{r}}m\,\bar{\mathbf{v}}$.

From above $E = -\frac{GM\,m}{2\,a}$ and $L = \sqrt{(1-e^2).GMm^2.a}$ .....(p)

Energy in Orbit $E = -\frac{GM\,m}{2\,r_p}(e-1)$ and $L = \sqrt{(1+e).GMm^2.r_p}$ .....(p1)

For e = 1, issues for Parabolas and Hyperbolas where $r_p(1 + e) = L^2 / GM\,m^2$.

Remarks

1. The two constituents of energy, $\frac{L^2}{2mr^2}$, - G $\frac{Mm}{r}$, depend on, r, so at points where the total energy E is equal to them and the radial motion along the line PF_1 is zero, which is at the turning points. For r → ∞ issues also zero meaning that energy E is positive or zero.

   If E > 0 is Positive, then mass m of point P approaches mass M at F_1, and moves away never return.

   If E = 0 is Zero, then mass m of point P approaches mass M at F_1, and moves Not bounded.

   If E < 0 is negative then exist two turning points and are created bound orbits. Energy is related to frequency as, E = h f = h.[$\frac{2S_n}{ab}$], *therefore*, *Positive frequencies*(Positive or zero Total energy) give Unbound-motion while, *Negative frequencies* (Negative Total energy)*create Bound motion.*

   This Property of Energy, frequency*, between Positive and Negative Energy, arises from the Reality for*Potential –Energy*, to be zero or Negative and twice the Kinetic*, $P_E = -2.K_E$.

2. The turning points (1), (2) are the maxima of the System P, F_1 , and from Energy-equation E = $\frac{GMm}{2a}$ is seen that the Energy E depends only on the length of the orbit (1) - (2) = 2a, while the Angular momentum L is proportional to, b, therefore the more eccentric orbits happen for the smaller b corresponds to lower L, while maximum L occurs for a circular orbit where b = a.

3. From the last equation, $\frac{T^2}{a^3} = \frac{4\pi^2}{GM}$ = k*constant*→ Kepler 3rd law , by measuring period T, or frequency f, can determine the mass M. Simultaneously since, 1 = k.f_n^2.r^3 , → $f_n^2 = \frac{1}{k\,r^3}$ i.e.
   Frequency squared is proportional to the inverse cube of Radius, is useful in Material-point.

4. From above, *Shapes* in a Conservative System related to Mechanical-energy are only four types,

   1. For a = b then e = 0, and the Shape are the Circles, with Zero Total-energy.
   2. For a > b then for e > 0 the Shape are the Ellipses, with Negative Total-energy.
   3. For a > b then for e = 1 the Shape are the Parabolas, with Zero Total-energy.
   4. For a > b then for e > 1 the Shape are the Hyperbolas .with Positive Total-energy.

From F.9-(3), Total energy in Bounds orbits, *Circles and Ellipse*, is *Negative*, in Critical-Bound Orbits, *Circle and Parabola*, is, *Zero*, while in Open, unbound orbits, *Parabola, Hyperbola*, *Positive,* extended to infinity.
Circles with e = 0, and Parabolas with E = 0, occur in Nano-Nature in the Material-Points.
For Zero, Angular-momentum L , eccentricity is e = 1.

The Extrema cases for Energy - Orbits are,

For Circle to Ellipse is as e → 0 where then Energy from Negative becomes Zero.

For Ellipse to Parabola is as e → 1 where then Energy from Negative becomes Zero.

For Hyperbola to Parabola is as 1 ← e where then Energy from Positive becomes Zero.

From eccentricity e equation $e = \sqrt{1 + 2EL^2/G^2M^2m^3}$, $e^2 - 1 = \frac{2E\,L^2}{G^2M^2m^3} = \frac{E\,k^2\,L^2}{8\pi^4m^3} \equiv \frac{A\,L^2}{GMm^2} \equiv \frac{b^2}{a^2}$

The Extrema Energy - Orbits help, The Moving – Energy - Stores, to enter the Caves.

Negative-Energy represents the fact that, to free the Planet, an orbiting mass, from the Central Potential requires *a Way to Add-Energy. Kinetic Energy is always Positive, therefore it is possible the Total Energy of the Orbiting-mass to be Negative, Zero, or Positive*, which happens in a circular motion with a constant velocity v = wr. It is later proved that Energy in Orbits is conserved in Planet-Focus-axis, by using the Material-LRC circuit to change the Direction of the Momentum-Vector of the between dipoles.

Force $F_1 = A_1 \sin(wt + \varphi)$ colliding with another force $F_2 = A_2 \sin(wt)$, by cross product, gives Power.

Power is D = $\mathbf{F_1F_2}$= $\mathbf{A_1}$ **sin** $(\mathbf{wt+\varphi})$. $\mathbf{A_2}$ **sin** $(\mathbf{wt})$ = $\mathbf{A_1A_2}$ [**sin** $(\mathbf{wt+\varphi})$. **sin** $(\mathbf{wt})$] and by using Trigonometry, the Power D =$\mathbf{A_1A_2}$ [**cos** $(\mathbf{2wt+\varphi})$.**cos** $\boldsymbol{\varphi}$] = $\mathbf{A_1A_2}$/2 [- **cos** $(\mathbf{2wt+\varphi})$ + **cos** $(\mathbf{-\varphi})$] = $\mathbf{A_1A_2}$ /2 [**cos** $(\mathbf{-\varphi})$ – 2 **cos** $\frac{\mathbf{2wt+\varphi}}{\mathbf{2}}$.**cos** $\frac{\mathbf{-\varphi}}{\mathbf{2}}$] = $\frac{\mathbf{A_1A_2}}{\mathbf{2}}$ [− **cos** $(\boldsymbol{\varphi})$ + 2 **cos** $^2\frac{\boldsymbol{\varphi}}{\mathbf{2}}$], and by analyzing

Power D = $\frac{\mathbf{A_1A_2}}{\mathbf{2}}$[- **cos** $^2\frac{\boldsymbol{\varphi}}{\mathbf{2}}$ + **sin** $^2\frac{\boldsymbol{\varphi}}{\mathbf{2}}$ + 2 **cos** $^2\frac{\boldsymbol{\varphi}}{\mathbf{2}}$] = $\frac{\mathbf{A_1A_2}}{\mathbf{2}}$ [**sin** $^2\frac{\boldsymbol{\varphi}}{\mathbf{2}}$ + **cos** $^2\frac{\boldsymbol{\varphi}}{\mathbf{2}}$] = $\frac{\mathbf{A_1A_2}}{\mathbf{2}}$, and since wave is twice of the frequency this represents the fluctuating component of Power , meaning that the average value of which is zero, and are,

$$D = -\frac{\mathbf{A_1A_2}}{\mathbf{2}}[\ \mathbf{cos}\ (\mathbf{2wt+\varphi}) + \mathbf{cos}\ (\boldsymbol{\varphi})\ ]\ ,\quad \text{and att} = 0,\ D = -\mathbf{A_1A_2}\ [\ \mathbf{cos}\,\boldsymbol{\varphi}\ ] \text{i.e.}$$

By collision at perihelion $\boldsymbol{r_p}$ *, with another object of velocity v ,then velocity becomes* $\boldsymbol{v^2_p}$*, or*

$$\mathbf{v^2_p} = 4\pi^2\ \frac{\mathbf{a^3}}{\mathbf{T^2}}\ [\frac{\mathbf{1+e}}{\mathbf{r}}] = 4\ \pi^2 a^3.\ \mathbf{f_p}^2[\frac{\mathbf{1+e}}{\mathbf{r}}],\ \text{acceleration}\ \mathbf{a_p} = -\frac{\mathbf{32\,\pi}}{\mathbf{T^2\,r^5}},\ \text{and}\ L = 0\ ,\ e = 1\ ,\ D = -\mathbf{A_1A_2} \qquad \text{....(pe)}$$

From Energy-State-equations (pe) is transparent that,
Any moving Particle when is Tangentially-colliding with Any Material-Point, P , executing Circular motion on a circle of radius, r, then the Total Energy, E, is Negative , and the Particle follows constant Elliptical – Energy - Orbits on the same semi major axis, and of the same constant Energy.

If the New Orbit is of eccentricity e = 0, and Zero Total Energy*, then is a Circle, If it is 0 < e < 1,* and Zero Total Energy*, then is the Ellipse , If it is e = 1,* and Zero Total Energy*, is a Parabola and If it is e>1,* and Positive Total Energy*, is the Hyperbola .*

So all Planets move in this way either in Atoms or in, Planetary-System*, obeying Newton`s equations of motion, such in microcosm as in macrocosm.*
The How this Begins from Material-Point and where this Finishes in Universe ??? markos 31-8-2018

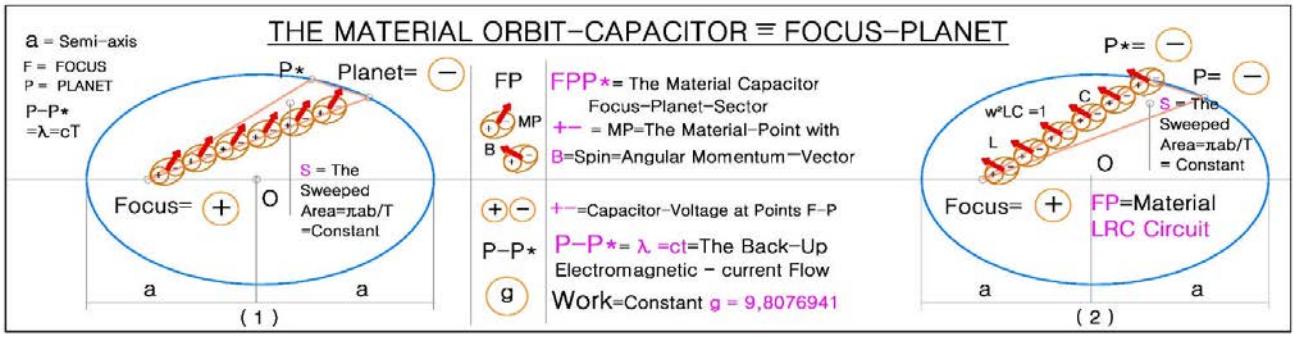


Figure 10: The Material, LRC Circuit on Orbit, on Focus-Planet-Sector FP

In (1). Force g, as wave, is directed to the center of rotation F, and is proportional to the distance PF ≡ Focus-Planet. The Gravitational Potential-Energy $\mathbf{g_G}$ =9, 8076941is stored in → Focus-Planet-Sector ≡ FP ← which is The Material-Capacitor-Stores-charge, *as that of Material-LRC-circuit*, and Inductors .Because of the chains of Spins, is thus created a Magnetic field due to LRC-circuit and which is tuning to the critical Quantum-critical-State $\mathbf{g_G}$. The chains of Spins are pointy vibrating with their characteristic frequencies. Since Inner-stresses $\boldsymbol{\sigma_{1,2}} = \boldsymbol{\sigma_1/2} \pm (½)\sqrt{\boldsymbol{\sigma_1^2 + 4.\sigma_1^2}} = \boldsymbol{\sigma_1/2}$ [1±√5] follow the *Golden ratio on stresses* then this Quantum-energy $\mathbf{g_G}$ produced, is the State causing them to Magnetically-Resonate.

In (2) is presented the Back-Up Electromagnetic current flowing in opposite direction FP by changing the Spin direction of the Sector-Material-Points such that work W = g.
From Kepler`s 2nd law the area , S , swept by any*Focus-Planet-Sector* ≡ FP is constant and equal to,

$$S^2 = \frac{\mathbf{L^2\,T^2}}{\mathbf{4m^2}} = \pi^2a^2[b = \pi a(\frac{\mathbf{L^2}}{\mathbf{2mE}})],\ \text{or}\ \frac{\mathbf{T^2}}{\mathbf{a^2}} = \frac{\mathbf{4\pi^2 m}}{\mathbf{2E}} = \frac{\mathbf{4\pi^2}}{\mathbf{2E/m}} = \frac{\mathbf{4\pi^2\,a}}{\mathbf{GM}}\ \text{and} \rightarrow \frac{\mathbf{T^2}}{\mathbf{a^3}} = \frac{\mathbf{4\pi^2}}{\mathbf{GM}} = k = \frac{\mathbf{1}}{\mathbf{f^2_n.a^3}} \rightarrow 1 = k.\mathbf{f^2_n.a^3}$$

For *Planck`s length* light velocity c=2,9979.$\mathbf{10^8}$ m/s , *time* $\mathbf{t_P}$=5,391.$\mathbf{10^{-44}}$ sec ,$\boldsymbol{\lambda_P}$ = c$\mathbf{t_P}$=1,6162.$\mathbf{10^{-35}}$
The number $\mathbf{N_S}$, of possible swept areas S = r².dθ/2 , *in circle* is$\mathbf{N_c}$ =(2πa) / ($\boldsymbol{\lambda_P}$) m/s or

$$\mathbf{N_{Sc}} = (2\pi a)\ /\ (1{,}6162.\mathbf{10^{-35}}) = 3{,}8876.a.\mathbf{10^{35}}\ \text{m/s} \quad \text{.....(1)}$$

For Ellipse is $\mathbf{N_{SE}} \cong [2\pi\ \sqrt{\frac{a^2+b^2}{2}}/\ (\boldsymbol{\lambda_P})\ ]$ m/s = 2,74897.$\sqrt{\mathbf{a^2+b^2}}.\mathbf{10^{35}}$ m/s .....(2)

Above equations consist the *minimum Granular-Capacitors* of the *Orbit-Swept-areas*, with the minimum Gravity-Energy in $\boldsymbol{\lambda_P}$ / c time $\mathbf{t_P} \rightarrow \ \mathbf{g_G} =$ 9, 8076941 $\frac{\mathbf{N}}{\mathbf{Kg}}$

vii. *The Energy - Orbits in Microcosm - Macrocosm*

Piezoelectric-effectmeans, when *Using a Lattice-Disk* (as *Orbits, Caves, Material-Points, Particles, Atoms, Molecule, Crystals, Microchips, etc.*) *Converts the Mechanical energy which is Work*, *into Electricity*, (*Electrical Potential as a Voltage*) , *across the sides of the Disk* or vice versa, i.e. *When on a Lattice-Disk, is Put a Voltage across the Disk, and thus its Inside-content is subjecting to an electrical-Pressure then Inside-content has to move to rebalance,* and thus deformed.

Gravity is Potential-energy with binder Energy-Field{ [∇i]= [± s²] a constituent in MFMF Field, *the called Gravity force without Vibration but only local rotation*}, *occurring from Energy-Vectorsof the Material-Points*[⊕↻↺⊖]*in Gravity-field ,and this because are axially on their Spin-Vector* $\bar{\mathbf{B}}$ ≡ *Spin* ≡ *Rotational -Energy*, *and which Energy-Vectors is the* Inside-content of the Gravity-field.

The Dot-product happens for interactions between *Similar dimensions*, while the *Cross-product* between *Different-dimensions*. Cross-product of two vectors $\bar{\mathbf{a}}$, $\bar{\mathbf{b}}$ is $\bar{\mathbf{a}} \times \bar{\mathbf{b}} = |\bar{\mathbf{a}}|.|\bar{\mathbf{b}}|\ \mathbf{sin\,\theta}.\bar{\mathbf{n}}$ and for $\bar{\mathbf{a}}=\bar{\mathbf{b}}$ and θ=90º then $\bar{\mathbf{a}} \times \bar{\mathbf{a}} = \bar{\mathbf{a}}^{\,2}$, and for Quaternion, s, which performs the Work of rotating the one vector around the other is → Work = $\bar{\mathbf{a}} \times \bar{\mathbf{a}} = \bar{\mathbf{a}}^{\,2}.\bar{\mathbf{r}}$, and for $\bar{\mathbf{a}}= \bar{\mathbf{v}}$ then → Work = $\bar{\mathbf{v}}^{\,2}.\bar{\mathbf{r}}=|\bar{\mathbf{v}}|.|\bar{\mathbf{v}}|.\bar{\mathbf{r}} = v^2.\ r.\bar{\mathbf{n}} = (wr)^2 r.\ \bar{\mathbf{n}}$, *or* Work = $(wr)^2 r.\ \bar{\mathbf{n}} = (2\pi r/T)^2\ \mathbf{r}\,\bar{\mathbf{n}} = (4\pi^2 r^2/T^2).\ r.\ \bar{\mathbf{n}} = \frac{4\pi^2 r^3}{T^2}.\ \bar{\mathbf{n}} \ \rightarrow\ W = 4\pi^2 . \frac{r^3}{T^2} .\ \bar{\mathbf{n}} = 4\pi^2.r^3.\mathbf{f^2_p}\,.\,\bar{\mathbf{n}}$*i.e.*

Kepler constant celestial law for microcosm

Kinetic Energy, *motion*, in Orbits becomes from the, *Piezoelectric-effect*, where Orbit is subject to a Mechanical-stress, $\sigma = \pm \frac{4\pi r}{(1+\sqrt{5})}.\mathbf{f_p}$, *becoming from the Centripetal-acceleration* $\bar{\mathbf{a}}_\mathbf{P}$ *of the Planet* and thus is appeareda Positive charge at the *Nucleus* and a Negative-charge at the *Planet*, so is created an electric-signal with a given frequency $\mathbf{f_p}$. The two faces at N and P are connected by the in-between *Energy-Vectors* $\bar{\mathbf{B}}$ **,** of the Stationary-material-points [⊕↻↺⊖] in Gravity-field [∇i]

In Orbits which are Negative-Energy-Rims, with binder Energy the atraction between the two opposite forces $\mathbf{P_N \leftrightarrow P_P}$at points, Focus N and Planet P, is created the Central motion where, *Orbital-Resonance* is the Plane Surfaces, representing a Constant-Energy-Rim followingthe Celestial Kepler Laws*and say this as an Plane-Energy-Resonance ,*because happens in-Plane and on Energy-Field-vectors →Spin $\bar{\mathbf{B}}$.

In Figure -8-9-10- are shown the Ellipse-Orbits,1=c.$\mathbf{f_n}^2$.r³, with their content which is The Spin-Field-vectors $\bar{\mathbf{B}}$ in all area π ab of MFMF field, where Centripetal-acceleration $\bar{\mathbf{a}}_\mathbf{P} = \sigma = \pm\frac{4\pi r}{(1+\sqrt{5})}.\mathbf{f}$.

i.e. *Orbit is subject to a Mechanical-stress,* σ*, becoming from the Centripetal-acceleration* $\bar{\mathbf{a}}_\mathbf{P}$ *, and so is appeared the* Piezoelectric-effect with Positive-charge *at the Focus* ≡ *Nucleus* and Negative-charge *at the Planet*. The two faces at N, P *are connected by the* Spinning-stationary-material-points [⊕s²↻↺⊖s²] forming the → *Focus-Planet-Sector* ≡ *Store-Charge field*[∇i] =[± s²] in [MFMF] Field ≡ ← and thus is *flowing Current which is the Resonance on Orbit,* and it is the Gravity Force, g.

In the *Inverse* Piezoelectric-effect on Orbit, *when a voltage is applied across its opposite* faces at N, P becoming from the[⊕↔⊖] stretching, then Orbit becomes mechanically stressed, *Deformed in Shape by the Resonance at* N *and* P. The way that *Potential-Energy is stored*, *is that of the Material-LRC-circuit*, which is for the Gravitational Potential-Energy the *Material-Capacitor* or the → *Focus-Planet-Sector-Stores-charge* ←which develop a voltage in response to that charge. The coil of wire is the *infinite Stationary-Dipole-Spinning Material Points* of this → *Focus-Planet-Sector* ← which develops the Back Electromagnetic-flux , when the current through them changes.

Orbit or, *Negative-Energy-Rim,* is the Stable and Stationary Granular-lattice-Energy-Disk , *which is kept in the Plane-Orbit of motion,*{ *The-Focus-Planet-Sector in Ellipse area* πab = $\pi a^2\sqrt{\mathbf{1-e^2}}$, sweeps out equal areas in equal times and on *Focus-Planet-Sector a voltage is applied as Gravity-field*} ,*which is an Electromagnetism,* and in a way is *Opposite* to that which follows the Central motion, i.e

Gravity-Force-Vectors $\bar{\mathbf{B}}$ *of Material-points as Spin*[⊕↻↺⊖] *is packet from the Focus-Planet-Sector to Orbit-Rim as Energy-conveyer for the interactions between,* Nucleus N *and the orbiting object*, *the* Planet P*,* and consists the energy-quanta, *the minimum constant energy* ,of motion →[⊕↻↺⊖]← *in monad Rim in atom*.

viii. *The minimum Energy RIM and The Golden ratio frequency*

From equation 1 =c.$\mathbf{f_n}^2$.a³, and constant work 1/k =$\mathbf{f_n}^2$.a³ the constant energy in Orbit is k = $\frac{\mathbf{T^2}}{\mathbf{a^3}}$.....(e)

It was shown that the maximum Energy in Hydrogen atom is E = h f = -13,6 eV =- 13,6 x 1,6.$\mathbf{10^{-19}}$= 2,176.$\mathbf{10^{-18}}$ Joule, the frequency is f = E / h or, f = 2,176.$\mathbf{10^{-18}}$ J/6,6262.$\mathbf{10^{-34}}$ J.s = 3,28393.$\mathbf{10^{15}}$/s and the Period in Orbit, T = $\mathbf{f^{-1}}$= 3,04513.$\mathbf{10^{-16}}$ s

The motion of all moving Energy-Storages is Sinusoidal as equation $\{[\varepsilon E^2 + \mu B^2] = 2.\lambda c.\sin.2\varphi\}$ ...(e1) and the work produced is stored in their sine curve area of x, y, coordinate axis as $\int_0^{\pi} \mathbf{sin\ x\ dx} = 2$ as equation (e1). Simultaneously unity-Work = sine Integral = $\int_0^t \frac{\sin t}{t}\mathbf{dt} = 1$, at Critical-Energy-point where point is such that Si(x=1) work becomes equal to monad 1, and this critical-energy-unit happens at the point x = 1, 0572508754, or at axis → a = 2x = 2,1145016 m .

From Sphere relation $(4\pi a^3/3)^3 = 1{,}616229.\mathbf{10^{-35}}$, a = 5,447.$\mathbf{10^{-11}}$, or semi-major axis in Hydrogen cave is a =$\mathbf{10^{-11}}$ m, and the Basic-coefficient [2Si(1)] , is the constant a = 2x = 2 ,1145016.$\mathbf{10^{-11}}$ m.
Placing in Hydrogen-Rim the Period T, and the prior Semi-major axis a ,then constant energy E = k,

$k = \frac{T^2}{a^3} = \frac{[3{,}04513.10^{-16}]^2}{[2{,}1145016.10^{-11}]^3} = \frac{9{,}272817.10^{-32}}{9{,}4541768.10^{-33}} = 9{,}808238\frac{s^2}{m^3} = \frac{N}{Kg}$, *agreeing with Gravity* g, *measured.*

i.e. The Minimum-Work → $W = 4\pi^2 \frac{r^3}{T^2} . \bar{n} = 4\pi^2.r^3. \mathbf{f^2_p}.\bar{n}$←*in an Negative-Elliptic-energy-field-Disk as is* PNS, is stored as a Voltage[N≡⊕↔⊖ ≡P] across the Disk-Orbit-Sectors between the rotating Planet P and the Nucleus N, Produced from *the pressure*, σ, *of the frequency* $\mathbf{f_p}$ *and of the semi-major axis* $\mathbf{a_p}$ of the Planet. This minimum work in Atom is equal to Gravity acceleration g = 9,808238 m/s²

Motion is Kept, *is quantized,* as work → W =1= k ≡ [∇i].[±s²] ≡ MFMF Field ← *in the Orbit-area*, πab upon the Spin $\bar{B}$ *Orientation of the Pointy-Material-points* [±s²]. Orientation of Spin becomes from the Energy in the sinusoidal gravity-fields in orbit , created by the motion of oscillation of the material points [⊕↻↺⊖]. Any *Interaction* between this *Oriented-Energy-Sector Disk-Rim* and a *Body-Planet* creates disturbances in Disk and *Reorientation of Spin* $\bar{B}$≡ motion ≡ work ≡ k = constant = quanta and is transformed as, *The Gravity-Force in Disk*, and which Energy is equal to the Gravity acceleration g, and this because *g = force,* as equation g = F/m.

Remarks:

Since constant $k = \frac{T^2}{a^3} = 9{,}808$ and $1 = k.\mathbf{f_n}^2.a^3$, is easy to calculate, a cave, $a = \sqrt[3]{\frac{1}{9{,}808.\mathbf{f_n}^2}}$ .....(e2)

1. Hydrogen Z=1 electron is of frequency $\mathbf{f_H}$= 1,3.$\mathbf{10^{17}}$/sec and $\mathbf{f_H}^2$ = 1,69.$\mathbf{10^{34}}$, so $\mathbf{a_H}$ cave is

$$\mathbf{a}_H = \sqrt[3]{\frac{1}{9{,}808.1{,}69.10^{34}}} = \sqrt[3]{\mathbf{6{,}0329928.10^{-36}}} = 1{,}0820445.\ \mathbf{10^{-12}}\ \text{m}$$

2. Uranium Z=92 electron is of frequency $\mathbf{f_U}$= 1,1.$\mathbf{10^{21}}$/sec and $\mathbf{f_U}^2$ = 1,21.$\mathbf{10^{42}}$, so $\mathbf{a_U}$ cave is $\mathbf{a}_U = \sqrt[3]{\frac{1}{9{,}808.1{,}21.10^{42}}} = \sqrt[3]{\mathbf{84{,}262462.10^{-45}}} = 4{,}3840830.\ \mathbf{10^{-15}}$ m i.e. the energy-circuits.
3. Constant k, becoming from the microcosm by measuring the energy of a cave or Atom-orbit and the semi major axis, or from the macrocosm be measuring the energy of Planetary system and the axis of orbiting , gives the same result.
4. In the next Figure-11 is shown the Way that Universe is formulated by following the basic Internal *Material-Point-eternal-motion* as *Frequency-Golden-ratio* → $\mathbf{f_n} \equiv [\frac{1+\sqrt{5}}{2}]\frac{\sigma}{2\pi r}$ ← from Photons to Atoms, to Molecules, to Crystals, to ,,,,, or to the all Planetary-System obeying Newton`s equations of motion, such in microcosm as in macrocosm and to the expanding universe.

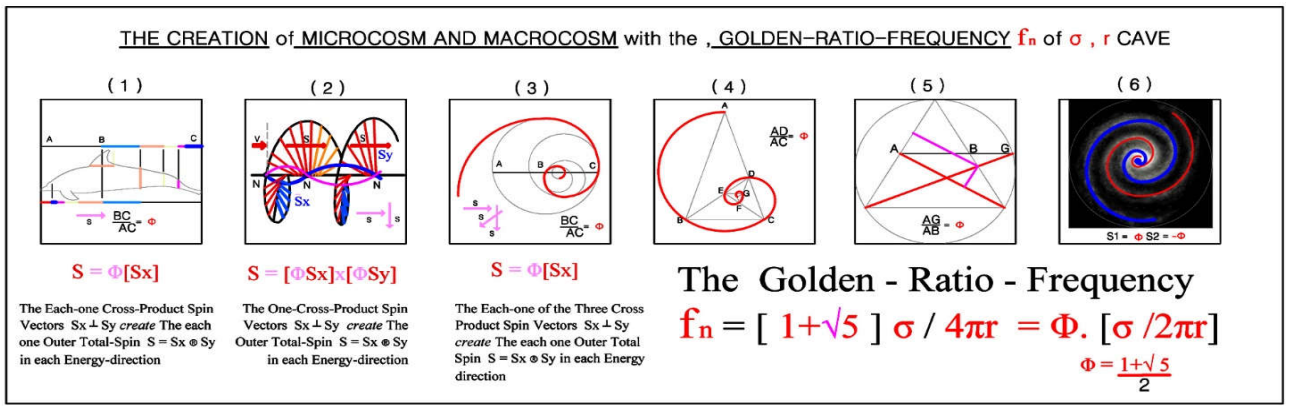
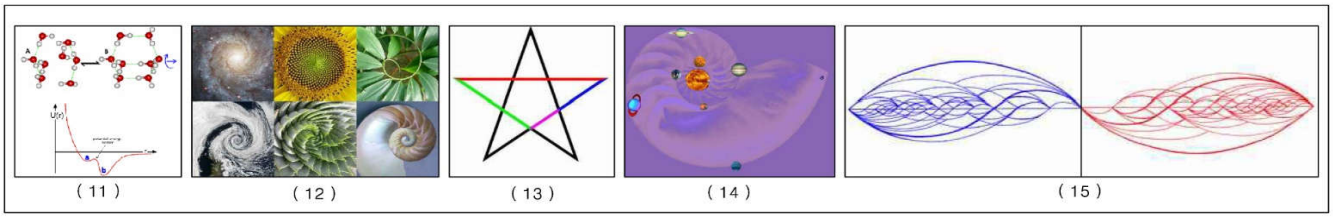


Figure 11: The Why Universe is formulated by the *basic golden-ratio-frequency* $\mathbf{f_n} \equiv [\frac{1+\sqrt{5}}{2}]\frac{\sigma}{2\pi r}$ *Electromagnetic fields undulate within fieldsin the Universal Electromagnetic process of Dipole*[±s²]

≡ [⊕↻↺⊖], *in*[MFMF] ≡ *The Chaos* as base for all motions, *for the Centripetal-Centrifugal forces*.

(1) One-Vector → From velocity vectors, to Animals, to comets to all expanding universe ….
(2) Two-Vectors → From Photons, to Pine-cone, Plants, to Galaxies, to expanding universe …
(3) Three-Vectors → From Sub-atomic particles, to DNA molecules, to Inorganic Chemistry, to Elliptical Galaxies, to expanding universe ……
(4) Three -Vectors → From Elements, molecules, to Fruits, to Milky-Wave Galaxies, to ……
(5) Tree –Vectors in a Circle → From Elements, molecules, to Fruits, to Milky-Wave Galaxies, to all caves and to expanding universe …
(6) N–Vectors in a Circle → From Sub atomic particles, Elements, molecules, to all Organic and Inorganic elements, to all types of Galaxies, to expanding universe ….

Since Frequency in Material-point of cave $\mathbf{10^{-62}}$ m *exists as Golden-ratio pattern*, is seen that *exists also in the Structure and motion of the Atom and Molecule* within the materials, *and in all Universe*.



(11) From Web, the Water molecules-structure follows the *golden-ratio-frequency* $\mathbf{f_n}$
(12) From Web, the Animals and Plant-structures follows the *golden-ratio-frequency* $\mathbf{f_n}$
(13) From Web, the Geometrical Pentagon-structure follows the *golden-ratio-frequency* $\mathbf{f_n}$
(14) From Web, the Planetary Position-structure follows the *golden-ratio-frequency* $\mathbf{f_n}$
(15) From Web, the *Space Anti-space Electromagnetic-fields* in [MFMF] Chaos follow the *Golden-ratio-frequency* $\mathbf{f_n}$ *for the Centripetal-Centrifugal forces*.

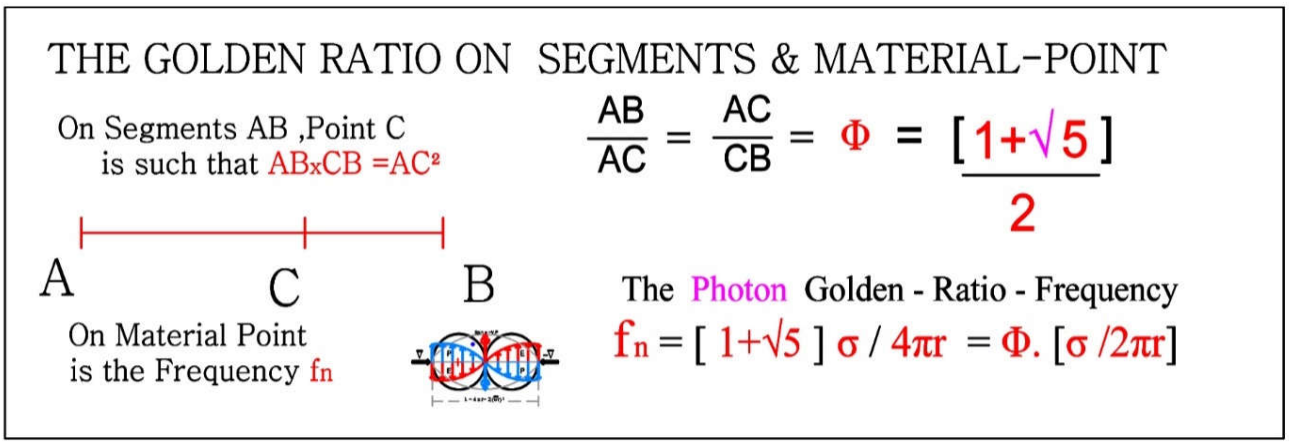


Figure 12: The Golden ratio on Segment AB is at point C, while on Material point[⊕↻↺⊖] is on Principal Stress σ, as frequency $\mathbf{f_n} \equiv [\frac{1+\sqrt{5}}{2}]\frac{\sigma}{2\pi r} \equiv [\frac{n\sigma}{8\,r^2}]$. $\overline{\mathbf{B}} \equiv \frac{\mathbf{E}}{\mathbf{h}}$ i.e.

Frequency $\mathbf{f_n}$ in Material-point and cave $\mathbf{10^{-62}}$ m *exists as Golden-ratio pattern*

Remarks:

1. *Addition, Subtraction, multiplication and Division*

Addition combines two Numbers or two same magnitudes, *the addends or terms*, into a single number or magnitude. Addition is commutative and associative so the order in which finitely many terms are added does not matter. The inverse of a number with respect to a binary operation is that number when combined with any number, yields the identity with respect to this operation, therefore the inverse of a number with respect to addition, *its additive inverse or the opposite number*, is the number that yields the additive identity, 0, when added to the original number, and which is the negative of the original number, i.e. The additive inverse of a number, N, or Segment $\overrightarrow{\mathbf{AC}}$ is → - N, or $\overleftarrow{\mathbf{AC}} \equiv \overrightarrow{\mathbf{CA}}$.

Above logic is that of Inverse elements.

Subtraction is neither commutative nor associative , so was introduced the concept of inverse elements as in Addition, i.e. [a - b = a + (- b)], or Segment $\overrightarrow{AB} - \overrightarrow{AC} = \overrightarrow{AB} + (- \overrightarrow{AC}) = \overrightarrow{AB} + (\overrightarrow{CA}) = \overrightarrow{CB}$ *Multiplication* combines any two numbers into a single number, *the product*, and is a scaling operation so for any number N, greater than one, 1, is as stretching everything away from zero, 0, uniformly in such a way that number,1, is stretched to N, while for any number N, less than one, 1, is as squeezing towards zero 0. Multiplication is commutative and associative, and it is distributive over Addition and Subtraction. The multiplicative Inverse for any number, *and for* 0, is the Reciprocal of this number because multiplying the reciprocal of any number by the number itself yields the multiplicative identity 1.

For number Zero , 0, the Reciprocal is ∞ and issues $0.[\frac{1}{0} = \infty] \equiv 1 - 0 \equiv 1 \equiv \rightarrow$ any Constant.

The process for multiplying two arbitrary numbers a, b, *or any two Segments* AB, AC, *is similar to the process for Addition* a. (1 / b).

Division is the inverse operation to multiplication and is neither commutative nor associative, so was introduced the concept of inverse elements as in Multiplication and thus Division becomes multiplication with the dividend and the Reciprocal of the divisor, *as factors*, i.e.$[\frac{a}{b} = a .\frac{1}{b}]$, and for the Segment $AB\frac{AB}{AC} = AB .[\frac{1}{AC}]$.

2. *Inverse elements*

Inverse Elements are applied to all operations in Arithmetic and Algebra.
For any number N exists an Inverse or an Reciprocal number 1/N , or – N such that, *in*
Addition, *its additiveinverse or the opposite* number, yields the additive identity equal to zero 0,
Subtraction, *itssubtrahend or the opposite* number, yields the additive identity equal to a difference,
Multiplication, yields the multiplicative identity equal to monad 1 or zero 0,
Division, yields the identity equal to N squared.

3. *The Extreme and Mean ratio*

In figure -12 , AB Sector is divided by point C such that $AC = \frac{AB}{2}[\sqrt{5}+1]$ .....(1)

Proof:

According to the definition of Mean ratio is

$AB / AC = AC / CB$, or $AC^2 = AB.CB = AB.[AB-AC] = AC^2 = - AC.(AB) + AB^2 \rightarrow AC^2 + AC\ (AB) - AB^2 = 0$ .....(2)

Solving the second degree equation (2)

then $AC = \frac{AB}{2}[\sqrt{5}+1]$, i.e. Point C on AB sector, is such that issues (1).

The Physical meaning is from Mechanics where, when a force P acting on a surface S of a differential volume ds^3 then Principal stresses σ1,σ2 , Shear stresses τ_{12} are as $\sigma = \sqrt{(\sigma 1 - \sigma 2)^2 + 4\,\tau_{12}}$ and

$$\sigma 1,2 = (\sigma 1 + \sigma 2)/2 \pm (½)\sqrt{(\sigma 1 - \sigma 2)^2 + 4\,\tau_{yz}{}^2} \text{ where } \rightarrow \tan\theta = 2.\tau_{12}/(\sigma 1 - \sigma 2) \quad \ldots\ldots\ldots (3)$$

When the surface becomes a point [This is the Extreme case *where surface is interchanged as line or line-segment, it is the same as the infinite small,* ds*, in Calculus*], *then*σ2 = 0 *and* $\tau_{12}$is very small i.e. it is a type of vanishing-shear due to layers laterally shifted . Since force P is a vectorthen as in cross-product to a right–handled coordinate system, where exists σ2 = 0 and $\tau_{12} = \sigma 1$, equation (3)

becomes → $\sigma 1,2 = \sigma 1 /2 \pm (½).\sqrt{\sigma 1^2 + 4.\sigma 1^2} = \frac{\sigma 1}{2}.[1 \pm (\sqrt{5})] = \frac{\sigma}{2}.[1 \pm (\sqrt{5})]$ .....(4)

Equation (4) denotes the way that Stresses σ1, 2 are shaped on any Volume according to the Principal Stress σ , and which is the Golden-ratio $\Phi = \frac{1}{2}[1 \pm (\sqrt{5})]$of Stress σ.

Since also *Stress* σ eternally exists in Material point and *is of the Golden-ratio-pattern* Φ, therefore microcosm and sequence all macrocosm follows, *the Stress* σ *Property*, of the Golden-ratio-pattern Φ

4. The Φ Properties:

To show that $\Phi = 1 + \frac{1}{\Phi} = 1,6180339887$: Proof,

It is holding → $1 + \frac{1}{\Phi} = 1 + \frac{1}{[1+\sqrt{5}]/2} = 1 + \frac{2}{[1+\sqrt{5}]} = \frac{2[\sqrt{5}-1]}{[\sqrt{5}+1].[\sqrt{5}-1)]}$ or,

$$1 + \frac{1}{\Phi} = 1 + \frac{2[\sqrt{5}-1]}{4} = 1 + \frac{[\sqrt{5}-1]}{2} = \frac{2+\sqrt{5}-1}{2} = \frac{[\sqrt{5}+1]}{2} = \Phi \text{ , } \textit{therefore,} \Phi = 1 + \frac{1}{\Phi} \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Equation (5) is a very Special property of the Golden ratio because is that *it can be defined in terms of itself*, i.e. of unit 1 equal to a new Φ which defines *the Space*, and of $\frac{1}{\Phi}$ defining *the Anti-Space*, and as continuous fraction,

$$\Phi = 1+[\frac{1}{1+\frac{1}{1+\frac{1}{1+\frac{1}{\cdot}}}}] \quad \ldots\ldots (6)$$

Because number Φ, multiplied with its Reciprocal number $\frac{1}{\Phi}$, *is process of Addition*, and equal to unit 1,

$$\text{so} \rightarrow \Phi \cdot \frac{1}{\Phi} = [1+\frac{1}{\Phi}]\frac{1}{\Phi} = 1 \text{ or } \rightarrow \frac{1}{\Phi}+\frac{1}{\Phi^2} = 1 \text{ and } \Phi + 1 = \Phi^2 \text{ or } \rightarrow \Phi^2 = \Phi + 1 \quad \ldots\ldots (7)$$

Equation (7) is also a very Special property of the Golden ratio because, *according to Euclid*, A straight line AB is said to have been cut in Extreme and Mean ratio when as the whole line is to the greater segment AB / AC, so is the greater to the lesser AC / CB, *and according to Markos,*

Since frequency in Material-point $\rightarrow \mathbf{f_n} = (\frac{n\sigma}{8r^2}).\overline{\mathbf{B}} \equiv \frac{(1+\sqrt{5}]).\sigma}{4\pi r} \equiv \frac{E}{h}$, *is occupying the Property of the Golden-ratio-pattern*Φ, equation (7) defines that Material Point of frequency $\mathbf{f_n}$, *when collide with another* Material Point, *or with another Particle or particles,* then Produces another monad as 1 ≡*a New quaternion*, and the first continuous to be of the same Identity, *frequency* $\mathbf{f_n}$, as before ,i.e.

The Frequency of Photon*, embodied with the Golden-ratio-pattern* Φ, Uses *the Vibrating Physical Structures*, *the Granular Material-Instruments*, to Kick-Start *everything in this world.*

VI. General

1. *The Theory of Material Geometry and article[70]*

Energy is the Work, the *motion* in a Material-point A-Bin all directions and which is conserved.

In order that *Motion*, *Displacement*, maybe conserved, then must be *Quantized in a finite Space* because differently *gets annihilate*. Motion in a finite-space, r, can be realized *only as a Reciprocating* [⊕s²↔⊖s²] *or a Revolving motion*[⊕s²↻↺⊖s²] which is Periodic and then happens an Eternal-Quantized-motionin r. All above happen in Material-Point AB ≡[⊕⊖], where Point A = Positive ⊕ and Point B =Negative ⊖.

Since *Energy is the motion of Opposites ,or the* [⊖↔⊕] ≡ [Space ↔ Anti-space] charge in all Levels, *as is the Electrostatic force*, and then the N loops as *Work can be stored in the,* n, *Energy lobes of the Stationary-Wave of cave,* r. The N loops are the Energy-Stores of M-P, and *mass the Reaction* to this *Up - Down oscillatory motion in Loop* of each wave Segment at frequency, $\mathbf{f_n}$, which describe each *mode* and characterized by a different λ, and , f , *into the Energy-Geometrical-Shape of motion*.

This happens because of charges alternation [+, - to - , +], i.e. (AC) which exists on Antinodes amplitude of this local *Inverse* oscillation. The Work produced is stored into the Shape of motion.

All monads can immediately be other monads with different frequency, f, following the *Breakage rule* $\rightarrow s^2 - |\bar{s}|^2 + 2|s|^2.\nabla i \leftarrow$ i.e. matter (+) , antimatter (-), energy (+↔ -) or, *Material Point* A - $\mathbf{K_R}$≡ monad ≡ The Dipole ≡ [⊕⊖] = ∅ =$\mathbf{K_r}$ **A** $\mathbf{K_{R=r}}$*where* → { $\mathbf{K_R}$≡ [⊕] }↔ { $\mathbf{K_r}$≡ [⊖] } → ≡ 0.

The Trapped - Energy into the Stationary Energy – Lobes of monads becomes the Outward Wave with Kinetic Energy for those monads, the Photons, when in cave is followed the Cycloidal-motion where there wavelength λ *is the moving Energy-store, and from EM-radiation, the Electric- field is the Matter and the Magnetic- field is the equilibrium Anti-matter of the Energy-monad -Photon.*

From [66] Angular – Momentum – Vector$\overline{\mathbf{B}} = \frac{\pi r^3 \sigma}{8}[1+\sqrt{5}] \equiv [\frac{h}{2\pi}]$ and , $\sigma = \pm\frac{4\pi r}{(1+\sqrt{5})} \cdot \mathbf{f_1}$

Energy $E = h.\mathbf{f_n} = \frac{h(1+\sqrt{5})}{4\pi}.[\frac{\sigma}{r}] = (\frac{n\sigma}{8r^2}).\overline{\mathbf{B}} \rightarrow$ i.e. *The Energy for the Short or Strong-range forces is dependent*, on Principal stresses, σ, the Spin vector $\overline{\mathbf{B}}$, and on inverse square cave, r. *The Strong Forces as Energy in Nucleus is due to the fact that Proton is a compound element and nucleons* (protons and neutrons) *are held together within an atom`s nucleus by the presence of additional particles as holds for the Breakage-Principle ,While the Short range forces exist on Primary and Neutral Particles only.*

From [66] The First harmonic is $\mathbf{f_1} = \frac{(1+\sqrt{5}]).\sigma}{4\pi r}$, and mass $m = \frac{E}{2r^2.w^2} = \frac{(1+\sqrt{5}])\,4r^2\sigma}{6r\sigma^2\,(1+\sqrt{5})^2} = [\frac{4\pi r^2}{3}].\mathbf{f_1}$ ……………………… (12)

i.e. *Mass is dependent*, on fundamental frequency $\mathbf{f_1}$, and on the square of cave r, is a number measuring the time-rate of changes in cave, *so Energy, the motion, and Mass, a number, are not equivalent*. All Clashed and all The-Un-clashed Material-Fragments exist only in *Chaos* [±s²]≡ [MFMF].

The Geometries:[53-58]This is *the Euclidean Quantization* of points A, B in geometry.

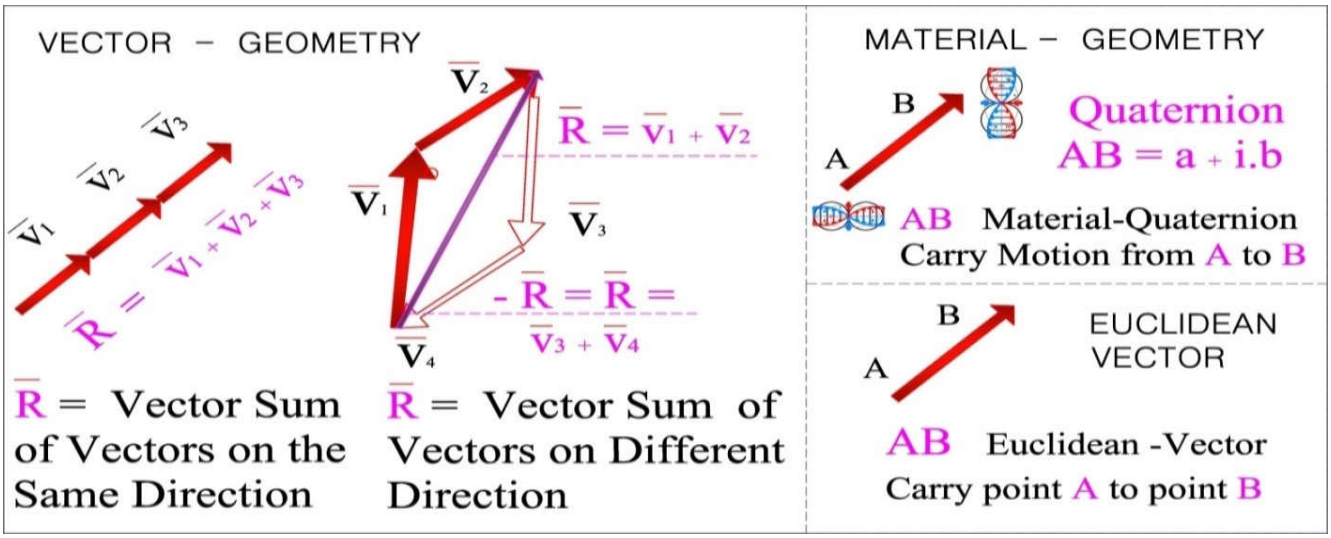


Figure 13: Explanation for the, Vector, in Euclidean and Material-geometry Properties

The Euclidean-Vector carries *point* A to point B, while in M-G *carries motion* from A to B point.

a. *Point in Euclidian-Geometry* is nothing and is possessing Zero-magnitude and Infinite-directions.

b. *Two Points* consist the Straight-line-segment, possessing |AB| - magnitude and the |A→B| Directions.

Euclidean-vector $\overrightarrow{\mathbf{AB}}$ carries Point A to point B, possessing |AB|-magnitude and the two opposite directions $\overrightarrow{\mathbf{AB}}$, $\overleftarrow{\mathbf{BA}}$ respectively. *Atraction* of opposite forces $\mathbf{P_A \leftrightarrow P_B}$at points A, B creates the Central motion and Kepler`s laws where ,*Orbitsare Plane-Surfaces representing a Constant-Energy becoming from the squared Periods T ²,* or Frequency $\mathbf{f_n}^2$*, representing the Imaginary -Energy- Part of monad and* $\mathbf{r_n}^3$ *representing the Real-Space -Part of monad* 1 = c.$\mathbf{f_n}^2$.r³ ,The constant Quantized-Plane-Rims *These energy-Rims are of constant Energy equal to* g*, and follow The Celestial Kepler Laws.*

c. *Three Points* A, B, P, consist the Plane ABP, i.e. the line AB and point P, not on AB, and is the First-Rigid figure , *The Triangle* , In E-Geometry is the First-Shape-Stable figure in Mechanics.
d. *Four Points* A, B, C, P, consist the Space-shape ABCP, i.e. the Plane ABC and point P, not in Plane ABC, and is the First Stable-Solid-figure, *The Tetrahedron* , in E-Geometry.
e. *N- Points* A, B, C, .. P, consist the Space-shape ABC... P, i.e. the Space ABC. and point P, not in Space ABC…., and is the First Stable-Solid-figure, *The N - edron*, in E-Geometry.

1. *Pointin Material-geometry* is the Glue-Bond [⊕⊖] of opposite caves, r, possessing the finite Magnitude |r|, where *both forces exist apriori*, as the Glue-Bond ,σ, between the opposites and as Direction that of the inside Spin $\overline{\mathbf{B}}=\frac{\pi r^3 \sigma}{8}[1+\sqrt{5}] \equiv \frac{\pi^2 r^4}{2}\mathbf{f_1} \equiv [\frac{h}{2\pi}]$ where $\sigma = \pm\frac{4\pi r}{(1+\sqrt{5})}.\mathbf{f_1}$ i.e.

→ Material-Pointconsists *the first Energy-Automobile-Quantum-Space of Euclidean-Geometry*.

2. *Two Points* A ↔ B consist, Quaternion, a + i b , carrying *Energy = motion* from A to B.

where,a, is a scalar quantity that has *Magnitude* but NOT *Direction*.

b, is a vector quantity that has both *Magnitude* AND *Direction*. i.e.

Direction is the $\overrightarrow{\mathbf{AB}}$, $\overleftarrow{\mathbf{BA}}$ denoted as (+) the Right and (-)the Left-direction, axis,[- ← O → +] .

→ Material-Segment consists *the first Energy-Automobile-Quantum-Space-Vector and is equal to the Material-Quaternion* { Real-axis O → Oand Imaginary-axis O → $\sqrt{-1}$ }*of Euclidean-Geometry* Two Points create all , The maximum-minimum and constant Energy-Shapes of M-Geometry. [54]

3. *Three Points* A ↔ B ↔ C consist, the Plane-Quaternion, a + i b, carrying *Energy = motion* from point A to B and C, from B to C and A, and from C to A and B.

where, a, is a scalar quantity that has *Magnitude* but NOT *Direction*., b, is a vector quantity that has both *Magnitude* AND *Direction* . i.e.

→ Material-Plane consists *the first Energy-Automobile-Quantum-Planeand is equal to the Material-Plane-Quaternion* {Real-axis O → x and Imaginary-axis O → $\sqrt{-1}$ }, it isa Field a Region in which each point is affected by a force ,*in Euclidean-Geometry.*

Because the three points in E-Geometry correspond to Six in Material-Geometry therefore the First-Stable figure in Mechanics is the Regular-Hexagon , which is followed by nature. [56]

4. *Four Points* A ↔ B↔ C ↔ P consist ,the Space-Quaternion ,a + i b , carrying *Energy = motion* from point A to B, C and P, from B toC, P and A , from C to P, A and B, from P to A, B and C. *where*, a, is a scalar quantity that has *Magnitude* but NOT *Direction* .

b, is a vector quantity that has both *Magnitude* AND *Direction* . i.e.

→ Material-Space consists *the first Energy-Automobile-Quantum-Space-Plane and is equal to the Material-Volume-Quaternion* { Real-axis O → x , Imaginary-axis O →$\sqrt{-1}$, and O →z }, a Volume, a Region in which each point is affected by a force, *in Euclidean-Geometry.*

Because four points in E-Geometry correspond to eight in Material-Geometry therefore the First-Stable figure in Mechanics is the Regular-Octagon which is followed by nature.

5. *N - Points* A, B ,,, P,,, $\mathbf{P_N}$, consist the, N-Spaces-Quaternion, a + i b, carrying *Energy = motion* from point A to B, P and $\mathbf{P_N}$, fromB toP, $\mathbf{P_N}$ and A, from $\mathbf{P_N}$ to A, B and P, *where*,

a, is a scalar quantity that has *Magnitude* but NOT *Direction*.

b, is a vector quantity that has both *Magnitude* AND *Direction*. i.e.

→ Material-N-Space consists *the first Energy-Automobile-Quantum-N-Space and is equal to the Material-N-Volume-Quaternion* {Real-axis O → x, Imaginary-axis O →$\sqrt{-1}$, and O → $\mathbf{Z_N}$}

N-Volume, the N-Regions in which each point and each volume is affected by a force, *in Euclidean Geometry.* Because N-points in E-Geometry correspond to 2N in Material-Geometry therefore the First Stable figure in Mechanics is the Regular N-gone which is followed by nature.

Regular-N-Edges shape, ABP$\mathbf{P_N}$, is The RegularN - Edges – Polyhedrons.

It was shown in [25] that → Quaternion $\overline{\mathbf{AB}}$ ≡ monad [AB] ≡ ($\mathbf{s + \bar{v}\nabla i}$) = 1 .....(a)

Since also from [33] Action (©) of a quaternion $\bar{\mathbf{z}}$= s + $\bar{\mathbf{v}}$.i= s + $\bar{\mathbf{v}}$.∇i on itself is a Binomial type

$$(s + \bar{\mathbf{v}}.\nabla i)(©)(s + \bar{\mathbf{v}}.\nabla i) = [s + \bar{\mathbf{v}}.\nabla i]^2 = s^2 + |\bar{\mathbf{v}}|^2.\nabla i^2 + 2|s|.|\bar{\mathbf{v}}|.\nabla i = s^2 - |\bar{\mathbf{v}}|^2 + 2|s|.|\bar{\mathbf{w}}r|.\nabla i = s^2 - |\bar{\mathbf{v}}|^2 + [2\bar{\mathbf{w}}].|s|.|r|.\nabla I = s^2 - |\bar{\mathbf{s}}|^2 + 2|s|^2.\nabla i \quad \{\text{for } s = v = w.r \text{ and } s \perp v\}$$

where ,

s^2 → is the real part, *Matter*, of the new quaternion and is *a Positive Scalar magnitude*.

$-s^2$ → is the always negative part, *Anti-matter*, which is always *a Negative Scalar magnitude*.

$2.s^2\nabla i$ → is the double Angular-velocity term, *Energy*, which is *a Vector magnitude,*

or → $z^2 = s^2 - s^2 + 2.s.s = 1$, the same becomes from (a) $s^2 + (iv)^2 = 1$ or → $s^2 - v^2 = 1$ so,

Breakage – Principle on Material-Geometry is identified with Euclidean-Geometry Principles.

It was proved from Mohr circle that,$(\bar{\boldsymbol{\rho}})^2 + (\bar{\mathbf{a}})^2 = (\bar{\mathbf{M}} = \mathbf{J_a})^2$, which is

[Work ≡ Energy ≡ Torsional-momentum] ^{2} = [Moving-Space-Energy] ^{2} + [Rest-Space-Energy] ^{2}

or [The Energy-vector] ^{2} = [The Space-vector] ^{2} + [The Mass-meter] ^{2} is the Ellipsoid of motion

Rotational-Momentum Ellipsoid ≡ *Work* ≡$\bar{\boldsymbol{\rho}}$, → *The Energy-vector*

Angular-Velocity–Inertial-Ellipsoid ≡ *Force* ≡ $\bar{\mathbf{a}}$, → *The Space - vector*

Reaction to velocity-change-motion ≡ *Mass-scalar* M ≡ $\mathbf{J_a}$, → *The Mass – meter*

Above Breakage-Principle issues in Euclidean and Material-Geometry and in all others Geometries. Applying Pythagoras theorem in any circle [63M] or, angles on diameters of circles being always 90° then →

$z^2 = s^2 - s^2 + 2.s.s = 1$, and from Unit-quaternion $s^2 + (iv)^2 = 1$ or → $s^2 - v^2 = 1$ ……(b)

Equation (b) is a *Cone relation* on where Total-energy, *Kinetic and Potential* is conserved and for Photon Particle , Electromagnetic radiation is the *Kinetic-energy* and the Velocity-vector-energy-tank is the *Potential*. Photon is an Energy-store r , in a Stationary-wave of wavelength n $\lambda = 2r$, consisted of n stationary lobes filled in λ with inner motion the Electromagnetic-Displacement-current ,while Outward Propagating with light speed as Energy-store $\lambda = 2r / n$, [+] Electric-field as Space, [-] Magnetic-field as Anti-space.Above relation of squares is one way of Energy-transferring from one system to another.

The two Forces *Newton`s Inertia Force* → $ma = m\ddot{\mathbf{x}}$ and *Glue-Bond Force* of opposites $\mathbf{F_p} = \mathbf{F_f} \rightarrow m.v^2/R = \sigma = m.c^2 / r$ and $m = [\sigma r] / c^2$ or, Force $F = m.v^2/R = \nabla(\sigma^2.r^2) / (\mathbf{c^4}r) = \nabla[\frac{\sigma}{c^2}]^2.\ r$ and for Gravitational Force becomes → a constant, $\nabla(\mathbf{m_1}.\mathbf{m_2})/(\mathbf{x_1}\text{-}\mathbf{x_2}) = g.\nabla[\frac{\sigma}{c^2}]^2.\ r$ markos 30 / 1 / 2018

2. *The Energy Quantization-States in all Levels*

State 1. In the equilibrium Space-cave of radius, r, the equilibrium opposite rotating velocities $\pm\bar{\mathbf{v}}$ collide resulting to the three Fragments, $s^2 - |\bar{\mathbf{s}}|^2 + 2|s|^2.\nabla i$. [26-29]

State 2. The constant maximum velocities, $\bar{\mathbf{c}}$ and $\bar{\mathbf{v}}$, as *Thrust* in cave, r, acting On the three Breakages { $[s^2 = \pm (\bar{\mathbf{w}}.r)^2$, $[\nabla i] = 2(wr)^2]$ and through *Geometrical Mechanism*[STPL] are becoming, *Fermions* →$[\ \pm\bar{\mathbf{v}}.s^2\ ]$and *Bosons* → $[\bar{\mathbf{v}}.\nabla i = [\bar{\mathbf{v}}.2(\bar{\mathbf{w}}.r)^2] = [\bar{\mathbf{v}}.2s^2\ ]$, [35] which become Waves {*Distance* $|ds| = |A\mathbf{A_E}|$ *is the Work embedded in monads and it is what is vibrated* } and are Particles, with Inherent Vibration.

The Un-clashed Breakages $[\ \pm s^2 = \pm (wr)^2]$ and $[\ \nabla i = 2(wr)^2\ ]$, *Outward*[STPL] *Mechanism*, consist the Medium-Field-Material-Fragment [MFMF]=$[\ \pm s^2\ ]$= *The Chaos* ,as base for all motions and the Gravity as the force $[\nabla i]$, whilethe Clashed with the constant velocity,$\bar{\mathbf{c}}$, consist the Dark matter $[\ \pm \bar{\mathbf{c}}.s^2\ ]$ and the Dark Energy $[\bar{\mathbf{c}}.\nabla i] \equiv [\ \nabla i = 2(wr)^2\ ]$. $\mathbf{r^4}$. All above Obey Newton`s Laws of motion in all Scales.

From the Properties of Vibrating-Systems , the Elastic behavior can be expressed either in terms of the Stiffness [K], or the Flexibility $[\mathbf{K}]^{-1}$, so the equations of motion for the normal vibration in terms of the stiffness is →

$$(-w^2[M] + [K])\ \{X\} = \{0\} \quad \text{……(a).}$$

Forces are expressed in terms of the displacement

$$\{F\} = [K]\{X\} \quad \text{…… (b),}$$

where displacement

$$\{X\} = [\mathbf{K}]^{-1}\{F\} = [a]\ \{F\} \quad \text{……(c)}$$

and the equation of motion in terms ofthe Flexibility is determined by equation →

$$(-w^2[a][M] + I)\ \{X\} = \{0\} \quad \text{……(d)}$$

where $[\mathbf{K}]^{-1}K = I$ = Unit matrix . Equation (d) is altered as

$$-\bar{\boldsymbol{\lambda}}X + \bar{\mathbf{A}}X = \{0\} \text{ or , } \bar{\mathbf{A}}X = \bar{\boldsymbol{\lambda}}X \quad \text{……(d1)}$$

where $\bar{\mathbf{A}} = [a]\ [M] = [\mathbf{K}]^{-1}[M]$ *and* $\bar{\boldsymbol{\lambda}} = 1/w^2$, and $\mathbf{w_1}$ is the natural frequency, *i.e.*

Energy ≡ motion in Vibrating Systems are the *Golden-ratio-frequencies* →$\mathbf{f_n} = \mathbf{w_1}/2\pi = n\frac{(\mathbf{1}+\sqrt{\mathbf{5}})\boldsymbol{\sigma}}{\mathbf{4\pi r}} = \frac{\boldsymbol{\lambda_N}}{\boldsymbol{c}}$

Equation (a) may be written in Exponential form as

$$(-w^2[M]+[K])\ \{X\} = [-w^2M + K]\ u.\mathbf{e^{iwt}} = 0 \quad \text{……(e)}$$

From equation $[-w^2M + K]\ u.\mathbf{e^{iwt}} = 0$, isinterpreted $\mathbf{m_G} = -Jw^2$ Gravity-force $\mathbf{F_G}$ becomes from the in-storage acceleration $a = v^2 / r$, and this because force $[\nabla i]$ is stationary and from the pointy-rotating $[-s^2\circlearrowright\circlearrowleft+s^2]$ exists in the Material-point, *and for Planck length the gravity*g, *is as*,

Gravity force $[\nabla i] \equiv \mathbf{F_G} \equiv \mathbf{m_G}g = \nabla[\frac{\sigma}{c^2}]^2\ r.g = \mathbf{m_G}\frac{\mathbf{v^2}}{\mathbf{r}} = Jw^2.\ \mathbf{g_G} = [\frac{\pi r^4}{2}]w^2.\frac{\mathbf{v^2}}{\mathbf{r}} = [\frac{\pi r^4}{2}]\frac{\mathbf{v^2}}{\mathbf{r^2}}\frac{\mathbf{v^2}}{\mathbf{r}} = [\frac{\pi r v^4}{2}]$ ……(a)

$\mathbf{g_G} = [\frac{\pi r v^4}{2}] = [\frac{3{,}1415926\left([\sqrt{5}+1].\sqrt[4]{2}.10^{-35}\right).(299793458)^4}{2}]e^3 = 6{,}044981.\mathbf{10^{-35}}.80{,}776078.\mathbf{10^{32}}.20{,}085536 =$

$\mathbf{g_G}$ = 9,8076941, *where* π = Euclidean number pi,

r = Planck`s cave with the dimensionless coefficient $[\sqrt{5}+1]$ of Material-cave,

$\sqrt[4]{2}$ = The unity-Quaternion coefficient,
e^3 = The three dimensions Rotation-System coefficient of Euler`s number.

The difference between, *Vacuum - Energy* [$\mathbf{W_{n(n+1)}}$] *and Dark - Energy*[$\bar{\mathbf{c}}.\nabla$i] , is that Vacuum [r] *is a Stationary Wave* with Energy $\mathbf{W_n}$in n, Loops of the Material point while Dark-Energy is a *Pushing Kinetic Energy* {DE}≡ [$\bar{\mathbf{c}}.\nabla$ i], travelling with the → DM-DE ≡ [± s²], Field ← with the light velocity, c, and the binding Gravity-Force [∇i] *as*, [$\bar{\mathbf{c}}.\nabla$ i] (©)→{ (∇i),(+s²),(-s²),(+cs²),(-cs²) } *i.e. The Cause Expansion of the Universe, is the continuous and simultaneous effection of Dark-Energy* DE = [$\bar{\mathbf{c}}.\nabla$i] *on all Five Energy-Fragments with light velocity* $\bar{\mathbf{c}}$, *as* [$\bar{\mathbf{c}}.\nabla$i] → {(∇i),(+s²),(-s²),(+cs²),(-cs²)} *which is the rolling Heap. Energy Quantities* [∇i = 2(wr)²], *in the rolling Heap, acting on the dipole breakages* [± s²] *formulate the Gravity-Field and Gravity-Force while acting on dipole breakages* [±$\bar{\mathbf{c}}$.s²] *formulate Dark matter*, DM, *and Dark Energy*, DE, *respectively, while* DE *acting on Leptons and Quarks Anti-Leptons and Anti - Quarks, Bosons, formulate the whole existing Material worlds*.

State 3. The *Quantized Energy-levels, States, result* from the relation between a particle`s energy E, and its wavelength, λ, because following the *Breakage - Principle* where *The - Energy-part* ≡ E = $\frac{h.c}{\lambda}$, the in Planck Scale h, c, constituents are both constants. From relations v = c = w r, $\mathbf{f_n} = \mathbf{w_1}/2\pi$ then $\mathbf{f_n} = \frac{w}{2\pi} = \frac{c}{2\pi r}$ and → c = 2πr.$\mathbf{f_n}$, i.e. either velocity, c, or Golden-frequency $\mathbf{f_n}$, creates Energy ≡ motion.

For a *confined - particle* such an atom or monad, *wave function*, has the form of a Standing wave, *its peaks and any other point of the wave do not move spatially*, *i.e. a Quaternion* AB = $\bar{\mathbf{q}}$= [s+$\bar{\mathbf{v}}\nabla$i] ,*with* s ≡ the real part ≡ wavelength λ, and $\bar{\mathbf{v}}\nabla$i ≡ The Energy-part consisted of the frequencies $\mathbf{f_n}$= n.$\mathbf{f_1}$=$\frac{E}{h}$ in Energy-loop of Lobes where, n represents → *a Normal mode vibration* with natural frequency $\mathbf{f_n}$ determined by the equation →$\mathbf{f_n} = \frac{n.v}{4r} = \frac{n\sigma}{8r}[1+\sqrt{5}]$ ← and *is an Energy-cave* (the n, modes of $\mathbf{f_n}$) in where, Energy ≡ Spin exists, and *stored*. Above relation denotes the Energy-Storages in Material-point or Oscillations or and monads which are the Quantization of frequencies as the harmonics $\mathbf{f_1}$, $\mathbf{f_2}$,…., $\mathbf{f_n}$ of cave, r = *l* , depended on, σ, only. *Only stationary states*, [the eigenvectors with the eigen values are the loops which correspond to integer numbers n = 1,2,3, … of wavelengths *as this happens in all Homogenous equations*], *can exist* ,[and this *because rotation is considered as a grating having n lines per,* r , as this happens for Spin $\bar{\mathbf{B}}$] *while* for other states The Waves , *Interfere-Destructively*, resulting in zero wavelength λ = s = 0 , and then is remaining the Energy-part, $\bar{\mathbf{v}}\nabla$i only, *it is the M-P- density*.

Since the, n, modes of vibration are the n, energy-levels in monads in case of Bohr-model and radius for minimum acceleration the cave $\mathbf{10^{-13}}$ m = $\mathbf{10^4}$nm, then in Hydrogen-atom for,

$$\lambda = 2\pi\mathbf{r_1} = 6{,}28.\mathbf{10^{-13}}\text{ m corresponds to an Energy E(eV) } = \frac{hc}{\lambda} = \frac{19{,}864510^{-24}}{\lambda 1.1{,}6021810^{-19}} = 1{,}9744.\mathbf{10^8}\text{ eV.}$$

$$\lambda = 2\pi\mathbf{r_2} = 12{,}57.\mathbf{10^{-13}}\text{ m corresponds to an Energy E(eV) } = \frac{hc}{\lambda} = \frac{19{,}864510^{-24}}{\lambda 2.1{,}6021810^{-19}} = 0{,}9862.\mathbf{10^8}\text{ eV.}$$

$$\lambda = 2\pi\mathbf{r_3} = 18{,}85.\mathbf{10^{-13}}\text{ m corresponds to an Energy E(eV) } = \frac{hc}{\lambda} = \frac{19{,}864510^{-24}}{\lambda 3.1{,}6021810^{-19}} = 0{,}6579.\mathbf{10^8}\text{ eV.}$$

State 4. The next state for *Non-confined - particle*, such an atom or molecule, *monad*, is Crystal. Crystals are solids that form by a Regular-repeated-Pattern of atoms or molecules connecting together. In some solids the arrangements of the building blocks, *atoms and molecules* , can be random or very different throughout the material. In crystals however, a collection of atoms called the *Unit-cell* is the *repeated in exactly the same arrangement* , over and over throughout the entire material.

Microscopically, atoms and molecules of Crystal, are in a near-perfect *Periodic-or -Not* arrangement following the *Breakage – Principle of Material-Geometry*, where Crystal - lattice – Position consist the Space and Anti - space equilibrium, and Energy part is the binding amorphous solid in order the whole to be a monad. Since Golden-ratio frequency $\mathbf{f_n}$ = c / 2πr is motion then, All monads are motion i.e. →

Energy ≡ Motion ≡ Space + Anti space + Kinetic Energy.

In case Crystal-lattice is *Non-equilibrium* then consist a *New moving monad for New-Future-Technology*. From above is seen that the quantized Grouped-Crystal-Systems, *either these are in Equilibrium or Not*, follow the Material-geometry Principles.

State 5. The Parallel to Crystal state-4 is Organic chemistry , where all organic molecules contain carbon and nearly all hydrogen. *The first three dimensioned simplest ordinary convex in Geometry is Tetrahedron* and, in Material Geometry the 3D-link $\mathbf{CH_4}$ methane, which consists the simplest organic compound in chemistry. This happens because Monads ≡ Energy ≡ Motion ≡ Space + Anti space + Kinetic Energy.

State 6. The combination of Inorganic-Compounds, *as the Crystals* , and Organic Compounds, *as the methane and benzene*, is the evolutionary cosmos. Again, velocity $c = 2\pi r.\mathbf{f_n}$ is related to the *Golden-ratio-frequencies* $\rightarrow \mathbf{f_n} = \mathbf{w_1}/2\pi = n\frac{(1+\sqrt{5})\sigma}{4\pi r} = \frac{\lambda_N}{c}$ which formulates theEvolutionary and Expanded cosmos with the Golden-ratio Formation $\Phi = \frac{1}{2}[1 \pm (\sqrt{5})]$ of Stress σ.

Euclidean`s Geometry Quantized Spaces		Euclidean Geometry	Material Geometry	Material Dimensions	Permitted Units ⊖⊕	MOULDS Permitted Positions	S L U The Full Orbital Units
1		2				3	4
1	Point	A		The First ONE Dimention Point - Space	2	2 P^2	
2	Line Segment	A B		The First ONE Dimention Line - Space	4	1	H = 1s Hydrogen
3	Plane Reg.3gon	N = 3		The First TWO Dimention Plane - Space	6	2	H_e = 1s Helium
4	Volume Reg.4gon	N = 4		The First THREE Dimention Volume - Space	8	8	N_e = 2p Neon
5	Space Reg.5gon	N = 5		The First FOUR Dimention Volume -Space	10	18	A_r = 3p Argon
6	Space Reg.6gon	N = 6		The First FIVE Dimention Volume - Space	12	32	K_r = 4p Krypton
7	Space Reg.7gon	N = 7		The First SIX Dimention Volume - Space	14	50	X_e = 5p Xenon
8	Space Reg.8gon	N = 8		The First SEVEN Dimention Volume - Space	16	72	R_n = 6p Radon
9	Space Reg.9gon	N = 9		The First EIGHT Dimention Volume - Space	18	98	U_{uo} = np Ununoctium
10	Space Reg.10gon	N = 10		The First NINE Dimention Volume - Space	20	128	
N	Space Reg.Ngon	N = N	⊖⊕ = 2N ⊕ = N - 2	The First N - 1 Dimention Volume - Space	2 N	162 / 2 N^2	P = Number of Positives = N-2 and N=Spaces = The Number of Points

Figure 14: The Euclidean and *Material Geometry* in Particles and monads in Monad.

The Uniform Circular motion is the First Possible Position of Monads.

The Number of Neutrons in Space represent Isotopes in Nucleus→[$\mathbf{s + \bar{v}\nabla i}$]

In 1. Euclidean Geometry is defined on the Number of Points which can define a Space , i.e. The Point is defined from one Point , The Line Segment consisted of two Points , The Triangle consisted of three Points , The regular Tetragon consisted of four Points in , The regular Pentagon consisted of five Points in Space and so on , represent the Steady , *Regular and stable* , formations of Geometry.

In 2. Are shown the Material-Points , Positives and Negatives on each Point which is Zero and can be added to any other Positives and Negatives , and which represent Protons and Electrons in Physics.

In 3. Are shown the Permitted number in Units and in Moulds , which represent Electron Positions.

In 4. Are shown the Number of Neutrons in Space and the satiation states of electrons →[$\mathbf{s + \bar{v}\nabla i}$] From the definition of Work, *Work = Force* x *Displacement = Energy,* results the where this Energy as, *Momentum Vector* $\bar{\mathbf{B}}$ ≡ *Spin* ≡ *Energy ,is stored in* r, cave of $\mathbf{KK_1} = \bar{\mathbf{q}}$ = [s+$\bar{\mathbf{v}}\nabla$i]≡ Quaternion.

Cave, r, IS, *Outward a moving-Stationary Box* , *Inward a Stationary Wave*, with infinite frequencies $\mathbf{f_1}$....$\mathbf{f_n} \rightarrow \mathbf{f_\infty}$and with Energy, E = h.$\mathbf{f_n} = \frac{\mathbf{h(1+\sqrt{5})}}{\mathbf{4\pi}}$. $[\frac{\sigma}{r}] = (\frac{n\sigma}{8\,r^2})$.$\bar{\mathbf{B}} = \mathbf{W_d} = 8.k.\mathbf{f_n A}_r$.

The How and Why, *This Inward Stationary Wave* becomes an, *Outward moving Wave*, follows ↻.

3. *The Cycloid*

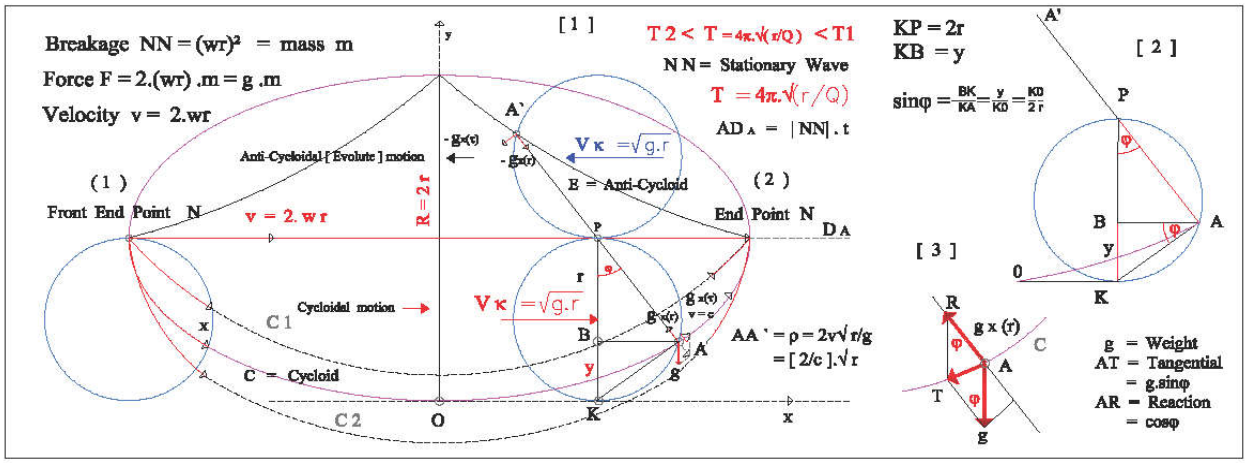


Figure 15: The Cycloid

The Cycloidal motion in , *Material Point* ≡ *Monad is* the Dipole ≡ [⊕⊖]= ∅ =AA` *where* → A≡[⊕] →A`≡[⊖] → |AA`|≡∅≡*The Brachistochrone Curve* C ≡ N1→N2.

Motion of Dipole [AA`] on curve C1 acquires a period T1 > $4\pi\sqrt{\mathbf{r/g}}$while on C2, T2 < $4\pi\sqrt{\mathbf{r/g}}$ which is not Isochronous. Motion of Dipole [ AA`] on Curve C ,*The Cycloid* , acquires a CONSTANT period T = $4\pi\sqrt{\mathbf{r/g}}$ which is Isochronous.

Monad (1) –(2) = NN is The Electromagnetic-Wave in NN , *and* [AA`] ≡ *Energy Distance*.

Properties: Cycloid is the curve described (traced) by a point P, on the circumference of a circle of radius, r, as this rolls along a straight line, AA, without slipping on an orthogonal coordinate System (x, y) at O. Let find the equation of this curve using the geometry logic in mechanics.

In absolute magnitudes$\frac{\mathbf{dy}}{\mathbf{dx}} = \frac{\mathbf{KB}}{\mathbf{KA}} = \frac{\mathbf{BA}}{\mathbf{BP}} = \frac{\mathbf{BA}}{\mathbf{2r-y}}$ and (BA)² = (BP).(BK) = (2r-y).y and

by squaring → $(\frac{\mathbf{dy}}{\mathbf{dx}})^2 = \frac{\mathbf{y}}{\mathbf{2r-y}}$ .....(a)

which is the differential equation of cycloid, and or as → $(\frac{\mathbf{dx}}{\mathbf{dy}})^2 + 1 = \frac{\mathbf{2r}}{\mathbf{y}}$

For any element on trace, ds, issues (a) and Pythagoras theorem as, $(ds)^2=(dx)^2+(dy)^2 = (\frac{2r}{y} - 1).(dy)^2 + (dy)^2 = (\frac{2r}{y}).(dy)^2$ and $ds = \sqrt{\mathbf{2r}}.\mathbf{y^{-1/2}}.dy$ and by integrating, $\int \mathbf{ds/dy} = s = \sqrt{\mathbf{2r}}.\int_0^y \mathbf{y^{-1/2}} = \sqrt{\mathbf{2r}}.\frac{\mathbf{y^{+1/2}}}{\mathbf{-1/2}} = 2.\sqrt{\mathbf{2ry}} + C$ and since in axis for y=0 *exists* s=0 and C=0,

so $s = 2\sqrt{\mathbf{KP.KB}} = 2.\sqrt{\mathbf{KA}^2} = 2.KA = 4r.\mathbf{\sin\varphi}$ ..... (b)

i.e. the length of Cycloid Curve*, from point O to point* A*, is twice the* Segment *of chord KA and when point* A *is at the end point (2) then* → 2.KA = 4r *for the semi-cycloid.*

The area between the curve and the straight line is $A=3\pi r^2$ and the arc length l = 8r.

For motion on cycloid, we consider a Weight Q, at point A, moving with free motion.

Since reaction N, is vertically acting, doesn`t give any Tangential component therefore the only one becomes from Q which is equal to AT= g.$\mathbf{\sin\varphi}$,and since from (b) ,$\mathbf{\sin\varphi} = \frac{\mathbf{s}}{\mathbf{4r}}$then AT= g.$\frac{\mathbf{s}}{\mathbf{4r}}$.

Since acceleration =$\frac{\mathbf{d^2s}}{\mathbf{dt^2}} = \frac{\mathbf{dv}}{\mathbf{dt}} = \frac{\mathbf{d}}{\mathbf{dt}}(\frac{\mathbf{ds}}{\mathbf{dt}})$ = -g.$\frac{\mathbf{s}}{\mathbf{4r}}$then $\frac{\mathbf{d^2s}}{\mathbf{dt^2}}$= -g.$\frac{\mathbf{s}}{\mathbf{4r}}$*or*{$\ddot{\mathbf{x}} = -w^2\dot{\mathbf{x}}$*where* w=$\frac{\mathbf{2\pi}}{\mathbf{T}}$} .....(c)

Equation (c) is a Harmonic Oscillatory motion showing that Acceleration is proportional to displacement and is directed towards the origin with a period

$$T=\frac{2\pi}{w}=2\pi.\sqrt{\frac{4r}{g}}=4\pi.\sqrt{\frac{r}{g}} \quad \text{.....(d)}$$

since $w^2=\frac{g}{4r}$ i.e.

Equation (d) *denotes that the Harmonic Oscillation due to any Force or Weight which follows the free motion on cycloid, is Independent of the amplitude of oscillation and, is Isochronous*.

Since total period of oscillation $T=4\pi.\sqrt{r/g}$ and which does not depend on speed of rolling, (Huygens cycloid pendulum) but only from rolling radius, r, means that the arc length l=8r is completed for faster, as one revolution in less time than the slower one, meaning that,

On cycloid all points of y axis reach x-x axis at the same time, regardless of the height from which they begin (isochrones). This property is used for breakages to reach STPL line isochrones. Evolute also of a cycloid is a cycloid itself, (apart from coordinate shift). Velocity vector of any motion is directed along the tangent and is the sum of the velocity vectors of the constituent motion, thus at each point A, of a cycloid, the line joining that point, to the point P, that circle is, then at the top of the generative circle is tangent to the Anti-cycloid and the line joining point A`, that is to that of bottom (of circle) is normal to the cycloid. Evolutes of a cycloid, *The Space≡ matter*, is the balancing cycloid, *The Anti -Space≡ Anti-matter*, and is called Anti-cycloid, [A↔ A`].

The *Tangential component of Acceleration* is $AT=g.\mathbf{sin}\,\boldsymbol{\varphi}=\frac{g}{4r}.s$ and analogous to OA arc, While the *Centrifugal component of Acceleration* $\frac{v^2}{\rho}$, is dependent on initial point of motion.

Any Material point moving from A to P point, acquires velocity $v^2=2.g.PB=2g(2r-y)$ and

$$\frac{v^2}{\rho}=\frac{2g(2r-y)}{2.PA}=g.\mathbf{cos}\,\boldsymbol{\varphi}=g.\frac{PA}{2r}=\frac{g}{4r}.\rho \quad \text{.....(e)}$$

i.e. The *Centrifugal component of Acceleration is proportional to curvature radius*, ρ, *and extended on this Stress – common - curve of motion*, *with the same proportionality ratio*g/4r *meaning that any motion on cycloid is outward directed,* and this because acceleration $\ddot{\mathbf{x}}=-w^2.x$ and also since force

$F=m\,\ddot{\mathbf{x}}$,*due to the Skin-effect exists on this* , Surface - Stress– common - curve*, Outward during the cycloidal motion of Space and Anti-space* . [5]

Skin-Effect happens at Stress-common-curve because of the difference in density $\rho=\sigma$, on great or small circles, *instead of*$\rho=0$ at the center.Figure-3 .

This Property on Cycloid applied on Photons Launches The-Inner-Electromagnetic-Wave →
$\{[E^2+H^2]/2=2rc.\sin.2\varphi\}$ of wavelength λ, Outward λ as The-Outer-Electromagnetic-Wave →
$\{[\varepsilon E^2+\mu B^2]=2.\lambda c.\sin.2\varphi\}$

The velocity $v=\sqrt{\mathbf{g/4r}}.\rho$ is proportional to curvature radius ρ, with proportionality ratio the root of g/4r. On cycloid, all moving points on y axis reach x-x axis at the same time (isochrones motion) regardless of the height from which they begin (they do not depend on the oscillation amplitudes), or if, a particle of mass $m=|(wr)^2|=1$ tied to a fix point A executes a Simple harmonic motion under the action (Thrust) of the tangential velocity $\bar{\mathbf{v}}=\bar{\mathbf{w}}.\bar{\mathbf{r}}$. Since also → the linear momentum$\bar{\mathbf{p}}=$ [Breakage x Velocity] then, $\bar{\mathbf{p}}=$ [Breakage x Velocity] $=|\bar{\mathbf{w}}.r|.\sqrt{\mathbf{g/4r}}.\rho=\bar{\mathbf{w}}.\sqrt{\mathbf{gr}}.\rho=\sqrt{\mathbf{gr}}.\rho.|\bar{\mathbf{w}}|$, and follows that, a Cycloid`s trajectory with, a Total time period $T=4p\,v(r/)g=\frac{r}{2v}.\sqrt{\frac{r}{g}}$, and dependent, on angular velocity $\bar{\mathbf{w}}=\bar{\mathbf{v}}/r=\bar{\mathbf{c}}/r$ only and it is the Spin of particle |AA|.

Remarks:

a. Breakage x Velocity $=\sqrt{\mathbf{gr}}.\rho.|\bar{\mathbf{w}}|$, and force $F=[(\bar{\mathbf{w}}.r)^2.(\bar{\mathbf{w}}.r)]=2(mg/\bar{\mathbf{c}}).\bar{\mathbf{w}}=2mg.(\frac{\bar{\mathbf{w}}}{\bar{\mathbf{c}}})$, This property is used to show that the wavelength of norm $|\bar{\mathbf{v}}|$, of vectors ,$\bar{\mathbf{v}}$, is a Stationary wave, with the two edges as Energy material nodes ,Cycloidally carried on wavelength $|\lambda|=2|\mathbf{A_1}-\mathbf{A_2}|$ twice the norm. $KA=2.r.\mathbf{sin}\,\boldsymbol{\varphi}$ and $KA.\mathbf{sin}\,\boldsymbol{\varphi}=y$ so $\mathbf{sin}^2\,\boldsymbol{\varphi}=y/2r$ and $\mathbf{cos}^2\,\boldsymbol{\varphi}=1-y/2r=\frac{2r-y}{2r}$ and by division becomes $\frac{v}{\cos\varphi}=\sqrt{\mathbf{4gr}}$, which means that any Weight falling , or rolling on Cycloid from upper point A, the ratio $\frac{v}{\cos\varphi}$ *remains constant*, and for the center of PK, $\mathbf{v_K}=v.\frac{r}{PA}=\frac{1}{2}.\frac{v}{\cos\varphi}=\sqrt{\mathbf{gr}}$, i.e. the rolling circle has a constant *velocity* and with an area of moving circle $A=\pi.r^2=\pi.(2r.\mathbf{cos}\,\boldsymbol{\varphi})^2=4\pi R^2.\mathbf{cos}^2\,\boldsymbol{\varphi}$.

b. Thrust is the velocity vector $\bar{\mathbf{v}}=\bar{\mathbf{w}}.r$ on the circumference of common circle of the inversely rotating Space, anti-Space becoming from the rotational energy vector ±Λ of PNS. The wavelength of norm of velocity $|v\therefore|$ is the static equilibrium position vector of amplitude, ds, of dipole $|AB|=|\bar{\mathbf{v}}|=ds$ and in terms of the static deflection, ds, then $T=1/f=2\pi/w$ where $ds=z=\bar{\mathbf{v}}=A.\mathbf{e}^{\mathbf{i.wt}}=\bar{\mathbf{v}}.\mathbf{cos}\,\mathbf{wt}+i.\bar{\mathbf{v}}.\mathbf{sin}\,\mathbf{wt}$.

i.e. Breakages acquire different velocities and different energy, and because are following cycloid trajectories, thus, need the same time (isochrones) to reach [STPL] line. Simultaneity is a property of Absolute system and the intrinsic property of vectors and Poinsot's ellipsoid now becomes a <Cycloidal ellipsoid> since on c1($\mathbf{T_1}$) > c > c2($\mathbf{T_2}$).

Any material point [Medium-Field Material-Fragment] →[± s²]=|$\bar{\mathbf{w}}$x$\bar{\mathbf{r}}$|²→[MFMF] Field following trajectory, in=(c1), or, out=(c2), Cycloid=(c)=|A1-A2| needs more or less time ($\mathbf{T_2}$)< T = 4π √(r/g)<($\mathbf{T_1}$)to reach end A2. And since frequency f = 1/T and energy E = h.f then Cycloid motion Controls constancy of Energy by changing velocity, $\bar{\mathbf{v}}$ = $\bar{\mathbf{w}}$.r, and the period, T, of monads.

Breakage quantity 2.(wr)² under the tangential action $\bar{\mathbf{v}}$ = wr becomes 2.(wr)³ acting on point A → 2wr.m of common circle. The same also for points A,B,C of Space and $\mathbf{A_E}$,$\mathbf{B_E}$,$\mathbf{C_E}$ of Anti-Space. Because all velocity vectors AA,BB,CC carry material points A,B,C at points $\mathbf{D_A}$,$\mathbf{D_B}$,$\mathbf{D_C}$, in time , t, isochrones, then material points follow a cycloid with period the norm of wavelength of velocities |AA|,|BB|,|CC|.

This Simultaneity is succeeded by Lorentz factor where transformations between Inertial frames that preserve the velocity of light will not preserve simultaneously. [65]

c. Work W, by a constant force F = 2(wr)² exerted on an object [breakage ±(wr)²] which moves with a distance times dx=|(wr)²| is capable of Vibration and is calculated in two perpendicular Formulations (dx⊥dy) which is as, Stiffness k = N/m → velocity vector v1 → *Electric field E* → and Flexibility f = m/N → velocity vector v2 → *the Magnetic field P*. For more in [39-40]. The why Energy is transformed into velocity, and velocity to a field is explained also through Extrema Principle. [41]

Cycloid of Figure.14. is a cave and let this be IN Common-circle of STPL mechanism.

[1] *The applied force on this* NN *cave is* E = h.f = w.(h/2p)= w. Spin, and Spin = $\frac{\mathbf{E}}{\mathbf{w}}$ = [±$\bar{\mathbf{v}}$.s²]/w = (r.s²)

[2] For E = ±$\bar{\mathbf{v}}$ then → Spin =$\frac{\mathbf{E}}{\mathbf{w}}$ = [± $\bar{\mathbf{v}}$.s²] / w =(± r . s²)→Producing ± *Fermions with spin* $\frac{\mathbf{1}}{\mathbf{2}}$

[3] For E = [∇i=2(wr)²=2.$\bar{\boldsymbol{\nu}}$s²]=2.(r.s²) then Spin =$\frac{\mathbf{E}}{\mathbf{w}}$=[2.$\bar{\mathbf{v}}$.s²]/w = 2.(r.s²) → Producing *Bosons of spin* 1.

i.e. Double energy [2.(r.s²)] on a constant cave creates 2 crests and doubling the frequency (f) , with Spin 1. For N-times energy[N.(r.s²)] on a constant cave creates N crests N-times the frequency (f) with Spin N/2 .Since Energy in cave is an Electromagnetic Wave [$\bar{\mathbf{E}}$x$\bar{\mathbf{H}}$] = Pressure = Spin S = ρ.c.w , or [εE²+μH²] / 2 = 2rc. sin.2φ → then Energy /sin2φ = [εE²+μH²] / **sin 2φ** = 2rc/ ρw = 4r² /ρ = constant , happening only for Cycloidal motion on the Stress-common-curve, where ε=Permittivity for electric and μ =Permeability for magnetic fields.[41]

Since in Cycloid acceleration $\ddot{\mathbf{x}}$ = - w².x *produces the* Skin-effect → *therefore on material-point the Inner-Energy as rotational Momentum* ≡ *Spin is transformed into the Outer Electromagnetic-Wave and Cancel, during the cycloidal motion, the propagation of Space and Anti-space, towards* AA`*axis*[33]

Because of above Force F = m$\ddot{\mathbf{x}}$on AA`≡ Stress-common-curve, happens Skin-effect on this because of the difference in density ρ = σ instead-of ρ = 0. *This Property on Cycloid Launches The Inner Electromagnetic-Wave* {[εE²+μH²]/2 = 2rc.sin.2φ} *of wavelength* λ, to the *Outward*, λ, *as The Outer Electromagnetic-Wave* and allows all → *The -Energy-Wave-Storages- monads to Propagate any Distance in Vacuum without dissipation*. The *Inner -motion in cave* ≡*Work* W *becomes from the Wave Energy-Pattern with Wave lengths* $\boldsymbol{\lambda_n}$*, created from all Points of the Periodic Oscillation in any Cave* r = (1)-(2) , *and is Stored into the,* n*, Integer and Energy - Lobes of cave* r*,* as Photon in Galaxies.

4. *The flexible String*

Material point may be considered as a *flexible String of mass*, ρ, per unit length, which is stretched under tension T = ± σ, due to the principal stresses on $\mathbf{KK_1}$ axis. The lateral deflection, y, of the string K$\mathbf{K_1}$ to be small, the change in tension with deflection, is negligible and is ignored.

The equation of motion in the, y, direction according to Newton`s second law is,

$$T\left[\theta + \frac{\partial\,\theta}{\partial x}dx\right] - T\theta = \rho.dx.\frac{d^2y}{dt^2} \quad \text{or} \quad \rightarrow \quad \frac{\partial\,\theta}{\partial x} = \frac{\rho}{T}.\frac{d^2y}{dt^2} \qquad \text{.....(1)}$$

and because the slope of the string K$\mathbf{K_1}$ is $\theta = \frac{\partial\,y}{\partial x}$ equation (1) reduces to $\frac{\partial^2 y}{\partial x^2} = \frac{1}{c^2}.\frac{\partial^2 y}{\partial t^2}$ .....(2)

where $c = \sqrt{\frac{T}{\rho}} = \sqrt{\frac{\sigma}{\rho}}$ and can be shown to be the velocity of wave propagation along the string.

The general solution of the equation (2) can be expressed in the form y = $\mathbf{F_1}$(ct - x) + $\mathbf{F_2}$(ct + x) where, $\mathbf{F_1}$, $\mathbf{F_2}$, are arbitrary functions and regardless of the type of function, the argument (ct ± x) upon differentiation leads to equation

$$\frac{\partial^2 F}{\partial x^2} = \frac{1}{c^2}.\frac{\partial^2 F}{\partial t^2} \qquad \text{..... (3)}$$

and hence the differential equation is satisfied, the wave profile moves in the ±x, direction with speed, c, therefore refer to, c, as the velocity of wave propagation. The solution of (3) using the separation of variables is

$$y(x\ t) = Y(x).G(t) \quad \text{.......(4)}$$

and by substitution to (2) then →
$$\frac{1}{Y}\cdot\frac{d^2Y}{dx^2} = \frac{1}{c^2}\cdot\frac{1}{G}\cdot\frac{d^2G}{dt^2} \quad \text{....... (5)}$$

where the left side is independent of, t, and the right side independent of, x, so both sides must be constant. Letting this constant be $-[\frac{w}{c}]^2$, are obtained the two ordinary differential equations,
$\frac{d^2Y}{dx^2} + [\frac{w}{c}]^2 = 0$ and $\frac{d^2G}{dt^2} + w^2 G = 0$ with the general solution,

$$Y = A\,.\sin(\frac{w}{c})\,x + B\,.\cos(\frac{w}{c})\,x, \quad G = C\,.\sin wt + D\,.\cos wt \quad \text{.......(6)}$$

The arbitrary constants A, B, C, D, depend on the boundary conditions and the initial conditions.
When the string $K\mathbf{K_1}$ = ds is stretched between ds = *l*, the boundary conditions are y(0,t) = y(*l*t) = 0.

The condition that y(0,t) = 0, leads to the solution $y = [C\ .\sin wt + D\ .\cos wt].\sin(\frac{w}{c}).x$ ....(7)

The condition that y(*l*, t) = 0, leads to the equation $y = \sin(\frac{wl}{c}) = 0$ or , →$\sin\frac{wl}{c} = 0$

and , $\frac{w.l}{c} = \frac{w_n\,.\,l}{c} = n.\pi$, where n = 1 , 2 , 3 , 4, … n …… ∞ ....(8)

and so $\lambda = \frac{c}{f}$ is the wavelength , f = the frequency of oscillation , ρ = density i.e.
Each , n , represents a Normal - Mode - Vibration with natural frequency determined from equation,

Natural frequency →
$$f_n = \frac{n}{2.l}c = \frac{n}{2.l}\cdot\sqrt{\frac{T}{\rho}} = \frac{n}{2.l}\sqrt{\frac{\sigma}{\rho}} = \frac{n}{4r}\sqrt{\frac{\sigma}{\rho}} = \frac{n}{4r^3}\cdot\sqrt{\frac{(1+\sqrt{5})^2\sigma^2}{4\pi^2r4}} = [\,n\,\frac{\sigma(1+\sqrt{5})}{\pi\,(2r)^3}] \quad \text{.......(9)}$$

and the sinusoidal mode shape → $Y = \sin(n\pi\frac{x}{l}) = \sin(n\pi\frac{x}{2r})$ for caves *l* = 2r i.e. Fig-1 Equation (9) is the *Golden ratio frequency* on the strings and is

$$f_n = [\frac{(1+\sqrt{5})}{2}]\frac{\sigma}{4\pi r^3} \quad \text{.......(10)}$$

The rotating axis AA\` *creates the*, Linear vibration of string , *and the Natural - frequency* $\mathbf{f_n}$, *in Material – point* A\`≡ [⊖] ↔ A ≡ [⊕] *as well the* Rotational vibration of string[⊕s² ℧↺⊖s²].

In the more general case of free vibration of Material-point , *Linear* [⊕s² ↔ ⊖s²] *or Rotational* [⊕s² ℧↺⊖s²] in any manner , the solution contains many of the normal modes and the equation for displacement is written as,

$$y(x,t) = \sum_{n=1}^{\infty} C_n \sin w_n t + D_n \cos w_n t\ .\sin(n\pi\frac{x}{l}) \text{and } w_n = \frac{n\pi c}{l} = \frac{n\pi c}{2r} \quad \text{.......(11)}$$

where, by fitting equation to the initial conditions of y(x,0) and $\acute{y}$(x,0), the $\mathbf{C_n}$,$\mathbf{D_n}$, can be evaluated.

From Planck\`s Energy E = h.f = (h/λ).c is equal to the Isochromatic pattern fringe-order in monad as $\sigma_1 - \sigma_2$ = (a/d).N = (a/d).n.$\mathbf{f_1}$ = (8πr²/3).n$\mathbf{f_1}$ where, n = the order of isochromatic, *a number*, and, $\mathbf{f_1}$ = The frequency of Fundamental-Harmonic. This is the why colors exist in fringe-order and are of wave form. In different modes, Antinodes Phase at a particular instant is either plus (+) or minus (-).

Since total Energy in cave, (wr)², is dependent on frequency only, and stored in the Fundamental and the first Six Harmonics, so the summations bands of these Seven Isochromatic Quantized interference fringe order-patterns, is the Total Energy, E, in the same cave (wr)² and for n=7 is as,

$$E = \text{Spin}\ ,\ \textit{work} \rightarrow W = \bar{\mathbf{S}}.w = (h/2\pi).2\pi f = [\frac{8\pi r^2 f1}{3}].[\frac{n(n+1)}{2}] = [\frac{4\pi r^2 f1}{3}].\,n.(n+1) \quad \text{and,} \quad \text{.......(12)}$$

Represents the Total Energy Stored in cave, r, *and of* n *fringes, where*→ $\mathbf{f_1} = \frac{(1+\sqrt{5}\,])\,.\sigma}{4\pi r}$

When stress ($\sigma_1 - \sigma_2$) go up then, n = order fringe defining Energy goes up also, and the colors cycle through a more or less repeating pattern and the Intensity of the colors diminishes .Since phase φ = kx-wt = Spatial and Time Oscillation dependence, For n = 1, Energy in the First Harmonic is,

E = 2πr.c = $[\frac{2\pi r^2}{3}].\mathbf{f_1}$, and for n = 2 , Energy in the First and Second Isochromatic Harmonic is,

E = 2 $[\frac{2\pi r^2}{3}].\mathbf{f_1}$ in threes, and, φ, is trisected with Energy-Bunched variation $\mathbf{f_2}$, i.e.

Energy, motion, *stored in a homogeneous resonance,* r, *is spread into the First of the Seven-Harmonics beginning from the* (first) *Fundamental* $\mathbf{f_1}$, *and after the filling with frequency,* $\mathbf{f_1}$, *follows the Second - Harmonic with frequency,* 2.$\mathbf{f_1}$, 3.$\mathbf{f_1}$,,,,, and so on , thus representing the *Store of Energy in cave* r.

In this - *way the Energy-Space monads are generated from the golden-frequency in caves, or from slits. Also this is the How Spin is*1 or½ or$\frac{\mathbf{l}}{\mathbf{N}}$, . . *The Why Spin is* , $\frac{\boldsymbol{l}}{\mathbf{2}}$,$\frac{\boldsymbol{l}}{\mathbf{3}}$, $\frac{\boldsymbol{l}}{\mathbf{4}}$, $\frac{\boldsymbol{l}}{\mathbf{5}}$, ……..$\frac{\mathbf{1}}{\mathbf{N}}$, in monads *i.e.*

One, Half, Third …$\frac{\mathbf{1}}{\mathbf{N}}$. - Lengths → $[\frac{\boldsymbol{l}}{\mathbf{1}}]$,$[\frac{\boldsymbol{l}}{\mathbf{2}},\frac{\boldsymbol{l}}{\mathbf{2}}]$, $[\frac{\boldsymbol{l}}{\mathbf{3}},\frac{\boldsymbol{l}}{\mathbf{3}},\frac{\boldsymbol{l}}{\mathbf{3}}]$,, , ,$[\frac{\boldsymbol{l}}{\boldsymbol{N}},,,\frac{\boldsymbol{l}}{\boldsymbol{N}}]$, with One, Two, Three ,,, N.

The same also to wavelengths of the harmonics which are simple fractions of the fundamental λ ,$\frac{\boldsymbol{\lambda}}{\mathbf{2}},\frac{\boldsymbol{\lambda}}{\mathbf{3}},\frac{\boldsymbol{\lambda}}{\mathbf{N}}$, *Wave-nodes*, where Spin =$\bar{\mathbf{B}}$= $\mathbf{f_n}.(\frac{\mathbf{8\,r^2}}{\boldsymbol{n\,\sigma}})$ = Energy in Nwave-node-loops as energy frequencies.

In Second- Harmonic Energy as frequency is doubled and this because of the sufficient keeping homogeneously in Spatial dependence , Quantity kx =(2π/λ).x , which is in threes , meaning that, *Dipole–energy is Spatially-trisected* in Space - Quantity Quanta the Spin=h/2π as the angle φ , of phase φ=kx-wt=(2π/λ).x , *and Bisected* by the Energy-Quantity Quanta as this happens in an RLC circuit [49].

Since Momentum-Ellipsoid, $\bar{\mathbf{B}}$ *,* is perpendicular to the*, Angular - velocity-Ellipsoid,* $\bar{\mathbf{w}}$ *, no Work is produced and the Status is Neutral. This property issuing in Material-point, allows Spin* ≡$\bar{\mathbf{B}}$ *Vector and the Velocity-Magnitude* ≡$\bar{\mathbf{w}}$*, be conserved as Total Energy* 2L=$\bar{\mathbf{B}}.\bar{\mathbf{w}}$= J . w². [70]

5. *An analysis of the vacuum Energy*

Galileo`s Principle of Equivalence states that, Inertial mass is equal to the Gravitational mass and *acceleration* a = d$\bar{\mathbf{v}}$/ dt equal to *acceleration due to gravity*, g . [39] Gravity is the Stationary force → [∇i = 2(wr)²] ← on the base for all motions, which is the → Medium – Field – Material - Fragment, |±s²| = (wr)² = [MFMF] ← in all universe and so, Newtonian theory of gravity, acting instaneousley between two separated masses is correct as above.

Maxwell`s equations predict Electromagnetic waves in and out of monads, while Einstein`s equations of GR predict Gravitational waves that travel at the speed of light in order to explain Simultaneity.

GR failed to conceive Gravity force as a Stationary force restraining breakages for monads between the Gravity length cave$\mathbf{10^{-62}}$and the beyond Planck`s length$\mathbf{10^{-35}}$.

Let call this in between distance Space → [$\mathbf{10^{-62}}$~$\mathbf{10^{-35}}$] ≡ *Vacuum*.

Breakages acquire different velocities and different energy and because follow cycloid trajectories thus need the same time (isochrones) to reach [STPL] line . Fermat`s Principle of Least time in Isochrones Principle is embedded in all wavelength, λ, as vector monads [59].

During Intrinsic Diffraction, d$\bar{\mathbf{s}}$=λ, of isochronous motion of vectors*, frequency*, f, *doesn't change* and only velocity, $\bar{\mathbf{v}}$, and wavelength, λ, changes so from equation → λ = $\bar{\mathbf{v}}$T = $\bar{\mathbf{v}}$/ f , → $\bar{\mathbf{v}}$= λf and

Acceleration a = d$\bar{\mathbf{v}}$/ dt = (dλ/dt).f + λ(df/dt) then → a = g = d$\bar{\mathbf{v}}$/ dt = (dλ/dt).f *since* f = *constant,*

or, let

λ→ be the wavelength of a moving monad, t = λ/c →is the needed time to cross length λ

s = at² / 2 → Deflection due to acceleration, a,

H = gt² / 2 → Deflection due to acceleration of

g, and → t² = 2. H / g ……..…….…….……..…….. (1)

For monad s = λ then s = at² /2 = c.T where , T is the period of Isochronous displacement and,

t² = 2. cT / a ……..(2)

Equating (1), (2) then cT /a = H /g, and since in gravity field the

cycloidal motion (Simultaneity) defines the same displacements cT, H *then* ct = H *and so* a = g

Therefore, all particles have the same acceleration , g *, in our gravitational field with frequency unchanged, and → velocity*, d$\bar{\mathbf{v}}$, *with wavelength,* λ*, to be changed so light being a particle also, is deviated in gravity field and, Inertial mass* is equal to the *Gravitational mass.*

i.e. The *Necessary and Sufficient Condition* for this Equality happens only in *Mass of Material-point*, where c.T = H, of this Isochronous motion where then *Inertial mass* ≡ *Gravitational mass* →

m =$\frac{\mathbf{2E}}{\boldsymbol{a_a}}$= $[\frac{\bar{\mathbf{B}}.\bar{\mathbf{w}}}{\bar{\mathbf{B}}\mathbf{x}\bar{\mathbf{w}}}]$. J = a number, meaning that mass is a Number only, which measures the magnitude of any two charges $\boldsymbol{q_1} \equiv \boldsymbol{m_1}$, $\boldsymbol{q_2} \equiv \boldsymbol{m_2}$, or reactions to any change of motion.

In C → *The Energy Stores in the Material point*, is proofed that Energy is stored in the, n, loops of

Monads ≡ Energy Vectors ≡ Quaternion and ,NOT *in mass* , with the current concordance model.

Energy in n = 1 *loop* → W = $[\frac{4\pi r^2}{3}].\mathbf{f_1}$ *and for the* $\mathbf{n^{th}} \rightarrow \mathbf{W_n} = [\frac{4\pi r^2}{3}].\mathbf{f_n} = n\frac{(1+\sqrt{5}).\sigma \mathbf{r}}{3}$

Total Energy in n = n *loops* → $\mathbf{W_{n(n+1)}} = [\frac{4\pi r^2 \mathbf{f1}}{3}]$. n.(n+1) where n = 1,2,3,4… n .... ∞ *by using the Summation of series.*

Issuing that Mass → $m \equiv \frac{2E}{a_a} \equiv [\frac{\bar{B}.\bar{w}}{\bar{B}x\bar{w}}].J \equiv W \equiv [\frac{4\pi r^2 f1}{3}]$. n.(n+1) ← a number k as,

k = $\mathbf{T_z}$ = Tensor (the length) of vector , z ≡ m , in Euclidean coordinates and which magnitude is,

k = $\mathbf{T_z} = \sqrt{\mathbf{y_1}^2 + \mathbf{y_2}^2 + \mathbf{y_3}^2 + \mathbf{y_n}^2}$.

From above the dimensionless coefficient of work W is that of frequency-golden-ratio, [√5+1] / 2 for any Material-cave r,

The Unity-Plane-Quaternion coefficient is $\sqrt[2]{\sqrt[2]{2}} = \sqrt[4]{2}, \overleftrightarrow{\mathbf{i} \perp \mathbf{j} \equiv \sqrt{2}} + \overleftrightarrow{\mathbf{k} \perp \sqrt{2} \equiv \sqrt[2]{\sqrt[2]{2}}} = \sqrt[4]{2}$

The Three dimensions for the Rotation-System ofEuler`s number is e . e . e = e^3

Remarks:

1. Since mass is dependent on $\bar{\mathbf{B}}$ vector which is *clock-wise* or *anti-clock-wise*, the same happens to *Mass – Anti mass*, or and, *Matter-Antimatter*, meaning that are different entities and, *Anti - mass*, *Antimatter* → *are counterpart to* → *Mass*, *Matter,* i.e. with opposite electric charge.
2. Since also,$\pm\bar{\mathbf{B}}$ vector on *Stress-common-curve* are of opposite direction ,*their Sum-Vector is zero,* i.e. mutual annihilation . This Summation of vectors exists at the intrinsic-motion in monads and in Vacuum where Energy as Work is stored in the, n, Stationary loops of cave.
3. Since also [33], Action (©) of a quaternion $\bar{\mathbf{z}} = s + \bar{\mathbf{v}}.i = s + \bar{\mathbf{v}}.\nabla i$ on itself is a Binomial type, ($s + \bar{\mathbf{v}}.\nabla i$)(©) $(s + \bar{\mathbf{v}}.\nabla i) = [s + \bar{\mathbf{v}}.\nabla i]^2 = s^2 + |\bar{\mathbf{v}}|^2.\nabla i^2 + 2|s|.|\bar{\mathbf{v}}|.\nabla i = s^2 - |\bar{\mathbf{v}}|^2 + 2|s|.|\bar{\mathbf{w}}r|.\nabla i = s^2 - |\bar{\mathbf{v}}|^2 + [2\bar{\mathbf{w}}].|s|.|r|.\nabla I = s^2 - |\bar{\mathbf{s}}|^2 + 2|s|^2.\nabla i$ {for s = v = w.r} where, s^2 → is the real part, *Matter*, of the new quaternion and is *a Positive Scalar magnitude*.- $|\bar{\mathbf{v}}|^2$ → is the always negative part, *Anti-matter*, which is always *a Negative Scalar magnitude*. $[2\bar{\mathbf{w}}].|s|\ |\bar{\mathbf{r}}|.\nabla i$ →is the double Angular-velocity term, *Energy*, which is *a Vector magnitude,* therefore when Anti-space comes in contact with its regular Space counterpart, they mutually destroy each other and all of their mass is converted to the three above Breakages → s^2 , $-|\bar{\mathbf{v}}|^2$, $[2\bar{\mathbf{w}}].|s|\ |r|.\nabla i$.

In case of Proton and Antiproton annihilate at rest , they produce 10 / 2 = 5 pions, of which 3/2 = 1,5 Positive charged,$+|s|^2$, 3/2 = 1,5 Negative charged ,$-|s|^2$, and 4/2 = 2 neutral $2|s|^2.\nabla i$.

In case of Electron and Positron have Kinetic Energy annihilate to an Equivalent-Energy Balance.

It was shown [40-42] that in STPL - Mechanism with intrinsic velocity, v, and under the Thrust of velocity, c, is created the whole universe with its constituents as,

A. $[\pm\bar{\mathbf{v}}.s^2] \rightarrow$ Fermions and → $[\bar{\mathbf{v}}.\nabla i]$ → Bosons, *which are Particles*, *with Inherent Vibration*

b. $[\pm s^2]$ → [MFMF]- Field ≡ *The Energy - Chaos*, and the binder Energy-Field [∇i] called Gravity force, *without Vibration but only local rotation*, which follows $\Phi = \frac{1}{2}[1 \pm (\sqrt{5})]$ of Stress σ

c. $[\pm\bar{\mathbf{c}}.s^2]$ → Dark matter and the binder Gravity-Force [∇i], *The Expanding Dark-Energy* $[\bar{\mathbf{c}}.\nabla i]$ constituents which are moving with light velocity, c, causing the universe to grow. Since velocity c =2pr.$\mathbf{f_n}$ is related to the *Golden-ratio-frequencies* →$\mathbf{f_n} = \mathbf{w_1}/2\pi$then follow $\Phi = \frac{1}{2}[1 \pm (\sqrt{5})]\sigma$

Since galaxies travel with light velocity, Obeying Newton`s Laws of motion, thenafter a collision of galaxies, Dark–matter{DM}≡$[\pm\bar{\mathbf{c}}.s^2]$ is left behind and by bumping into regular matter is get destroyed.

Because Dark–matter {DM} and Dark–energy{DE}≡ $[\bar{\mathbf{c}}.\nabla i]$, travel with light velocity , *cannot be seen* using light, *while* {DM} interacting gravitationally *can be seen* through its gravitational effect on other matter and {DE}≡ $[\bar{\mathbf{c}}.\nabla i]$ can be seen as pushing apart galaxies and causing universe to expand at an increasing rate. Because{DE}≡ F is a force and, c, continually acting on matter, then according to Newton`s second law, matter is accelerated so galaxies are accelerated and expanded as →

$ds = \frac{\mathbf{F}}{2\mathbf{m}}[\frac{1}{\mathbf{f}^2}] \equiv \frac{\mathbf{F} = [\bar{\mathbf{c}}.\nabla \mathbf{i}]}{2\mathbf{m}}[\frac{1}{\mathbf{f}^2}] \equiv \frac{[\bar{\mathbf{c}}.\nabla \mathbf{i}]}{2\mathbf{m}}[\frac{1}{\mathbf{f}^2}]$ …….. *the equation of motion for galaxies*.

Any Breakage with non- measurable magnitude is called *Degenerate Matter*.

It was proved that the more general case of free vibration in Material- point , *Linear* $[\oplus s^2 \leftrightarrow \ominus s^2]$ *or Rotational* $[\oplus s^2 \circlearrowleft \ominus s^2]$ in any manner, the solution will contain many of the normal modes and the equation (11) for the displacement can be written as,

$$y(x,t) = \sum_{n=1}^{\infty} \mathbf{C_n} \sin(w_n t) + \mathbf{D_n} \cos(w_n t) . \sin(n\pi \frac{x}{l}) \text{ and } \mathbf{w_n} = \frac{n\pi c}{l} = \frac{n\pi c}{2r} \quad \ldots\ldots\ldots\ldots\ldots(11)$$

where,

by fitting equation to the initial conditions of y(x,0) and $\dot{y}(x,0)$, the $\mathbf{C_n}$,$\mathbf{D_n}$, can be evaluated.

Above happens in regular matter that has been compressed until atoms break down and the particles lock into a giant mass as this happens to gas, *that particles are not bound to each other*, and liquid gas, *that particles are packed closely to each other,* and cannot move much since velocity c =2πr.$\mathbf{f_n}$.

Since *Matter Antimatter destroy each other* when they come into contact under normal conditions shows the way to develop a Mechanism of, *High-Energy-Particles-Beam* , [HEPB] combined with an, [ILP] *Intense-Laser-Pulse*, to Rip-Apart the Under-Planck`s length Vacuum .Since also was shown that Energy is stored in Energy-loops of Stationary waves, i.e. *a Sink-mechanism ≡ Recessional – motion* , so a very Strong Electromagnetic - Field is the suitable *mechanism for reaching vacuum*.

It was shown also that the *Quality of monads* depends on the *Golden-ratio-frequency* $\mathbf{f_n} = [\frac{(1+\sqrt{5})}{2}]\frac{\sigma}{4\pi r^3}$ And the Total-work $\mathbf{W_n} = [\frac{4\pi r^2}{3}]\mathbf{f_n} = [\frac{(1+\sqrt{5})}{2}]\frac{\sigma}{3r}$,so all monads can be immediately be *Another monads with different frequency* (f) , by following the Breakage rule → $s^2 - |\bar{s}|^2 + 2|s|^2.\nabla i \leftarrow$ i.e. matter (+), antimatter (-), energy (+ -) or *Material Point ≡ monad* ≡ Dipole ≡ $[\oplus\ominus] = \varnothing = \mathbf{K_r}\,\mathbf{AK_{R=r}}$ *where* → $\mathbf{K_R} \equiv [\oplus] \leftrightarrow \mathbf{K_r} \equiv [\ominus] \rightarrow \equiv 0$, always on the *Stress-common-curve*. Since this Infinite Vacuum is *a Lattice – Granular - Space, connected by Energy*, i.e. *an Energy Space Universe*, *therefore* thus is shown The Way of penetration and The How this is succeeded. [39]. In Electromagnetism, density ρ per two unit length is declared as Permittivity-Permeability $\boldsymbol{\varepsilon_o, \mu_o} \rightarrow \boldsymbol{\varepsilon}, \boldsymbol{\mu}$ related to velocity in vacuum as $\bar{\mathbf{v}} = \frac{1}{\sqrt{\varepsilon\mu}}$ and for Material-point, $c = \sqrt{\frac{T}{\rho}} = \sqrt{\frac{\sigma}{\rho}} = \frac{1}{\sqrt{\rho/\sigma}} = \frac{1}{\sqrt{\varepsilon\mu}}$, the known relation $c^2 = \frac{1}{\varepsilon\mu}$

6. *The Energy in Stationary loops and Photon*

In Material point*, and because of rotation, Stretched- String Energy* $\bar{\mathbf{B}}$ *is not transmitted , but trapped in the,* N loops*, where* $\bar{\mathbf{B}}$ =Motion in Loops*, are all in Phase with each other, and the amplitude of oscillation varies from zero, at the* N *nodes, to maxima at the antinodes. By considering rotation as a grating having* N *lines per,* r, *then maximum values of,* n, *is* $n < \frac{1}{N\lambda}$*, i.e. the biggest whole number less than* $\frac{1}{N\lambda}$ *which is* Always Integer *and* → the N loops are the N Energy- Stores in M-P.

This is the Why Spin is , $\frac{l}{2}, \frac{l}{3}, \frac{l}{4}, \frac{l}{5}, \ldots\ldots\ldots \frac{l}{N}$, *i.e. to* $\boldsymbol{N^{th}}$*- loop*

One, Half, Third …$\frac{1}{N}$. – of Length as the loops → $[\frac{l}{2}, \frac{l}{2}]$, $[\frac{l}{3}, \frac{l}{3}, \frac{l}{3}]$, , ,$[\frac{l}{N}, \frac{l}{N}, \frac{l}{N}, \frac{l}{N}$, ,,,, N….. ∞], with → One, Two, Three ,,,,,,, N ….. ∞ *loops* → *and Wave-nodes with* $L = \frac{1}{2}\lambda, \frac{2}{2}\lambda, \frac{3}{2}\lambda, \ldots, \frac{n}{2}\lambda$

Above is the, Stationary - Wave - Nodes Principle, in Material – point, and issues in all monads.

The Energy $\bar{\mathbf{B}} = \frac{h}{2\pi} =$ Spin $= \frac{h.f_1}{\bar{w}} =$ as velocity , v = (wr) in cave, *l*, is the Spin ½ , while Doubled $\bar{\mathbf{B}} = \frac{h}{2\pi} =$ Spin $= 2 = \frac{h.f}{\bar{w}} = 2.\bar{\mathbf{B}}$, in the same cave , *l* , then → $f = 2.\mathbf{f_1} = \mathbf{f_2}$, *it is the How is quantization* i.e.

In the same cave, *l*, Energy is quantized as → $\frac{1}{2} \mid \mathbf{2}.\frac{1}{2} = 1 \mid \mathbf{3}.\frac{1}{2} = 1{,}5 \mid \mathbf{4}.\frac{1}{2} = 2$, …$|\mathbf{n}\,\frac{1}{2} = n.\mathbf{f_1}|$ and so on, depending on the number, n, of wave-nodes in cave, *l* , and Energy in, n, fringes is,

Energy in n = 1 *loop* → $W = [\frac{4\pi r^2}{3}].\mathbf{f_1}$ *and for the* $\mathbf{n^{th}} \rightarrow W = [\frac{4\pi r^2}{3}].\mathbf{f_n} = n\frac{(1+\sqrt{5}).\sigma r}{3}$

Total Energy in n = n *loops* → $W = [\frac{4\pi r^2 f_1}{3}] . n.(n+1)$ where n = 1,2,3,4… n .... ∞

by using the Summation of series .

The Work is $W = [\frac{4\pi r^2}{3}].\mathbf{f_1} = [\frac{4\pi r^2}{3}]\frac{(1+\sqrt{5}\,]).\sigma}{4\pi r} = \frac{(1+\sqrt{5}\,])r.\sigma}{3}$ dependent on cave ,r, and Glue-Bond ,σ.

It was proved that Energy of wave is , → $E = m.\dot{y}^2/2 = (m/2).(-w\mathbf{A_o})^2$, and $m = \frac{E}{2r^2.w^2}$i.e.

Mass in cave ,r, is → $m = \frac{E}{2r^2.w^2} = \frac{\bar{B}}{2r^2.w^2} = \frac{W}{2r^2.w^2} = \frac{(1+\sqrt{5}\,])\,4r^2\sigma}{6r\sigma^2\,(1+\sqrt{5}\,)^2} = \frac{2\,r}{3\sigma\,(1+\sqrt{5}\,])} = [\frac{4\pi r^2}{3}].\mathbf{f_1}$ ……...(12)

i.e. mass is dependent on cave , r , *and on first-Harmonic , or and Principal Glue-Bond-Stress*, σ *and is not any Store in where Energy can be stored. On the contrary , Energy is the motion of the* [⊖↔⊕]≡[Space ↔ Anti-space] charge, *as this is the Electrostatic force*, and the N loops of n lobes are the Stores in where *Work as Energy can be stored in Stationary Wave of cave* r.

The N loops are the Energy- Stores in M-P, and *mass the Reaction* to the *Up - Down oscillatory motion in Loop* of each wave Segment at frequency, $\mathbf{f_n}$, which describe each *mode* characterized by a different , λ and f. The Loop, *Antinode*, vibration gives no appearance of motion along the length of the loop and this because the accelerating motion happens in the Up-Down axis only.

Alternative current (AC) is an electric current which periodically reverses direction in contrast to Direct current which flows only in one direction. This happens because of charges alternation i.e. +, - *to* - , + *charges which exists on Antinodes amplitude of oscillation*. Since Cycloidal motion in M-P is Isochronous, *The acceleration*, $\ddot{\mathbf{x}} = -w^2\dot{\mathbf{x}}$ *where* w = 2π/T, *produces the Skin-effect*.

As the acceleration of an electric charge in an alternative current produces waves of Electromagnetic Radiation that *Cancel* the propagation of charges (electrons) towards the axis of the Loop the same happens *in Material point* where , *The driving force*[⊖↔⊕ ≡ σ]*on the Up – Down oscillatory motion of Loop is developing* the *Amplification factor* on Stress-common-curve where the weak force, σ, causes a powerful motion, *an Electromagnetic Wave whose Golden-frequency* $\mathbf{f_P} = \frac{(1+\sqrt{5}\,]\,).\sigma}{4\pi r} = \frac{E}{h}$

Skin-Effect *happens at Stress-common-curve because of the difference in density* ρ = σ *instead-of* ρ=0. Because of the Skin-Effect *This Electromagnetic Wave* produced from the, *Driving force* ≡ $\bar{\mathbf{B}}$, travels with speed velocity. At Rest, this *Stationary-Material -Point*, is absorbed and destroyed, while created when emitted. All above properties of, *Stationary-Material-Point,* occur in *Photon* and since it is Quaternion, issues the *Complex-Frequency-Response* H(w) and the Wave Energy-Pattern Energy particles are as $\mathbf{z^{1/w} = |zo|^{-w}.L_v} = \rightarrow$ *Energy Monads* and for sin.(φ+kπ)/w = 0 then exists only the Imaginary part of monad , s=0,where φ =-2π±k.π, and then $\mathbf{z^{1/w} = |z_o|^{-w}.e^{i.\varphi} = e^{i.(-2.\pi).b}}$and it is the *Diffraction Energy mechanism* for all Space Levels of quantization which are particles with least mass only . Extending cave $\mathbf{L_v = e^{i}.(-2\pi \pm k\pi).b}$ for *minimum acceleration* [31] then *Energy Balanced tank caves for Regulating Valves,* [*massive – energy , from* 3,56.$\mathbf{10^{-14}}$*to* 9,31 .$\mathbf{10^{-28}}$m], is for base e = 2,71828 and k = 0 $\mathbf{L_v = e^{i.(-2\pi)b}}$ and then $\boldsymbol{e^{-31,41593}}$ = 3,56237.$\mathbf{10^{-14}}$(m) = r,

The frequency of Photon with light velocity v = c = 2πr.fis → f =$\frac{v}{2\pi.r} = \frac{3.10^8}{2\pi.3,5610^{-14}}$= 1,34.$\mathbf{10^{21}}$ Hz.

From Photon and (12), mass → m = $[\frac{4\pi r^2}{3}].\mathbf{f_1}$= 4,18879.[86,73.$\mathbf{10^{-56}}$].(1,34.$\mathbf{10^{21}}$) = 4,868.$\mathbf{10^{-33}}$ Kg

i.e. *Photon has a frequency* $\mathbf{f_{Ph}}$ = 1,34.$\mathbf{10^{21}}$ Hz *and mass* $\mathbf{m_{Ph}}$ = 4,868.$\mathbf{10^{-33}}$ Kg.
The Wavelength $\boldsymbol{\lambda_p}$ = c / $\mathbf{f_{Ph}}$ = 2,00.$\mathbf{10^{-13}}$ m *momentum* mv =1,458.$\mathbf{10^{-22}}$ Kg.m /s

On Natural base , e, and decimal base b = 10 , the Total Energy is [$\mathbf{z^{\frac{1}{w}} = |zo|^{-w}}$.Lo], is Stored in the quantized Space $\mathbf{L_o}$= 3,56237.$\mathbf{10^{-14}}$, then passing through the Regulating Valves, [massive energy from 3,56.$\mathbf{10^{-14}}$m and 9,31.$\mathbf{10^{-28}}$m] and is quantized as 18 Particles (the Fermions and Bosons) in the Planck's length $\mathbf{L_p}$= 8,906.$\mathbf{10^{-35}}$m. which creates all others.

On the same Sub-Spaces and on the same exponential base exist also the infinite, *Spaces - Anti-spaces and Sub-spaces*, in loops. i.e. the infinite monads in one monad.
This is → The How→ (by following the Stationary - Wave -Nodes Principle) and,
The Where →(In the first Energy Stationary-monad of Material-Geometry cave, r).
The How this →(Practically can be succeeded, is left to Laboratory Nuclear Physicists).
i.e. *In Material – point, Complex - Frequency - Response ,* H(w)*, which is an Energy – monad, is composed of the Real – part which represents the Granularity of Energy as Particle, and the Imaginary – part which represents the Wave Energy--Pattern which carries Particle.*

The rotating axis, l = 2r = K$\mathbf{K_1}$ *in Material–point, creates the* Linear vibration of string*, l , which is in String* K≡ [⊖] ↔ $\mathbf{K_1}$≡ [⊕]*, and the Natural - frequency ,* $\mathbf{f_n} = \frac{(1+\sqrt{5}\,]\,).\sigma}{4\pi l}$ *in points* K, $\mathbf{K_1}$ *or, the* Rotational vibration Plan Energy *which is, The Spin as* [K ≡ ⊖ s^2 ↻ ↺ $\mathbf{K_1}$≡ ⊕s^2] ≡ $\bar{\mathbf{B}}$.

Above relation of this Plane Work is the Quantization in Geometry-Shapes *of motion and becomes into the Plane-Stores of Anti-Space and, consists the Unification of Geometry-monads with those of the Energy monads, which Energy-monads is the Work in Caves, the Up-down oscillation, stored as Angular momentum,* $\bar{\boldsymbol{B}}$*, and Angular velocity Ellipsoids,* $\bar{\boldsymbol{w}}$*, which was prior analyzed.*

7. *Gravitational red shift and Time Dilation: [39]*

Gravitational red shift is the Phenomenon where low frequencies of light [long T=620-750 nm] shifted to red (redshift → f = 400 - 484 THz) and higher frequencies of light [short T=450-495 nm] are shifted to blue (blue-shifted→ f = 606 - 668 THz) and Time Dilation the opposite Phenomenon for time.

Using the intrinsic property of constant light velocity vector $|\bar{\mathbf{v}}|$, *which is a Stationary wave in Photon`s wavelength* λ , *as*→ $\bar{\mathbf{v}}$= λ / T = λ.f and$\mathbf{f_1}=\frac{(1+\sqrt{5}\,]).\boldsymbol{\sigma}}{4\pi r}=\frac{\mathbf{E}}{\mathbf{h}}$and then $\bar{\mathbf{v}}=\lambda\frac{(1+\sqrt{5}\,]).\boldsymbol{\sigma}}{4\pi r}$,

In a Stress-Strain System, the State of Principle Stresses , ± σ at each point, is the double refraction in Photo-Elasticity and expressed as the Isochromatic lines [$(\boldsymbol{\sigma_1}\text{-}\boldsymbol{\sigma_2})$ = J.(λ/d), [J, constant, λ, wavelength, d, thickness] or as Isochromatic surfaces, depending on the direction of force (or and pressure) which is the same in gravity field as the length-contracted and the length-expanded in a given piece of quantized s. Streching Removal of λ creates, - $\boldsymbol{\sigma_1}$, while, Compressed Removal of λ creates,+$\boldsymbol{\sigma_1}$, and since velocity, c, is constant, long and short period T, or low and high, f, varies and a vector with Low energy E = h.f is at Red, →(Redshift) → low f = 400-484THz , long λ= 620-750nm and (Blueshift)→ high f = 606-668THz, short λ= 450-495nm and High energy since E = h.f at Blue .

In this way Light as caver = s = Particle is Photon, 2s = λ = 380-780 nm = (3,8-7,8).$\mathbf{10^{-7}}$m and as Wave, the Outer-moving Electromagnetic fields E , P = ∇i x Di= is of an Wave-nature-force→*or an Wave–Energy-Pattern* where∇i =$\bar{\mathbf{v}}$= λ.f = λ/T, since Lightis also ≡ quaternion → [q = s+∇i].

The Stationary Wave in 2s = λ means that, since Photon is the only Electric Displacement field in λ/2, D=ε.E+P, then in the rate of change is alternately in terms of The Electric field (∠P/∠t) and the traverse Magnetic field (∠E/∠t), i.e. for Low - Energy Red shift and for High energy Blue-shift is then |2s|≡as Particle.*The Breakage-Principle, is the way of Energy conservation*, *where Energy never annihilates and which is always reverted into* the *two Opposites* (+ E , - P) *and an Neutral Part* in care r as 2 .∇i.

Total Energy is Spin $\equiv\bar{\mathbf{B}}=[\mathbf{r}.\boldsymbol{\sigma}.(\mathbf{1}+\sqrt{\mathbf{5}})]=(\frac{\mathbf{8\,r^2}}{\boldsymbol{n}}).\mathbf{f_n}\equiv$ [εE²+μH²]/2 = 2rc.sin.2φ, or as *Matter*(+ E) ,as *Antimatter* (- P) *and as Energy part* , 2L = $\bar{\mathbf{B}}.\bar{\mathbf{w}}$, *and always to its constituents, either to all or separate* following → Total Energy as L = ($\bar{\mathbf{B}}.\bar{\mathbf{w}}$/2).

Since also frequency f = 1/T and energy1.$\bar{\mathbf{v}}$=E= h.f, then Cycloidal motion Controlls constancy of Energy by changing velocity$\bar{\mathbf{v}}=\bar{\mathbf{w}}$r , and period ,T≡1 / f,of monads.

Relativity failed to explain this reality and to explain the WHY → Wave nature*, is the Intrinsic Electromagnetic Wave of Particles and speed of light is constant in a Stress - Strain System with* (*Redshift, as low,* f, *and Blue-shift as high*, f) *Photon to be as Particle and also Wave, but considering constancy of light as an axiom from which* GR *was derived.*

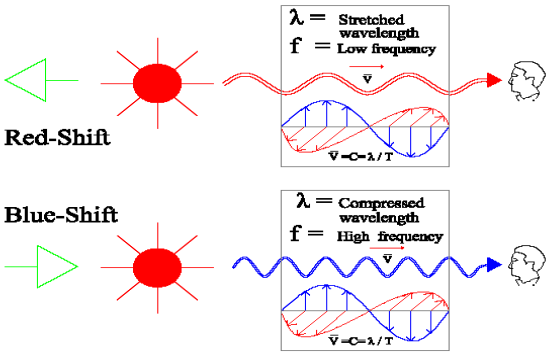


Figure 16: Redshift as low f, and Blue-shift as high f Photon as an Intrinsic-Stationary-Wave and a Removal Source F(f)

Since During Intrinsic Diffraction, d$\bar{\mathbf{s}}$= λ, of isochronous motion of vectors , *frequency*, f, *doesn't change,* and only velocity , $\bar{\mathbf{v}}$, and wavelength, λ, changes, so from equation →λ = $\bar{\mathbf{v}}$T = $\bar{\mathbf{v}}$/ f, then is $\bar{\mathbf{v}}$= λf and Acceleration a = d$\bar{\mathbf{v}}$/ dt = (dλ/dt).f + λ(df/dt) i.e. → a = g = d$\bar{\mathbf{v}}$/ dt = (dλ/dt).f ← and Since also The Total-Energy of a Photon is conserved in the Energy-Storages of, λ , which are the quantization of frequencies as the harmonics $\mathbf{f_1}$, $\mathbf{f_2}$, ,$\mathbf{f_n}=\mathbf{w}^2$ of, *cave* ≡ *recession* λ = 2.r ≡ n loops , *Therefore* the Photos emitted by a nebula lose energy on their journey to the observer by any effect, leads to a decrease in frequency , i.e. *Intrinsic Red-Shift*.

Since Total energy is conserved and happens decreasing in frequency then from formula E = h f = $\frac{\mathbf{hc}}{\boldsymbol{\lambda}}$, λ, is increasing , i.e. *corresponds to an increase in light`s wavelength* λ ≡ [$\mathbf{f_1}$, $\mathbf{f_2}$,,, ,$\mathbf{f_n}$ = w ² ≡N loops≡n lobes]which is following the *Stationary-Wave-Nodes Principle*.

In this way Total-energy is conserved as the hedgehog in its shell because differently, *the said tired light* should be annihilated. It was shown [58-59] Black-holes, *the quasars*, exist in the centers of galaxies and are the beacons for astronomers and consist the *Recycled Space machines* of the Universe.

Photon is a Material-point in caver, *Inner as Stationary*-Electromagnetic-Wave $[E^2+H^2]=2(2r).c.\mathbf{sin\,2\varphi}$ with n Lobes representing the *Normal mode vibration* with frequencies $\mathbf{f_n}= n.\mathbf{f_1}=\frac{\mathbf{E}}{\mathbf{h}}= [\frac{(1+\sqrt{5})}{2}]\frac{\sigma}{4\pi r^3}$ *Outward as the Propagating Electromagnetic-Wave* → { $[\varepsilon E^2 + \mu B^2] = 2.\lambda c.\sin.2\varphi$ } ← where E ⊥ B ⊥ r *Directions along which may Propagate without Birefringence,* the Caver=n.[λ/2]Is the *Electromagnetic Energy-Storage* and, the E, B Electromagnetic-RadiationIs *The conveyer of the Energy*-Cave.

7a. *Numeric Analysis*

Planck constant, h = 6,62606957. $\mathbf{10^{-34}}$ joules, 1 eV = 1,60218 . $\mathbf{10^{-19}}$ J

Light velocity c = 2,998.$\mathbf{10^8}$m/s , 1 THz = $\mathbf{10^{12}}$ Hz , 1 nm = $\mathbf{10^{-9}}$m , 1 μm =$\mathbf{10^{-6}}$m

Total-Energy E = h.f = $\frac{\mathbf{hc}}{\boldsymbol{\lambda}}$ = $\frac{6,62606957.10^{-34}.2,998.10^8}{\lambda}$ = 1,99.$\mathbf{10^{-25}}$m .($\mathbf{10^6}$μm/m) = $\frac{1,2398}{\lambda.(\mu m)}$ (eV)

and for redshift → f = 400 THz = 400.$\mathbf{10^{12}}$ Hz = 4.$\mathbf{10^{14}}$ Hz then corresponds a light`s wavelength

λ = $\frac{\mathbf{c}}{\mathbf{f}}$ = $\frac{2,998.10^8 m/s}{4.10^{14}\,Hz}$ =7,495. $\mathbf{10^{-7}}$m.($\mathbf{10^6}$μm) = 0,07495 μm and Total-Energy E =$\frac{1,24}{\lambda.(\mu m)}$ (eV) ……..(a)

$\mathbf{E_R}= \frac{1,24}{0,7495}$ = 1,6542 eV = 2,65.$\mathbf{10^{-19}}$ Joules . Where 1 eV =1,6022.$\mathbf{10^{-19}}$ Joules.

Because Photon may have any wavelength and also that of Planck cave 1,616.$\mathbf{10^{-35}}$ m, then Energy $\mathbf{E_P}= \frac{1,24}{1,616.10^{-35+6}}$ = 7,673.$\mathbf{10^{28}}$ eV = 1,229.$\mathbf{10^{21}}$ Joules . The difference ***e*** in Energy is E = $\mathbf{E_P}$ -$\mathbf{E_R}$= 7,673.$\mathbf{10^{28}}$ eV = 1,229.$\mathbf{10^{21}}$ Joules, *i.e The Energy - Stores of Photon are always full of Energy* ≡ The Up - Down Motion in Lobes*, following on wavelength,* λ*, The Stationary Wave - Nodes Principle.*

Considering the wavelength equal to Planck`s length r=4,453.$\mathbf{10^{-35}}$ then to observe this length we need the wavelength to be smaller than this cave r , being viewed.

The frequency is as $\mathbf{f_P}$= c/λ = (3.$\mathbf{10^8}$ m/s) / (4,453. $\mathbf{10^{-35}}$ m) = 6,73 .$\mathbf{10^{42}}\boldsymbol{s^{-1}}$ corresponding to an Energy E = h.$\mathbf{f_P}$ = [6, 6260696.$\mathbf{10^{-34}}$Js].[6,73 .$\mathbf{10^{42}}\boldsymbol{s^{-1}}$] = 4,459.$\mathbf{10^9}$ J = 2,783.$\mathbf{10^{28}}$ eV.

Planck`s constant h, is the ratio of a Quantum of Energy to its frequency and equal to h = [6,6260696.$\mathbf{10^{-34}}$Js] where →1 eV =1,6022.$\mathbf{10^{-19}}$ Joules →1 J = 6,24141.$\mathbf{10^{18}}$ eV The relation of wavelengths and colors, *energy*, is given from equations λ = hc / E and λf = c.

The seven light-colors are as below with wavelength in nm = 1.$\mathbf{10^{-9}}$ m, and energy in eV as, *Red* →700, *Orange* → 620, *Yellow* → 580, *Green* → 530, *Blue* → 475,*Indico*→ 450, *Violet* → 400 *nm*, f = 4,29.$\mathbf{10^{14}}$, f = 4,84.$\mathbf{10^{14}}$, f = 5,17.$\mathbf{10^{14}}$, f = 5,66.$\mathbf{10^{14}}$, f = 6,32.$\mathbf{10^{14}}$, f = 6,67.$\mathbf{10^{14}}$, f = 7,50.$\mathbf{10^{14}}$.. $\boldsymbol{s^{-1}}$ E = 1,77.$\mathbf{10^0}$, E = 2,00.eV , E = 2,14.eV , E = 2,34.eV , E = 2,64.eV , E = 2,76 eV , E = 3,10.eV ,

From above is seen the small- large size of the energy difference.

Extending quantization of Space and Energy according to exponential formula for acceleration,

Planck's Length $\mathbf{L_S}= \mathbf{e^{-i.(-\pi+k\pi).b}}= e^{-i.\pi(k-1).10}$*, then* , $\mathbf{e^{-(29,933606)}}$,

For base e = 2,71828 and base b = 10 then $\mathbf{e^{-(29,933606)}}$ = 1 .$\mathbf{10^{-13}}$ m *Particles length*

For base e = 2,71828 and k = 0 then$\mathbf{L_S}= \mathbf{e^{i.(-\pi).b}}$ = $e^{-i(-31,41593)}$ = 3,56237 . $\mathbf{10^{-14}}$ m

For base e = 2,71828 and base b = 10 then $\mathbf{e^{-(32,236191)}}$ = 1 .$\mathbf{10^{-14}}$ m *Particles length*

For base e = 2,71828 and base b = 10 then $\mathbf{e^{-(92,103404)}}$ = 1 .$\mathbf{10^{-27}}$ m *Particles length*

For base e = 2,71828 and k = 1 then$\mathbf{L_S}= \mathbf{e^{i.(-2\pi).b}}$ $e^{-i(-62,83185)}$ = 9,31289 . $\mathbf{10^{-28}}$ m

For base e = 2,71828 and base b = 10 then $\mathbf{e^{-(94,405989)}}$ = 1 .$\mathbf{10^{-28}}$ m *Particles length*

Minimum Acceleration happens for Particles in, *Cave* ≡ *Recession* ≡ *Wavelength*, where then Energy, Energy $\mathbf{E_a}= \frac{1,24}{3,56237.10^{-14+6}}$ = 3,481.$\mathbf{10^7}$ eV = 5,576.$\mathbf{10^{-10}}$ Joules, while Redshift Energy happens as

$$\mathbf{E_R}= \frac{1,24}{0,7495}= 1,6542 \text{ eV} = 2,65.\mathbf{10^{-19}} \text{ Joules} . \qquad [31]$$

It was prior referred that, when Matter and Antimatter annihilate at rest or when Anti-space comes in contact with its regular Space counterpart, they mutually destroy each other and all of their Energy is converted to the *Three Breakages*

→ s^2 , -$|\bar{\mathbf{v}}|^2$, $[2\bar{\mathbf{w}}].|s|\,|r|.\nabla i$ ← and for , $\bar{\mathbf{v}}$≡ s ≡ r = the cave , then → s^2 , - s^2 , $2[\bar{\boldsymbol{s}}]^2.\nabla i$← [58]

Because Pure energy happens at s = 0 then $2[\bar{\boldsymbol{s}}]^2.\nabla i = 0$, i.e. $\nabla i = 0$ or $[\nabla i]^2 = 0$, meaning that Energy as Matter is moving perpendicularly to Anti-matter without annihilate each other . Photon is a Particle in all Levels of

Energy-magnitudes , and thus traversing gaseous-media of any temperature is experiencing redshift without losing Energy. Star - light passing near the Sun is bending because of its refraction in the dense-Sun, and of Newton`s gravitation.

Since Storage r = n λ/2 is an EM -Energy-tank with n frequencies and, $\mathbf{f_n}$ the Electromagnetic Radiation E, B the conveyer, in case of *Conveyer-annihilation* then *Photon* is regenerated by the Intrinsic-store which is the intrinsic Electromagnetic wave E, H and is indistinguishable from the annihilated.

It was proved before that, either velocity ,c , or Golden-frequency $\mathbf{f_n}$, creates motion ≡ Energy.

In case of Redshift , Energy is squared as $\mathbf{E_a}^2 = \mathbf{E_R}$ or $[\ 5{,}576.\mathbf{10^{-10}}\ ]^{\ 2} = 31{,}09\ .\mathbf{10^{-20}} = \mathbf{E_R} = 3{,}109.\mathbf{10^{-19}}$ Jouls corresponding to aRedshift → f = 468THz. markos 11 / 2 / 2018.

8. *The Numeric - Length of Space-caves: [26 - 29]*

Why Rotational energy $\bar{\mathbf{\Lambda}}$ is Elastically damped in monad $\boldsymbol{\lambda_2} = \mathbf{10^{-35}}$m as → mass m, velocity $\bar{\mathbf{v}}$, angular velocity $\bar{\mathbf{w}}$, and finally as a Constant Frequency f, which is dissipated in the fundamental particles (Fermions and Bosons) by altering the two variables, velocity$\bar{\mathbf{v}}$and wavelength λ, only ??

Since monad $(\overline{\mathbf{AB}})$ = *quaternion* = $\bar{\mathbf{z}}$ and the, w, Spaces and ,1/w = $\mathbf{w^{-1}}$, Sub-spaces are monads in, w, powerand, $\mathbf{w^{-1}}$, the root which represent the Regular Circumscribed and the Regular Inscribed Polygons in monad $\overline{\mathbf{AB}}$ then quaternion $\mathbf{z^w} = \bar{\mathbf{z}} = s + \bar{\mathbf{v}} = s + \bar{\mathbf{v}}.i = s + [\ \mathbf{v_1} + \mathbf{v_2} + \mathbf{v_3}].\nabla i = s + \bar{\mathbf{v}}\nabla i$, where s = the Scalar part, and $(w^2\varphi+\varphi+2k\pi)$, $\frac{(w^2\varphi+\varphi+2k\pi)}{w}$, $\mathbf{e}^{i[\frac{(w^2\varphi+\varphi+2k\pi)}{w}\ ]}$

$\bar{\mathbf{v}}$= [v1 + v2 + v3] the Imaginary part of it , equal to$\bar{\mathbf{v}}\nabla i$ …… [25] and then becomes

$$\rightarrow \mathbf{z^w} = (\mathbf{s} + \bar{\mathbf{v}}\nabla\mathbf{i})^{\mathbf{w}} = [\ \mathbf{z_o}.(\cos\boldsymbol{\varphi} + \mathbf{i}\ \sin\boldsymbol{\varphi})]^{\mathbf{w}} = |\mathbf{z_o}|^{\mathbf{w}}.(\cos\mathbf{w}\,\boldsymbol{\varphi} + \boldsymbol{\varepsilon}.\sin\mathbf{w}\boldsymbol{\varphi}) = |\mathbf{z_o}|^{\mathbf{w}}.\mathbf{e}^{\mathbf{i}.\mathbf{w}\boldsymbol{\varphi}}$$, *where*

$$\rightarrow |\mathbf{z_o}| = \sqrt{\mathbf{s}^2 + \mathbf{v1}^2 + \mathbf{v2}^2 + \mathbf{v3}^{\ 2}}\ ,\ \boldsymbol{\varepsilon} = [\mathrm{v1.i} + \mathrm{v2.j} + \mathrm{v3.k}] \,/\, [\sqrt{\mathbf{v1}^2 + \mathbf{v2}^2 + \mathbf{v3}^{\ 2}}\ ], \cos\boldsymbol{\varphi} = \frac{s}{|\mathbf{z_o}|}\ \mathrm{s}$$ *and*

$$\rightarrow \mathbf{z^{1/w}} = (\ \mathbf{s} + \bar{\mathbf{v}}\nabla\mathbf{i}\ )^{\mathbf{1/w}} = |\mathbf{z_o}|^{-\mathbf{w}}.[\cos(\boldsymbol{\varphi} + \mathbf{2k\pi})/\mathbf{w} + \mathbf{i}.\sin(\boldsymbol{\varphi} + \mathbf{2k\pi}/\mathbf{w})] = |\mathbf{z_o}|^{-\mathbf{w}}.\mathbf{e}^{\mathbf{i}.(\boldsymbol{\varphi}+\mathbf{2k\pi})/\mathbf{w}}$$

where $\mathbf{z^w}$= The Space , and $\mathbf{z^{1/w}}$ = The Anti-space of Monad ≡ Quaternion $\overline{\mathbf{AB}}$.

Above equations define the Wave-nature of monads in all Levels or Sub-levels.

Adding Space, Anti-space then $\mathbf{z^w} + \mathbf{z^{1/w}} = [\mathbf{z^w} + \mathbf{z^{1/w}}\ ] / 2 = A\ .\cos\mathbf{wt} = \mathrm{R.A}\mathbf{e}^{\mathbf{iwt}}$, where R stands for the real part of the quantity z.

Multiplying Space, Anti-space then $\mathbf{z^w}\mathrm{x}\mathbf{z^{1/w}} = \mathbf{A_1}\ \mathbf{A_2}\ .\mathbf{e}^{\mathbf{i}(\boldsymbol{\varphi}\mathbf{1}-\boldsymbol{\varphi}\mathbf{2})} = |\mathbf{z_o}|^{\mathbf{w}}\ \mathbf{e}^{\mathbf{i}.\mathbf{w}\boldsymbol{\varphi}\mathbf{1}}]\mathrm{x}[|\mathbf{z_o}|^{-\mathbf{w}}\ \mathbf{e}^{-\mathbf{i}.\mathbf{w}\boldsymbol{\varphi}\mathbf{2}}\ ] = 1$

The In-between Spaces $\mathbf{z^w}$and Anti-spaces $\mathbf{z^{1/w}}$ consists the *Absolute-Vacuum* of Spaces in all levels.

The Energy, Spaces $\mathbf{z^w}$andAnti-spaces$\mathbf{z^{1/w}}$, consists the *Granular-Vacuum* of Spaces in all levels.

Rotational Energy E = $\bar{\mathbf{\Lambda}}$= mv.r = (m$\bar{\mathbf{v}}$).λ/2 = (m.wλ/2).λ/2 = (mw).λ^2/4 = (m.2πf).λ^2/4 = f.[mπ.λ^2/2].

Total Energy E in k2 = $|\bar{\mathbf{\Lambda}}|\lambda$ = (m$\bar{\mathbf{v}}$).λ^2/2 = (m.wλ^2/2).λ/2 = (mw).λ^3/4 = (m.2πf).λ^3/4 = f [mπ.λ^3/2].

From equation of Work = Energy E=Pd$\bar{\mathbf{s}}$= P.$\bar{\mathbf{v}}$ dT= P.$\bar{\mathbf{v}}$.(2π/w)=P.$\bar{\mathbf{v}}$.(2π/2π.λ)= P.$\bar{\mathbf{v}}$/λ= hf = h(v/L) i.e. during diffraction, d$\bar{\mathbf{s}}$, frequency, f, doesn't change and only the velocity, $\bar{\mathbf{v}}$, and wavelength, λ, changes

Diffraction d$\bar{\mathbf{s}}$, maybe on any Quantized Space-monad (*quaternion*) *and in Planck Length* Lp *but how*?

Work is embodied in the three perpendicular regions $\mathbf{k_1}$, $\mathbf{k_2}$,$\mathbf{k_3}$, as the *rotating Energy* $\bar{\mathbf{\Lambda}}$ on dipole $\overline{\mathbf{AB}}$ = A ↔B =d$\bar{\mathbf{s_1}}$,d$\bar{\mathbf{s_2}}$, d$\bar{\mathbf{s_3}}$, in the Configuration of co variants $\bar{\mathbf{\Lambda}}$, d$\bar{\mathbf{s}}$, with constant C=4.$\bar{\mathbf{\Lambda}}$d$\bar{\mathbf{s}}$/(πwλ^2) *which exists simultaneously as the Equation of Quaternion*→ Spaced$\bar{\mathbf{s}}$ = $\bar{\mathbf{z}}$ = [s ±$\bar{\mathbf{v}}$.∇i] = [s ± $\bar{\mathbf{v}}$.i] = Work = Total Energy =

$$\mathrm{TE} = [\ \Lambda\nabla + \bar{\mathbf{\Lambda}}\mathrm{x}\nabla] = \sqrt{[\mathbf{m}.\mathbf{v_E}^2]^2 + [\mathbf{\Lambda}.\mathbf{v_B} + \bar{\mathbf{\Lambda}}\,\mathbf{x}\,\mathbf{v_E}]^2} = \sqrt{[\mathbf{m}.\mathbf{v_E}^2]^2 + \mathbf{T}^2} =$$

$$\sqrt{[\mathbf{m}.\mathbf{v_E}^2]^2 + |\sqrt{\mathbf{p_1 v_{B1}}}|^2 + |\sqrt{\mathbf{p_2 v_{B2}}}|^2 + |\sqrt{\mathbf{p_3 v_{B3}}}|^2} = (\bar{\mathbf{z_o}})^{\mathbf{w}} = (\boldsymbol{\lambda}, \boldsymbol{\Lambda}\nabla\mathbf{i})^{\mathbf{w}} = (\bar{\mathbf{z_o}})^{\mathbf{w}}.\mathbf{e}^{[\bar{\mathbf{v}}.\mathbf{w}\boldsymbol{\theta}]} = (\bar{\mathbf{z_o}})^{\mathbf{w}}.$$

$$\boldsymbol{e}^{[\ \bar{\mathbf{\Lambda}}\nabla\mathbf{i}\ /\sqrt{\ \mathbf{\Lambda}\grave{}\ \bar{\mathbf{\Lambda}}}\ [\mathbf{Arc\ Cos}(\frac{\mathbf{w}|\boldsymbol{\lambda}|}{2\left|\sqrt{\bar{\mathbf{z}}'\mathbf{o}.\bar{\mathbf{z}}\mathbf{o}}\right|})\ ]} \quad \ldots\ldots\ldots\ldots\ (\mathrm{TW})$$

Nature has not any < meter > to measure quantized quantities (of Space and Energy) except these of the Geometry constants, one of which is number, π,(Archimedes number π) so quantization of Points (λ) *follows geometry constant* (π) *and for Energy* $\mathbf{W_d}$*,which is the quantized Energy of the Quantity dissipated per cycle,*[*and this because monads follow sinusoidal oscillation on wavelength = monads as the* w.*th power and the* n.*th root of this monad where* w. n =1 *as above on and in the same monad*]*and which energy is*→ $\mathbf{W_d}$= (mw).λ^2/4 = (2mπf).λ^2/4 = (mπ.λ^2/2).f = C.f= C.$[\frac{(1+\sqrt{5})}{2}]\frac{\sigma}{4\pi r^3}$ = $\mathbf{W_d}$= C.$[\frac{(1+\sqrt{5})}{2}]\frac{\sigma}{4\pi r^3}$= (m/2r).$[\frac{(1+\sqrt{5})}{2}]\frac{\sigma}{4\pi r^3}$ = (m/λ).$[\frac{(1+\sqrt{5})}{2}]\frac{\sigma}{4\pi r^3}$ → a Golden ratio pattern ,i.e.

From above monads $(\ \mathbf{s} + \bar{\mathbf{v}}\nabla\mathbf{i}\ )^{\mathbf{1/w}} = |\mathbf{z_o}|^{-\mathbf{w}}.\mathbf{e}^{-\ \mathbf{i}.(\boldsymbol{\varphi}+\mathbf{2k\pi}).\mathbf{w}}$, where $\cos\boldsymbol{\varphi}$ = s / $|\mathbf{z_o}|$, and for Rotated Energy case where s = 0 , and also $\cos\boldsymbol{\varphi}$ = 0 exists for angle φ = π /2 , the quaternion $(\ \mathbf{s} + \bar{\mathbf{v}}\nabla\mathbf{i}\ )^{\mathbf{1/w}}$ *as dimension power*

→ w = b ←*and for* k = 1 *above becomes* , $\mathbf{e}^{-\,\mathrm{i}.(\pi/2+2k\pi).w} = \mathbf{e}^{-\,\mathrm{i}.(\pi/2+2k\pi).b} = \mathbf{e}^{-\,\mathrm{i}.(5\pi/2).b} = \mathbf{e}^{-\,\mathrm{i}.(5\pi/2).10}$ *and for Planck length*

$$\mathbf{L}_{p} = \mathbf{e}^{-\,\mathrm{i}.(5\pi/2).10} \quad \ldots\ldots (\mathbf{P}_{l})$$

Equation ($\mathbf{P}_{l}$), is thebasic Geometrical interpretation of the <*Planck scale meter*>based
On the two *Geometry constantse*, π where k = 1 , and *base* b = 10 , and this from logarithm properties with different bases on the same base e as this is , $\mathbf{e}^{w} = [\,b^{\log_b(e)}\,]^{w} = b^{w.\log_b(e)}$ and because $\sqrt[w]{\mathbf{e}} = \mathbf{e}^{1/w} = \mathbf{e}^{-w} = x^{1/w.\log_b(e)}$ *which are monads in monads, and is therefore of Wave motion with angular velocity* w = 4$\mathbf{W_d}$/(π.$\mathbf{C_o}$.λ²), [5-4] i.e.
Space and Energy is quantized and measured on the two Constant and Natural numbers e, π.
where *for base* the natural logarithm, e, *and exponent* the decimal base, b = 10, then is→
For base e = 2,71828 and base b = 10 then$\boldsymbol{e}^{-\,(78,2879)}$ = 1 . $\mathbf{10^{-34}}$m *The answer*
For base e = 2,71828 and base b = 10 then$\boldsymbol{e}^{-(78,5398)}$ =8,906 . $\mathbf{10^{-35}}$m *to the above*
For base e = 2,71828 and base b = 10 then$\boldsymbol{e}^{-(80,5905)}$ = 1 . $\mathbf{10^{-35}}$m *question.*
$\mathbf{L_p} = \mathbf{e}^{\mathrm{i}.\left(\frac{\pi}{2}+2k\pi\right).b} = \mathbf{e}^{-\mathrm{i}.\left(5\frac{\pi}{2}\right).b} = \mathbf{e}^{\mathrm{i}.\left(-5\frac{\pi}{2}\right).10} = \mathbf{e}^{-.(78,5398).}$ = 8,906.$\mathbf{10^{-35}}$ m = {$\sqrt{\mathbf{3}}$.π. 1,616199.$\mathbf{10^{-35}}$ m}
i.e. *Planck's Length*$\mathbf{L_p}$ *During Diffraction,* d$\bar{\mathbf{s}}$*, frequency* ,f, *doesn't change and only the velocity*, $\bar{\mathbf{v}}$, *and wavelength*, λ, *changes, or the Wave nature of Even function* f(Λ)*and of Odd* f(-Λ)≡[0,-∇xΛ.∴] *creates on Planck-Length* ,d$\bar{\mathbf{s}}$, *Fermions and Bosons* .This becomes from velocity relation v= w.r = 2πf.r = (2πr / T) = [2πr.c/λ], where velocity ,c, or Golden-frequency $\mathbf{f_n}$,creates Energy ≡ motion.
Again $\mathbf{z}^{1/w} = (\,\mathbf{s} + \bar{\mathbf{v}}\nabla\mathbf{i}\,)^{1/w} = |\mathbf{z_o}|^{-w}.[\mathbf{cos}\,(\boldsymbol{\varphi} + \mathbf{k\pi})/w + \mathbf{i.sin}(\boldsymbol{\varphi} + \mathbf{k\pi}\,/w)] = |\mathbf{z_o}|^{-w}.\mathbf{e}^{\mathrm{i}.(\varphi+k\pi)/w}$
For $\mathbf{cos}(\boldsymbol{\varphi} + \mathbf{k\pi})/w$ = 0 then exists only the Imaginary part of monad,($\bar{\mathbf{v}}$.∇i) ≠ 0 , where φ = π /2 and then, it is the *Diffraction Energy mechanism* for all Space Levels of quantization which are The Energy Particles only i.e. Energy particles $\mathbf{z}^{1/w} = |\mathbf{z_o}|^{-w}.\,\mathbf{L_v}$ ≡ Energy Monads.

9. *The Energy conservation, due to any motion*

Since Medium-Field Material-Fragment → [± s²] = [MFMF] ≡*The Chaos*, is the base for all motions, *then issues for the Motion of Photons all issuing for the others motions*:
All motions create Work which is conserved.

1. When Motion presupposes a *Displacement-vector*$\bar{\mathbf{r}}$ and the small amount, $\mathbf{d}\bar{\mathbf{r}} = \bar{\mathbf{v}}$, with between angle θ , then the area dS, swept out by the two vectors is → 2.dS = r.dr.**sin θ**=$\bar{\mathbf{r}}$x$\mathbf{d}\bar{\mathbf{r}}$ = $\bar{\mathbf{r}}$x$\dot{\bar{\mathbf{r}}}$ ……(1)
   By differentiating with respect to time becomes $\mathbf{2d\dot{S}}$ =$\dot{\bar{\mathbf{r}}}$x$\dot{\bar{\mathbf{r}}}$ +$\bar{\mathbf{r}}$ x $\ddot{\bar{\mathbf{r}}}$ ……(2) i.e.
   The first term on the right hand side of (2) is zero because is the cross-product of a vector with itself.
   The second term is the cross-product of *Displacement-vector*$\bar{\mathbf{r}}$and *Acceleration-vector* $\ddot{\bar{\mathbf{r}}}$, which is directed to $\bar{\mathbf{r}}$, vector therefore is also Zero and $\mathbf{2d\dot{S}}$ =0, or, $\mathbf{d\dot{S}}$= 0, so, dS = constant = k ……(3)
2. When Motion presupposes *Velocity vector*$\bar{\mathbf{v}}$which , *when is in motion collides with other velocity Vectors*, creating a Constant Work k . Motion may be *Linear or Rotational* for any displacement r , so exists the Constant-work → k = $\bar{\mathbf{v}}$x$\bar{\mathbf{v}}$.$\bar{\mathbf{r}}$ = v².r ← ……(4)
   or , k = v². r = (wr)².r = $[\frac{\mathbf{2\pi}}{\mathbf{T}}\mathbf{r}]^2$.r=$\frac{\mathbf{4\pi^2\,r^2}}{\mathbf{T^2}}$ r = $\frac{\mathbf{4\pi^2\,r^3}}{\mathbf{T^2}}$= 4π².r³.$\mathbf{f^2_p}$ →

which is The Kepler Laws ,where for $\frac{4\pi^2}{k}$ = C then 1= C r³.$\mathbf{f^2_p}$ …… (4a)

Relation 1 = C r³.$\mathbf{f^2_p}$= [$\frac{4\pi^2}{k}$] r³.$\mathbf{f^2_p}$, becomes either from *Displacement*, *Space*, or *Velocity*, *Anti-space*.

Remarks:

1. Since (1)denotes *Area*, (3) denotes *Acceleration* ≡ *Force* ≡ *Energy*, and, are equal and same, *so* The area Swept-out by a vector radius is, 2.dS = constant = k = $\bar{\mathbf{r}}$ x $\mathbf{d}\bar{\mathbf{r}}$ and *Energy is Stored into it*. Since Photon is Particle as [$\bar{\mathbf{v}}$ =$\bar{\mathbf{c}}$= λf], then *Energy* ≡ *Work* produced in motion is stored into its, velocity - vector ≡ $\bar{\mathbf{c}}$= λf≡ $\mathbf{f_R}$ = [$\mathbf{B_P}$ ≡ $\mathbf{f_{1=N}}$, $\mathbf{f_2}$, $\mathbf{f_3}$,$\mathbf{f_R}$] ≡[E² + H²] = 2(2r).c.**sin 2**φ, *where* $\mathbf{f_R}$ ≡$\mathbf{f_N}$ and consists the moving Storage of Photon . *The carrier of Body* $\mathbf{B_P}$, is the *Outward*$\bar{\mathbf{c}}$= λf *Electromagnetic-Wave* →{[εE²+μB²] =2.λc.sin.2φ}
2. From(4)*Photon during Motion in* [MFMF] *Chaos collides with other* Photons, *by means of Cross-Product and produces a constant Work which is stored into the* Only-Four *Energy - Geometrical-Shapes, of the motion. The Interior motion is kept in its Wavelength-Tank* 2r = nλ, *and Linear motion is continued by the Propagating Electromagnetic-Wave* ≡ *The conveyer of the Storage.*

The mechanism of *Energy-transport through a Medium* involves the *Absorption and the Reemission* of the wave-energy by the atoms of the material . Since Quanta of Energy occupy a finite space λ = 2r, as motion then an electromagnetic wave impinging upon the atoms of a material, its energy is absorbed by the atoms of the material,

and since Energy ≡ motion then occurs *Resonance*, and electrons within the atoms undergo vibrations . After a short period of vibrational-motion, the vibrating electrons create a *New Electromagnetic wave* with the same frequency as the first one and thus delay motion through the medium. Because energy is related to the content of wavelength λ, *Body* $\mathbf{B_P}$, then once the energy of EM-wave is reemitted then it travels through a small region of space between atoms and once it reaches the next atom the EM-wave is absorbed and transformed into electron vibrations and then reemitted as an Electromagnetic-wave. The actual *speed of an Electromagnetic-wave through a material-medium*, due to the Absorption and Reemission-process, is dependent upon the *optical-density* of the medium, or when their atoms are closely packed upon their, *material – density*. i.e.

Photon is an Energy-store r, in a Stationary-wave of wavelength n λ = 2r, consisted of n stationary lobes filled in λ with inner motion the Electromagnetic - Displacement-current, while is Outward Propagating with light speed as Energy-store λ = 2r / n, [+] Electric-field as Space, [-] Magnetic-field as Anti-space.

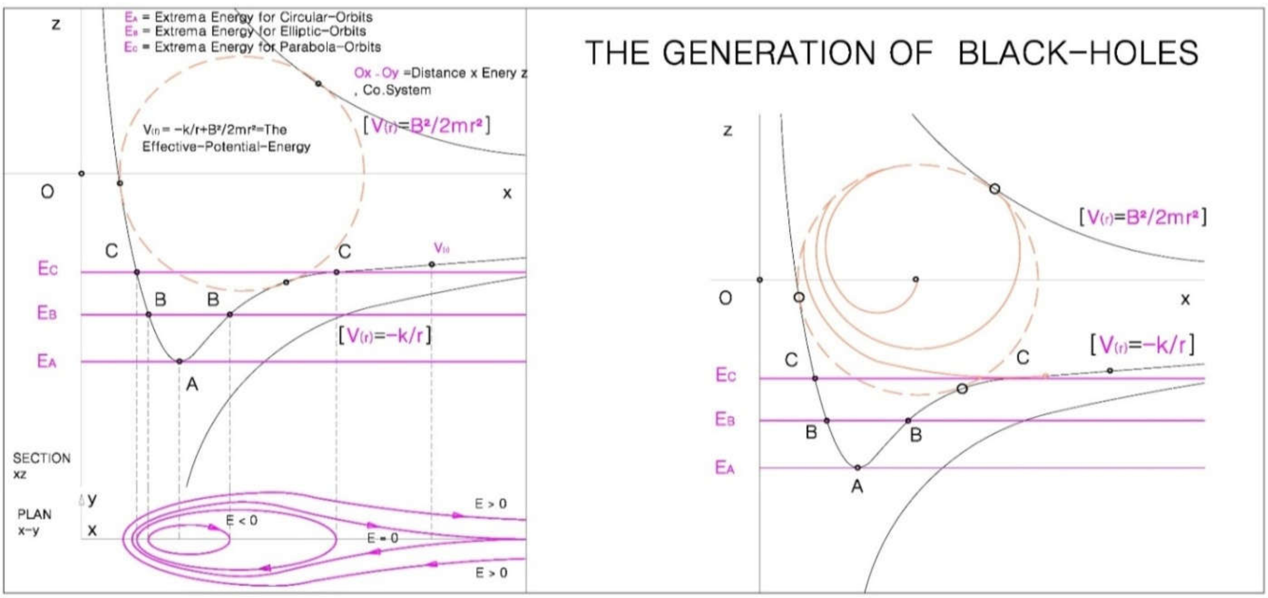


Figure 17: The Energy in Orbits and the *conditions for a Black-hole*[$\bar{\mathbf{v}}= \mathbf{n\pi\bar{c}}=\lambda\ .\mathbf{n\pi}$f]

1. In (1) is the Graph of *Effective-Potential-energy-Orbits* in a Central-motion becoming from Kepler constant

$$k = 4\pi^2.r^3.\mathbf{f_P}^2,\ \text{or}\ \ 1 = [\frac{4\pi^2}{k}]r^3.\mathbf{f_P}^2 \rightarrow 1 = c.\ r^3.\mathbf{f_P}^2, \ldots\ldots (4a)$$

where for r → 0 then $\mathbf{f}_{\mathbf{P}} \rightarrow \infty$

2. Because of the *Golden-ratio-frequency relation*$\mathbf{f}_{\mathbf{n}} = [\frac{(1+\sqrt{5})}{2}]\ \frac{\mathbf{n.\sigma}}{\mathbf{2\pi r}}$, and from $\bar{\mathbf{v}} = \mathbf{n\pi\bar{c}} = \lambda.\mathbf{n\pi}f$, $v = \lambda.\mathbf{n\pi}.[\frac{(1+\sqrt{5})}{2}]\ \frac{\mathbf{n.\sigma}}{\mathbf{2\pi r}} = \frac{\mathbf{\lambda.n^2.\sigma}}{\mathbf{2r}} = n^2.\sigma$, predicts the *Ubiquity of the Golden-ratio* in Nature from the microcosm to the macrocosm , *the macro scale*, and the when velocity $\bar{\mathbf{v}}$can enter a cave r.

Instead of it momentum B*, rotates into the Angular – Velocity–cone,* i.e. From equalities, acceleration $g = \frac{\mathbf{2\pi v}}{\mathbf{T}}$ and velocity $v = \frac{\mathbf{2\pi r}}{\mathbf{T}}$ then $g = \frac{\mathbf{4\pi^2.r}}{\mathbf{T^2}}$, Period $T = 2\pi\sqrt{\frac{r}{g}}$ or *frequency*$\mathbf{f_1} = \sqrt{\frac{\mathbf{g}}{\mathbf{4\pi^2 r}}}$ …………(4b)

or from acceleration on orbits $a = \frac{\mathbf{2\pi v}}{\mathbf{T}} = \frac{\mathbf{v}}{\mathbf{r}}\,v = \frac{\mathbf{v^2}}{\mathbf{r}}$ and from force $P = m\,\frac{\mathbf{d\bar{v}}}{\mathbf{dt}} = \frac{\mathbf{d(m\bar{v})}}{\mathbf{dt}} = m.\bar{\mathbf{a}}$….Fig-3.(2)

From $C\ r^3.\mathbf{f^2}_{\mathbf{P}} = 1$, when cave, r, tends to zero, 0, then frequency $\mathbf{f_1}$is tending to infinite ∞ where then constant $C = \frac{\mathbf{4\pi^2}}{\mathbf{GM_S}} = 5{,}9188.\mathbf{10^{11}}$ Kg²/Nm²$\mathbf{M_S}$. Photon exists as an Angular-Momentum body $\mathbf{B_P}$rotating in Angular-velocity-coneas a Stationary wave

$$[\mathbf{B_P} \equiv \mathbf{f_{1=N}},\ \mathbf{f_2},\ \mathbf{f_3}\ ,\mathbf{f_R}] \equiv [E^2+H^2] = 2(2r).c.\mathbf{\sin 2\varphi} \ldots\ldots (4c)$$

From (4a),(4b)and $\mathbf{f_1}$ when cave, r, tends to zero ,0, then frequency $\mathbf{f_1}$, is tending to infinite ∞, while from (4c), when $\mathbf{f_1}$ tends to ∞ then, r tends to zero, i.e. both are the cases of an Planar and an Atom-Black-hole. The How and When a Black-hole is formulated, in [73].

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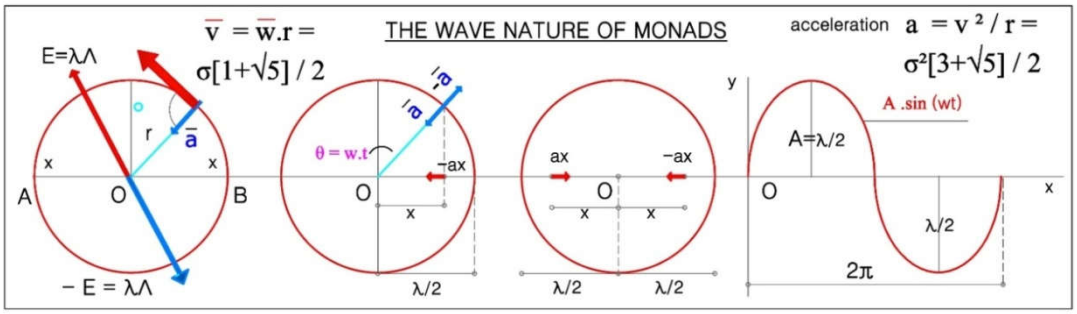
VII. The Electromagnetic - Fields E, P of Monads



(1) (2) (3) (4)

Figure 18: The Wave nature of the*Material-Point-Monad* AB

a) The Wave nature of Monad $\overline{AB}$

In (1), are shown *Velocity* , $|\bar{\mathbf{v}}| = w.2r = \frac{2\pi}{T}.r = 4\pi r.\ f = [\frac{\sigma}{2}].(1+\sqrt{5})$,*Angular velocity* $|\bar{\mathbf{w}}| = \frac{\sigma}{2r}[1+\sqrt{5}]$ And the *Golden-ratio-Frequency* $f = \frac{(1+\sqrt{5}\,).\sigma}{4\pi r}$ in cave, r.

In (2), are shown Centripetal, $\bar{\mathbf{a}} = v^2/r$, and Centrifugal, $-\bar{\mathbf{a}} = v^2/r$, acceleration in cave, r.

In (3), are shown the *Projections* on AB axis of Centripetal, $\bar{\mathbf{a}}_x$, and Centrifugal, $-\bar{\mathbf{a}}_x$ acceleration in cave, 2r = λ. Note that Waves transfer Energy but not mass.

In (4) , is shown the *Sinusoidal - motion* of the Centripetal ,$\bar{\mathbf{a}}_x$, and Centrifugal, $-\bar{\mathbf{a}}_x$, acceleration in cave , r = λ/2 . Following Analysis in [33] then, Monad $|\overline{AB}| = r = \lambda/2$ is the ENTITY ≡ Space, and [A , B $-\bar{\mathbf{P}}_A$, $\bar{\mathbf{P}}_B$] is the CONTENT ≡the Energy which is the LAW, so Entities are embodied with the Laws. Entity is quaternion ∇i=[s +$\bar{\mathbf{v}}$∇i] with *Real* part |AB| =The length r = s = λ/2 between points A,B and *Imaginary* part the equal and opposite forces $\bar{\mathbf{P}}_A$, $\bar{\mathbf{P}}_B$ such that $\bar{\mathbf{P}}_A + \bar{\mathbf{P}}_B = 0$, and In Primary-Neutral Space [PNS] the Dipole $|\bar{\mathbf{A}}\cup\bar{\mathbf{B}}| = [\lambda, \Lambda]$ in [PNS] are composed of the two elements λ, Λ which are created from points A , B only , where *Real* part |AB| = λ /2 = wavelength (*dipoles*) and from the embodied Work $\bar{\mathbf{B}}\bar{\mathbf{w}} = 2L$, *where the Imaginary part* $\bar{\mathbf{B}}$= (r.dP) = $\bar{\mathbf{r}}\times\bar{\mathbf{p}}$= l.w = [λ.p] = λ.Λ= $\bar{\mathbf{B}} = \frac{\mathbf{h}}{2\pi}$, the momentum Λ=$\bar{\mathbf{B}}$and the Forces dP =$\bar{\mathbf{P}}_B$ - $\bar{\mathbf{P}}_A$ are the stationary sources (*the excitation sources*) of the Space -Energy field . [22-23-25].

The moving charges is velocity, $\bar{\mathbf{v}}$, *created from the eternally rotated main stresses*, ± σ, forming the *dipole momentum vector,* $\pm\bar{\mathbf{\Lambda}}$, *when is mapped on the perpendicular to* Λ*plane as* → $\bar{\mathbf{v}}$E || dP and $\bar{\mathbf{v}}$B⊥ dP). Since (dP ⊥ ± $\bar{\mathbf{\Lambda}}$) the work occurring from momentum $\bar{\mathbf{p}}$ is $\bar{\mathbf{p}}$ = m$\bar{\mathbf{v}}$= Λ acting on force dP , d$\bar{\mathbf{P}}$is zero, so *momentum* $\bar{\mathbf{\Lambda}}$= m$\bar{\mathbf{v}}$*only is exerting the velocity vector* $\bar{\mathbf{v}}$*, onto the dipole,* λ /2, with the generalized mass m (*the reaction to the change of velocity* $\bar{v}$) which creates the component forces, $\mathbf{F_E}$ || dP.$\bar{\mathbf{v}}$and $\mathbf{F_B}$⊥ dP×$\bar{\mathbf{v}}$. Magnitude |A| =r.$\sin\theta$

Dipole momentum {Ω = (λ. Λ) = Spin} is the rotating total Energy on dipole $\overline{\mathbf{AB}}$ and mapped on the perpendicular to Λplane as*, velocity* $\bar{\mathbf{v}}$ *, mass* m*, on radius,* r *,* to AB/2 = λ/2.

From (1) velocity $\bar{\mathbf{v}}$ is created from the Centrifugal force $\mathbf{F_f} = -\sigma$ and from the equal and opposite to it Centripetal force $\mathbf{F_p} = +\sigma$ with acceleration $\bar{\mathbf{a}}$, and the *meter* of x, component equal to a sinθ = a.(x/A) = (a/A).x . The equation of motion then becomes m.(d²x/dt²) = - (a/A). x with the general solution, x = $\mathbf{C_1}$ sinθ + $\mathbf{C_2}$ cosθ = $\mathbf{C_1}$ sin.wt + $\mathbf{C_2}$ cos.wt, *where* w² = (a/Am), $\mathbf{C_1}$, $\mathbf{C_2}$, constant and for θ = 0 then v = $\mathbf{v_o}$= w.r = w. λ / 2 = (wλ) / 2 and $\mathbf{x_o}$= A = λ/2, where A =The amplitude of oscillation, and when x = 0 then A = λ / 2 = r. *Above equations define the wave nature of Inner motion of monad* AB.

The period of the Harmonic vibration is $T = 2\pi\sqrt{\mathbf{A/a}}$, and Displacement x, from the centre is

$$x = A.\mathbf{sin}[\sqrt{\left(\frac{A}{a}\right)}.t] = A.\mathbf{sin}[\sqrt{\left(\frac{A}{\sigma}\right)}.t] = A.\mathbf{sin}(w\,t) \quad \ldots\ldots(1)$$

i.e. The Harmonic-Vibration is *Sinusoidal – motion with* $w^2 = \left(\frac{A}{\sigma}\right)$, where for material point acceleration a ≡ σ ≡ Principal-stress.

Considering motion from time t = 0 where motion passes through O, (x = 0) with velocity $\mathbf{v_o}$// Ox, *then Displacement*

$$x = \mathbf{v_o}.\mathbf{sin}\,\mathbf{wt} = A.\sin[\sqrt{(a/Am).t}+\pi/2] = A.\sin[\sqrt{(\sigma/Am).t}+\pi/2]$$

Velocity $\dot{\mathbf{x}} = dx/dt = \mathbf{v_o}.w.\ \mathbf{sin\,wt} + \boldsymbol{\pi/2} =$

$$A.\sqrt{(a/Am)}.\ \sin[\sqrt{(a/Am).t}+\pi/2] \quad \ldots\ldots(2)$$

Acceleration $\ddot{x}= d^2x/dt^2 = -\mathbf{v_o}.w^2.\ \mathbf{\sin wt+\pi} = (a/m).\ \sin[\sqrt{(\mathbf{a/Am}).\mathbf{t}}+\pi] = -(a/Am).\ x= -(2a/\lambda m).\ x$, or $\ddot{x}=-(2a/\lambda m).\ x$ i.e. The amplitude of oscillation ($\mathbf{x}_{\mathbf{maximum}}$) is equal to the constant $\mathbf{v_o}/w$ while the period T of a complete oscillation to the constant $2\pi/w$ as,

$w = 2\pi/T = 2\pi f = \sqrt{(a/Am)}$ where f = frequency and solving for, a, then acceleration a is

$$a = \sigma = (2\pi/T)^2.\ (Am) = w^2.(Am) = w^2.(\lambda m)/2, \quad \ldots\ldots\ldots (3)$$

And for the material point where, $m = \frac{\mathbf{2E}}{a_a} = [\frac{\mathbf{\bar{B}.\bar{w}}}{\mathbf{B x \bar{w}}}].J$ then , $a = \sigma = w^2.\ [\frac{\mathbf{\bar{B}.\bar{w}}}{\mathbf{B x \bar{w}}}].\frac{\mathbf{\pi r4}}{\mathbf{2}}$ $\ldots\ldots\ldots$ (4)

i.e. Monads $|\overline{\mathbf{AB}}|$ *are Waves* or *of Wave nature, with angular-velocity* $w = \sqrt{\left(\frac{\mathbf{A}}{\mathbf{a}}\right)} = \sqrt{\left(\frac{\mathbf{r}}{\mathbf{a}}\right)} = \sqrt{\left(\frac{\mathbf{r}}{\mathbf{g}}\right)} = \sqrt{\left(\frac{\mathbf{r}}{\mathbf{\sigma}}\right)}$

b) Analysis of the Wave - System in monads

Free vibration on monads AB = $\bar{\mathbf{q}}$ = [s+$\bar{\mathbf{v}}\nabla$i] oscillating under the action (thrust) inherent in itself, subject to *damping* because energy is dissipated by the *stiffness*, k, of monad and *constant of proportionality*, c, regarding motion of *mass*, m, when placed into motion, oscillation will take place at the natural frequency, $\mathbf{f_n}$, which is the property of monads tobe the only possible motion in caves.

The homogenous differential equation of motion is

$$m\ddot{x}+c\dot{x}+kx = 0 \quad \ldots\ldots\ldots(1)$$

corresponds physically to the free damped vibration, where is x = the displacement, $\dot{x}$ = velocity of monad with general solution given by the equation → $x = A\,.\,\boldsymbol{e}^{s1.t} + B.\boldsymbol{e}^{s2.t}$, where,

$$s1,2 = -[c/2m] \pm \sqrt{\left[\frac{c}{2m}\right]^2 - \left(\frac{k}{m}\right)} \text{ and } S = \sqrt{\left(\frac{k}{m}\right) - \left[\frac{c}{2m}\right]^2},$$

and for initial conditions x(0), $\dot{x}$(0)→A, B then displacement $x= \mathbf{e}^{-\mathbf{i}.(\mathbf{c/2m})\mathbf{t}}.[\ A.\boldsymbol{e}^{S.t}+B.\boldsymbol{e}^{-S.t}\ ]$ and oscillatory,

$$x= \boldsymbol{e}^{\pm i\sqrt{(\frac{k}{m}-[\frac{c}{2m}]^2)}t} = \cos\sqrt{\left[\frac{c}{2m}\right]^2 - \left(\frac{k}{m}\right)} \pm i.\sin\sqrt{\left[\frac{c}{2m}\right]^2 - \left(\frac{k}{m}\right)} \quad \ldots\ldots\ldots(2)$$

where ,

For $[\frac{c}{2m}]^2 > [\frac{k}{m}]$ no oscillations are possible, *over-damped,*

For $[\frac{c}{2m}]^2 < [\frac{k}{m}]$ exponent becomes an imaginary number and terms are oscillatory, *under-damped,* and this because ↻For $[\frac{c}{2m}]^2 = [\frac{k}{m}]$ then oscillatory , non-oscillatory and radicalmotion is zero, *critical dumping*$\mathbf{C_c} = 2m\sqrt{[\frac{\mathbf{k}}{\mathbf{m}}]} = 2m\boldsymbol{w_n} = 2\sqrt{km}$.

Equalization of mass m from pairs $\mathbf{C_c} = 2\sqrt{km}\mathbf{C_c}^2 = 4km$, then $m = \boldsymbol{C_c}^2/4k$ and from $2m\sqrt{[\frac{k}{m}]} = 2m\boldsymbol{w_n} \rightarrow k = mw^2$ andm = $k/w^2 = \mathbf{C_c}^2/4k$, or → $2k = \mathbf{w.C_c} = 2\pi.\mathbf{f.C_c}$, $k = \pi.\mathbf{f.C_c}$ a relation between linear stiffness , circular frequency and the transverse damping coefficient , *the critical mass* . Any damping can then be expressed in terms of the criticaldamping by the non-dimensional number

$\zeta = C/\boldsymbol{C_c}$ and S in terms ofζ , $[\frac{\boldsymbol{C}}{\mathbf{2m}}] = \zeta\ [\frac{\boldsymbol{Cc}}{\mathbf{2m}}] = \zeta\boldsymbol{w_n}$,is $S = [-\zeta\pm\sqrt{(\zeta^2-1)}].\boldsymbol{w_n}$ and differential equation of motion becomes $\ddot{x}+2\zeta\boldsymbol{w_n}\dot{x}+\boldsymbol{w_n}^2x = 0$ ..(1a)and the general solution is given by the three equations

1. For $\zeta < 1$ is the Oscillatory motion, *Under-damped case.*

$$x = \boldsymbol{e}^{-\zeta.wn.t}.\ [A.\boldsymbol{e}^{i\sqrt{(1-\zeta^2)}.wn.t} + B.\boldsymbol{e}^{-i\sqrt{(1-\zeta^2)}.wn.t} =$$

$$\boldsymbol{e}^{-\zeta.wn.t}.\{[(\dot{x}(0)+\zeta.\boldsymbol{w_n}.x(0)).\sin\sqrt{(1-\zeta^2)}.\boldsymbol{w_n}.t]\ /\ [\boldsymbol{w_n}.\ \sqrt{(1-\zeta^2)}]\} + x(0).\cos\sqrt{(1-\zeta^2)}.\boldsymbol{w_n}.t\ \}\} \quad \ldots\ldots\ldots(3a)$$

which indicates that the frequency of the damped oscillation is equal to $\mathbf{w_d} = \frac{\mathbf{2\pi}}{\mathbf{\tau d}} = \boldsymbol{w_n}.\ \sqrt{(1-\zeta^2)}$

The study of vibration is concerned with the oscillatory motion of monads and the forces associated with them. Since all monads are processing mass and elasticity are capable of vibration. Monads or structures experience vibration to some degree, so require consideration of their oscillatory behavior. The Principle of superposition holds for linear oscillatory Critical damping for all Primary particles in contrast to Compound tending to become nonlinear with increasing amplitude of oscillation.

2. For $\zeta > 1$ is the Non-oscillatory motion, *Over-damped case* with the two roots increasing and decreasing with general solution,

$$x = A.e^{[-\zeta+\sqrt{\zeta^2-1}].wn.t} + B.e^{[-\zeta-\sqrt{\zeta^2-1}].wn.t} \text{ where}$$

$$A = \{\dot{x}(0) + [\zeta+\sqrt{(\zeta^2-1)}].w_n.x(0)\}/ [2w_n.\sqrt{(\zeta^2-1)}]$$

$$B = \{-\dot{x}(0) - [\zeta-\sqrt{(\zeta^2-1)}].w_n.x(0)\}/ [2w_n.\sqrt{(\zeta^2-1)}] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3b)$$

3. For $\zeta=1$ is the Internally Isochronal oscillatory motion, *The critical damped motion case* and the displacement, x, is as $\rightarrow$ $x = e^{-wn.t}.[A + B.t] = e^{-wn.t}.\{x(0) + [\dot{x}(0) + x(0).w_n].t\}$

i.e. a double root S1 = S2 = - w_n which is according to the Newton`s second law, the deformation of the real part, $|s|$, which is $k.|s| = -w = -mg$, and frequency $f_n = (1/2\pi).\sqrt{g/|s|} = 2\pi\sqrt{m/k}$ depending on the mass and stiffness of monad ,being its properties. The three types of Response with initial displacement x(0) are dependent on velocity $\dot{x}(0)$ factor as ,$\dot{x}(0) > 0 \rightarrow$ for cycloidal motion in caves,

$\dot{x}(0) < 0 \rightarrow$ for cycloidal motion in caves,

$\dot{x}(0) = 0 \rightarrow$ for energy-tanks,

This critical damping occurs on monads , which is their inner motion. *The Natural-Frequency* is then *the Golden-ratio-frequency* $f_n = \frac{n.v}{4r} = \frac{n\sigma}{8r}[1+\sqrt{5}] = \frac{1}{2}[1+\sqrt{5}]\frac{n\sigma}{4r}$

For $\zeta = 0$ differential equation reduces to s1, 2 / $w_n = \pm i$, and the roots on the imaginary axis correspond to un-damped case.

Complex Numbers, Quaternion and Resonance:

Rotation of [⊕] constituent around [⊖] constituent in Material point is equivalent to a force $T = F_0$ Eternally and Sinusoidal acting on String [Figure - 5] , and is according to the differential equation,

$$m\ddot{x} + c\,\dot{x} + kx = F_0.\sin wt \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where,

m = The mass of the [⊕] constituent related to acceleration,

c = A constant related to its velocity $\dot{x}$,

k = A constant related to its displacement, x,

w = The circular velocity of the [⊕] constituent related to the tension $T = \pm\sigma$

t = The time of rotation.

$w_n = \sqrt{k/m}$ = the natural frequency of undamped oscillation

$c_c = 2mw_n$ = critical damping

$\zeta = c / c_c$ = damping factor.

The Vector - Force - Polygon of equation (1) is consisted of force in different orientations, and if the force had been $\rightarrow$ $F_0.\cos wt$, instead of, $F_0.\sin wt$, the Vector- Force - Polygon would be unchanged and the terms of the equation then would have been the *Projections of the Vectors on the horizontal axis*.

Taking note of this , then could let the Harmonic - Force be represented by the equation,

$$F_0.(\cos wt + i.\sin wt) = F_0.e^{iwT} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

This would be equivalent to multiplying the quantities along the vertical axis by $i = \sqrt{-1}$, and using complex vectors. The displacement can then be written as,

$$X = X.e^{i(wt-\varphi)} = [X.e^{-\varphi}] . e^{iwT} = \bar{X}. e^{iwT} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

where,

$\bar{X}$, is a complex displacement - vector equal to $[X.e^{-\varphi}]$, and by substituting into the differential equation and cancelling from each side of the equation, then results to $(-w^2 m + k w + k)\,\bar{X} = F_0$ and

$$\bar{X} = \frac{F_0}{(k - w^2 m) + i.(c\,w)} = \frac{F_0/k}{\left(1 - \left(\frac{w}{w_n}\right)^2 + i.[\,2\zeta\frac{w}{w_n}\right]} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3a),$$

and by introducing the complex frequency response H(w) defined as the output divided by the input then becomes

$$H(w) = \frac{\bar{X}}{F_0} = \frac{1/k}{1-(\frac{w}{w_n})^2 + i.(2\zeta\frac{w}{w_n})} = \frac{1-[\frac{w}{w_n}]^2}{[1-(\frac{w}{w_n})^2]^2+[2\zeta\frac{w}{w_n}]^2} - i\,.\,\frac{2\zeta\frac{w}{w_n}}{[1-(\frac{w}{w_n})^2]^2+(2\zeta\frac{w}{w_n})^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots(4)$$

Equation (4) shows that *at Resonance the Real - Part is Zero*, *and the Response is given by the*

Imaginary - Part which is → $H(w) = -i.\frac{1}{2\zeta}$, and *the Phase angle* is → $\tan\varphi = \frac{2\zeta\frac{w}{w_n}}{1-(\frac{w}{w_n})^2}$ ……(4a)

The general solution of equation (1) consists of two parts, *the complementary function*, which is the solution of the *homogenous equation*, and the particular Integral, as

$$x = A.\sin(wt-\varphi) + e^{-\frac{c}{2m}t}\,[C_1 \sin\theta t + C_2 \cos\theta t] \quad \text{where,}$$

$$\theta = (\sqrt{4mk-c^2})/m\ ,\ \tan\varphi = \frac{cw}{k-mw^2}\ ,\ A = \frac{F_0\cos\varphi}{k-mw^2} = \frac{F_0}{\sqrt{k^2+(c^2-2mk)w^2+m^2w4}} = \frac{F_0}{(k-mw^2)\cos\varphi+cw\sin\varphi} \quad \ldots\ldots\ldots\ldots(5)$$

When the System is subjected to Harmonic excitation, it is forced to vibrate at the same natural

Frequencies as that of the excitation and then, *a condition of Resonance* is encountered and (5) is $x = A.\sin(wt-\varphi)$ i.e. an Harmonic vibration with the same Period $T = 2\pi/w$, but with time hysteresis $T_H = \frac{\varphi}{w}$, or a difference in Phase, angle φ.

For, c, very small then then angle φ is small near zero, and for $w = \sqrt{k/m}$ or, $k = mw^2 = 0$ then $\tan\varphi = \infty$ and $\varphi = 90°$, and Force → $F_0.\sin wt$ is vibrated with Period $T_R = 2\pi\sqrt{\frac{m}{k}}$, and amplitude $A = F_0 / c\,w$, tends to zero for infinite $c = \infty$.

i.e. *In Material – point, Complex - Frequency - Response,* H(w), *which is an Energy-monad, is composed of the Real – part which represents the Granularity of Energy as Particle, and the Imaginary – part which represents,* at Response, *the Wave Energy - Pattern.*

The rotating axis, l = 2r = $K\mathbf{K_1}$ *in Material–point, creates the* Linear vibration of string, *l , which is in String* $K \equiv [\ominus] \leftrightarrow \mathbf{K_1} \equiv [\oplus]$, *and the Natural - frequency,* $f_n = \frac{(1+\sqrt{5}\,]).\sigma}{4\pi l}$ *in points* K, $\mathbf{K_1}$ *or, the* Rotational vibration Plan Energy *which is, The Spin as* $[K \equiv \ominus s^2 \circlearrowright \circlearrowleft \mathbf{K_1} \equiv \oplus s^2] \equiv \bar{\mathbf{B}}$.

Above relation of this Plane Work, is the Quantization in Geometry-Shapes, and becomes into the Plane – Stores of Anti-Space and, consists the Unification of Geometry – monads with those of the Energy monads, which Energy-monads is the Work in caves stored as Angular momentum $\bar{\mathbf{B}}$*, and Angular velocity Ellipsoids* $\bar{\mathbf{w}}$*. When* a *Frequency of Excitation coincides* with one of the *Natural - frequencies* of Material-Point then it is a condition of *Resonance* and encountered as above.

It was proved that Units = Monads, and they have their place in Spaces.

From the Second-order differential equation excited by a Harmonic external force , F_t sin wt, and is as,

$$m\frac{d^2x}{dt^2} + c\frac{dx}{dt} + k\,.\,x = F_t \sin wt$$

corresponds Physically to the free damped vibration , where x = the displacement , dx / dt = the velocity and d^2x / dt^2 = the acceleration of monad, m, c, k constants, with the general solution given by the equation

$$x = A.e^{s1.t} + B.e^{s2.t} + X\sin(wt-\varphi) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

In Electromagnetism, *Change*, say a Space-monad is → *a Resonance which can occur in the RLC circuit*, where *Resistance* R, is the change in current amount *it is the converter of current*, *Inductance* L , is like mass or Inertia in Mechanical systems which store the Magnetic–energy and, *Capacitance* C, concentrates (±) charge which store the Electric–energy in much the same way that springs store mechanical energy *inverse spring constant*, is the analogous n Mechanics.

The differential equation excited by a Harmonic Electromotive force, $E_t.\sin wt$, in an RLC circuit, oscillating at its natural frequency is as,

$$\text{Equation} \rightarrow \quad L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{1}{C}q = E_t \sin wt\ .$$

Corresponds physically to the free damped vibration, where Charge q = is the physical property of matter that causes it to experience a force which can be positive or negative, dq / dt = the least quantized amount of

charge and d^2q / dt^2 = the space distribution of charge, and L, R, C Inductance, Resistance, Elasticity constants with general solution given by the equation

$$q = A.e^{s1.t} + B.e^{s2.t} + X \sin(wt-\varphi) \quad \ldots\ldots(2)$$

Equations (1) and (2) give the analogic relation of the *Classical mechanics* [Space position, x,] and the *Electromagnetism* [Quanta of energy ,q,] of *Storing and Removing of energy in Energy-Space* cosmos.

The distributed force is as $\mathbf{L_1}$-$\mathbf{L_2}$ = L (di/dt), $\mathbf{R_1}$-$\mathbf{R_2}$ = R . i, $\mathbf{C_1}$-$\mathbf{C_2}$ = q / C, respectively, showing the Identification of the Mechanical and Physical laws.

The way that *Potential-Energy is stored*, is that of Material-LRC-Circuit, which is for the Gravitational-Potential-Energy the *Material-Capacitor* or the →*Focus-Planet–Sector-Stores-change* ← which develop a voltage in response to that charge. The coil of wire is the infinite Stationary-Dipole-Spinning Material-Points of this → *Focus-Planet-Sector* ← which develops the back-emf, when the current through them changes.

Conservation of Energy in an, *Free-vibration Un-damped System,* Energy is partly kinetic T (*stored in the mass by virtue of its velocity and for mass-less in wavelength -velocity –vector* λ) and partly potential U, (*stored in the form of Strain-energy in Elastic Deformation of work done in a force field*),and is Quantized as the motion in λ, in n, lobes as frequencies

$$\mathbf{f_1} = \frac{(1+\sqrt{5}\,])\,.\sigma}{4\pi r} = \frac{E}{h} = \frac{W}{h},$$

Total Energy {*in*, λ, *massless* n *loops*}→ W = $[\frac{4\pi r^2 f1}{3}]$ .n.(n+1) where n = 1,2,3,4 .. n ... ∞

The principle of virtual work states that, in an equilibrium system under the action of a set of forces is given a virtual displacement, the virtual work done by the forces will be zero.

Coulomb damping results from the sliding of two dry surfaces where dumping force is equal to the product of the normal force and the coefficient of friction, μ, independent and opposite of the velocity valuing only for half-cycle intervals. Viscous damping force $\mathbf{F_d}$ determines an decay of amplitude X_2-X_1 = 4.$\mathbf{F_d}$/ k and the frequency of oscillation $\mathbf{w_n}$= √ k/m equal to that of the Un-damped system, and in case of two masses with stiffness k1, k2 then k = k1+k2.

From above implies that, *Vibration on a system taking place under the excitation of External-forces*, which *excitation is Oscillatory*, then the System is *Forced to vibrate at the excitation frequency*.

If the frequency of excitation coincides with one of *the Natural-frequencies* $\mathbf{f_{N=1}}$*of the System* S, then exists a condition of *Resonance*, i.e. Oscillatory-Excitation → $\mathbf{f_R}$ [S ≡ $\mathbf{f_{1=N}}$, $\mathbf{f_2}$, $\mathbf{f_3}$,$\mathbf{f_R}$] ← and $\mathbf{f_R} \equiv \mathbf{f_N}$.

For the Un-damped free-vibration, the System S, will vibrate at the Natural-frequency. However, in the N-DOF, the System not only vibrates at a certain natural-frequency but also with a certain natural-displacement –configuration. Moreover, there are as many Natural-frequencies and associated natural configurations as the number of DOF of the system, the natural modes of vibrations.

The equations of motion for the *Un-damped* N-DOF *System* is written as M.$\mathbf{\ddot{x}}$ (t) + K$\mathbf{x_{(t)}}$= 0 for initial conditions x(0) = $\mathbf{x_o}$ and$\mathbf{\dot{x}}$(0) =$\mathbf{x\dot{o}}$, where x(t) is the Displacement-Vector, M is the Inertia-matrix , and K is the Stiffness-matrix and the general solution is of Eigenvalue-equation

$$[-w^2M + K]\, u.\mathbf{e^{iwt}} = 0 \quad \ldots\ldots(m)$$

where u , is the constant scalar displacement-vector and w = 2*π*f, the frequency of the system.

The solution of the above equation determines the *Real or Complex numbers*, $\boldsymbol{\lambda_1}$, $\boldsymbol{\lambda_2}$, … $\boldsymbol{\lambda_n} = \mathbf{w}^2$, called *Eigenvalues*, which satisfy the *Characteristic equation* det K=[A-λI] x = [A-w^2I] x = 0 where x, is the eigenvector associated with the eigenvalues λ = w^2 , and the corresponding Non-zero vectors.

Equation (m) when applied *in Material-point* where stiffness K = 0 then $w^2M \neq 0$, is the complex mass equal to m = w^2J = w^2.($\pi\mathbf{r^4}$/2) =(w^2/2).π $r^2\mathbf{v^2}$/w^2 = (π r^2/2) $\mathbf{v^2}$ of the Vibrating cave r.

Remarks

1. In any material System S, *with any N-Net-Configuration* , in all levels is formed a Stationary equation containing the *M Inertial-matrix of Configuration*, and the *K Stiffness-matrix*.
2. The Characteristic matrix K = [A – λ I] and its Characteristic Determinant, det K = 0 produces a Characteristic polynomial with powers of, λup to $\boldsymbol{\lambda}^{\mathbf{n}}$, and therefore when it set equal to zero has , n , roots called eigenvalues, and factorized in the form (λ - $\boldsymbol{\lambda_1}$).(λ-$\boldsymbol{\lambda_2}$) … (λ-$\boldsymbol{\lambda_n}$) = 0 and for λ = 0 then → detA = $\boldsymbol{\lambda_1}$. $\boldsymbol{\lambda_2}$ … $\boldsymbol{\lambda_n}$= 0
3. The Operator associated with Energy is Euler`s or Lagrangian and the Operator on the Wave-function is Laplace or Lagrangian equation.

4. In case of an Energy-Rim issues the *Stability of Equilibrium*, $\frac{dy}{dx} = \frac{dv}{du}$, where x,y ≡ Space and u,v ≡ Energy ≡ motion and for very small velocities u, v then Characteristic matrix K = [A – λ I] and its Characteristic Determinant, det K = 0, which produces equations u = $\mathbf{u_1}.e^{\lambda 1.t} + \mathbf{u_2}.e^{\lambda 1.t}$, v = $\mathbf{v_1}.e^{\lambda 1.t} + \mathbf{v_2}.e^{\lambda 1.t}$ dependent on the one eigenvalue only , i.e.

In Energy-Rims motion is either Oscillatory or Aperiodic, for Stable –Systems. This happens in Atom and Orbit-Rims, in microcosm and macrocosm.

5. Since Material Point is quaternion composed of*the In-Box*, the Storage $\mathbf{B_P}$=ras[r ≡ cT≡ EM-R≡ $\mathbf{f_{1=N}}, \mathbf{f_2}, \mathbf{f_3}, \mathbf{f_D}, , \mathbf{f_n}$], *the Outer-Box*, as the Electromagnetic Radiation which is the Conveyer of energy-cave r, with the minimum Resonance-Golden-ratio-frequency $\mathbf{f_R} = \mathbf{f_1}$, when collides with another Material Point, *or with another Particle or particles*, then Produces another monad which is a New quaternion and the first continuous to be of the same Identity, *frequency* $\mathbf{f_n}$, as before i.e. Resonance occurs between the fundamental frequencies of the colliders and *is adjusted in Photon*.

The Frequency of Photon, embodied with the Golden-ratio-pattern Φ, Uses the Vibrating Physical Structures, *the Granular Material-Instruments*, *to Kick - Start current* through Storage $\mathbf{B_P}$.

Systems with N-DOF, Degrees of Freedom:

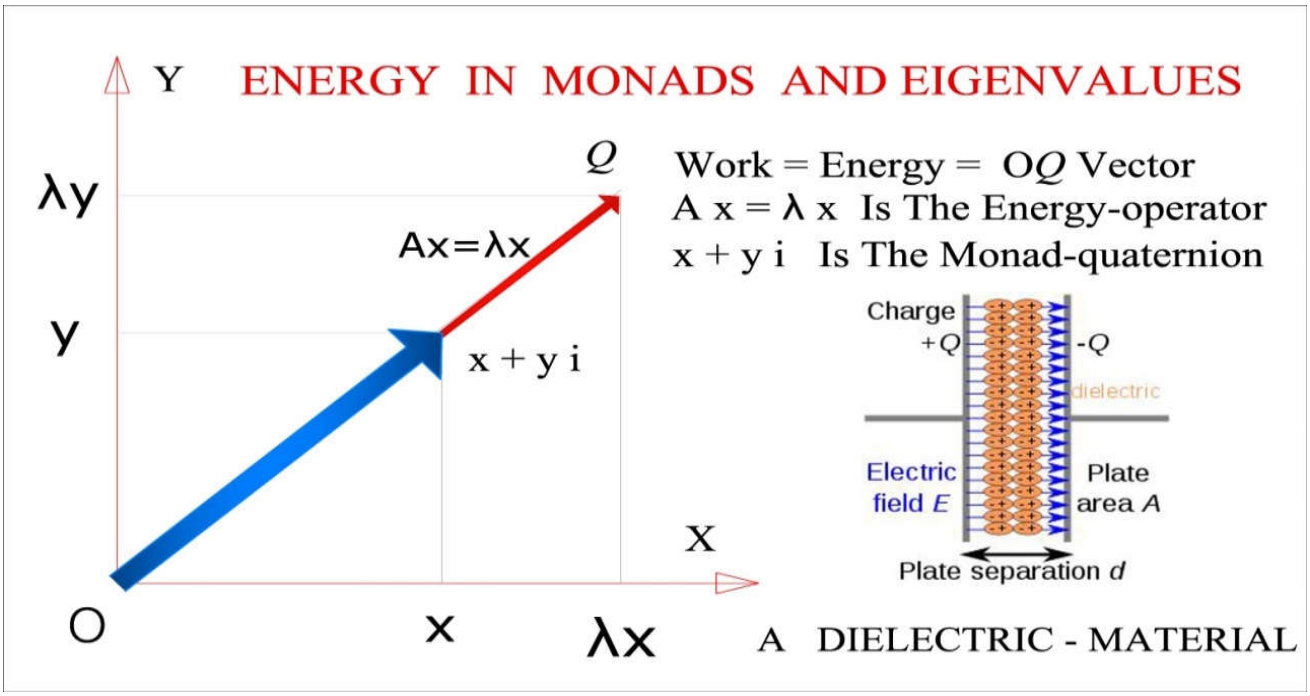


Figure 19: The Eigen values λ, in Energy monads

a. Monad is Quaternion [x + iy] and Energy the Vector $\mathbf{O\vec{Q}} = \{\lambda\}.X$
b. Energy is the Work produced in monads and equal to W =2L = $\bar{\mathbf{B}}.\bar{\mathbf{w}}$= J . w²
c. The Configuration of a Stationary-System is expressed by the matrices M.$\ddot{\mathbf{x}}$ (t) + K$\mathbf{x_{(t)}}$= 0
d. The Characteristic matrix K = [A – λ I] gives the, n , roots such that det. A = $\boldsymbol{\lambda_1}.\boldsymbol{\lambda_2}$ ..$\boldsymbol{\lambda_n}$= 0
e. Energy in Store 2λ= r = h/p ≡[$\mathbf{f_1}, \mathbf{f_2}, \mathbf{f_n}$≡ n lobes] follows the *Stationary-Wave-Nodes-Principle*.
f. Dielectric-medium is an Electric-Insulator that is Polarized by an , *applied or internal*, Electric-field.
g. Matrix A acts by stretching the vector X , *not changing its direction* , so X is an eigenvector of A.

Reorientation of Spin creates a New Nutation-Period $\mathbf{f_N} = n\frac{(1+\sqrt{5})\sigma}{4\pi r} = \frac{n.\bar{B}}{4\pi r^2}$ and New wavelength $\boldsymbol{\lambda_N} = \frac{2\,r}{n}$

The Energy-method overcame the difficulties of the Vector-method , but in terms of physical-coordinates is limited to single-DOF Systems. The Virtual-work-method is a powerful tool for Systems of higher DOF, however it is not entirely a scalar procedure in that vector consideration of forces necessary in the determining the Virtual-work.

Lagrange`s formulation is an entirely Scalar procedure starting from the scalar quantities of the Kinetic energy T = T($\boldsymbol{q_1}, \boldsymbol{q_2}, \boldsymbol{q_N}$ .. $\dot{\mathbf{q}}_1$, $\dot{\mathbf{q}}_2$, $\dot{\mathbf{q}}_3$, Potential energy U($\boldsymbol{q_1}, \boldsymbol{q_2}, \boldsymbol{q_N}$) , and *Work expressed in terms of Generalized-coordinates* as Lagrange- equation,

$$\frac{d}{dt}\left(\frac{\partial T}{\partial \dot{q}_i}\right) - \frac{\partial T}{\partial q_i} + \frac{\partial U}{\partial q_i} = \mathbf{Q_i} \quad \text{...(1)}$$

The left side of (1)

when summed for all the q_i, is a statement of the Principle of conservation of energy and is equivalent to d(T+U) = 0 . The right side of (1) results from dividing the work term in the dynamical relationship dT = dW into the work done by the potential and non-potential forces as is → dT = d$\mathbf{W_P}$ + d$\mathbf{W_{nP}}$ ← and thus Lagrange`s equation (1) is the q_i component of the energy equation d(T+U) = $\mathbf{\delta W_{nP}}$. The right side of this equation is as

$$\delta W = \sum \mathbf{Qi.\delta q_i} = \mathbf{Q_1 \delta q_1} + \mathbf{Q_2 \delta q_2} + \ldots ,$$

where$\mathbf{Q_i}$ is the Generalized-force .

Quantity $\mathbf{Q_i}$ can have Any-unit as, *Unit of forces, of Geometry, of Physical-coordinates*, *of motion,* and everything that can be considered as Work becoming from relation $\mathbf{Q_i \delta q_i}$.

In mechanics, the eigenvalues of a system are found from the roots of the polynomial equation obtained from the *Characteristic Determinant*. Each of the roots, *or eigenvalues*, is substituted, one at a time, into the equations of motion to determine the mode-shape, *or eigenvectors*, of the System . Fig-18

The Geometry and Physical Configuration-Structure of the Energy - Systems.

A. The Point-Line-Plane-Volume : E-Geometry : (1). (2).. (3)∴ ⁘(4)
B. The Material-Point : M-Point : [⊕↻↺⊖] , | ⊖↔⊕ |
C. The Material-Point-Spaces : M-Geometry : $\mathbf{f_R}$ [S ≡ $\mathbf{f_{1=N}}$, $\mathbf{f_2}$, $\mathbf{f_2}$,$\mathbf{f_R}$] ← $\mathbf{f_R}$ ≡$\mathbf{f_N}$.
D. The Forced-Nodes -Structure : Mechanics : [-λ M + K] X= 0 , [$\bar{\mathbf{A}}$ – λ I] Y= 0 , λ = w²
E. The Valence-Bond-Particles : Chemistry : ® ® ® ʘ®®☼ʘ ʘθ ʘʘ ® θ® ® (® ® above and below)

In Euclidean-Geometry are shown the different Stationary-Shapes that Points maybe formatted.
The Points on Shapes are called *Vertices*. Fig-14.
In Material-Point are shown the two Stationary-Shapes that Material-Points maybe formatted.
The Points on Shapes are called *Spaces,* ⊕, *Anti-spaces,* ⊖, or (+), (-) charge. $\mathbf{B_P}$
In Material-Geometry are shown the different Stationary-Shapes that Material-Points maybe formatted.
The Points on Shapes are called *Spaces,* ⊕, *Anti-spaces,* ⊖, or (+), (-) charge and consist a system.

In Mechanics are shown the modes of Non-stationary-Shapes in General-coordinates equal in number to degrees of freedom of the system, and by using Energy-Equation of motion is converted to the Standard –eigen value-form. $\mathbf{f_R}$ [$\mathbf{B_P}$ ≡ $\mathbf{f_{1=N}}$, $\mathbf{f_2}$, $\mathbf{f_2}$,$\mathbf{f_n}$] ← and $\mathbf{f_R}$ ≡$\mathbf{f_N}$.

The Points on Shapes are characterized with the *Degrees of freedom,* which are, Loaded or Unloaded.

In Chemistry are shown the different, Stationary or Non-stationary-Shapes of Elementary-Particles Atoms, Ions, Molecules, Crystals, etc. and Compounds, placed with their Chemical-Bonds, that maybe formatted. The Points on mode-Shapes are in *each-State* the System of *Atoms-Ions-Molecules-etc.,* which are, Loaded or Unloaded.

All above Configuration-Structures Are *under a Common-Relationship, that of* Resonance. *i.e.*

a. On a System, z, which is Quaternion z ≡ $\mathbf{s} + \bar{\mathbf{v}}\nabla\mathbf{i}$, ACTING, another Quaternion z` ≡ $\mathbf{s}$` + $\bar{\mathbf{v}}\nabla\mathbf{i}$ with Real and Imaginary parts, OCCURS *a Relationship*, *a Resonance*, between them, and is described by their common *Natural-frequency* $\mathbf{f_N}$, while motion in response to *Imaginary parts*. *At Resonance the Real - Part is Zero, and the Response is given by the Imaginary – Part only.*
b. Since monads are of Quaternion and of Wave-nature-Pattern Resistance of change is the mass, i.e. a *Measure of any Reaction to motions* and of, *Real* and of *Imaginary Part* as $\mathbf{R_z} = \mathbf{R_s} + \mathbf{R_{\bar{v}}}$.

If the Reaction to motions $\mathbf{R_z}$ causes losses from cycle to cycle then is due to Damping.
Damping is of great importance in limiting the amplitude of oscillation at resonance.

Reaction to motion, In Mechanics and Physics, is the mass or the Inertia, In-Electricity is the Inductance in electric circuit, In Material-point m $=\frac{2}{c^2}$ (wr)³ = $\frac{\mathbf{h.w}}{\mathbf{2\pi.c^2}} \equiv \frac{\mathbf{2E}}{a_a} \equiv [\frac{\bar{\mathbf{B}}.\bar{\mathbf{w}}}{\bar{\mathbf{B}}\mathbf{x}\bar{\mathbf{w}}}]$.J= $[\frac{\boldsymbol{\pi}\mathbf{r}^2}{2}].\mathbf{v^2}$

Since also monads are internally as the, *Storage-modes* $\mathbf{f_n}$, therefore Systems are able to *Store* and easily to *Transfer* energy between two or more Storage-modes.

In Material-point, *M-Point - Resonance* occurs on Material-point when placed in a uniform Magnetic Field. Its energy E = W = $[\frac{4\pi r^2}{3}].\mathbf{f_n}$= n$\frac{(1+\sqrt{5}).\sigma r}{3}$= 2L = $\bar{\mathbf{B}}.\bar{\mathbf{w}}$= J.w² is split into the, n, finite numbers of Energy-lobes dependent on the angular-momentum-vector $\bar{\mathbf{B}}$ ≡ Spin. Reorientation of Spin creates a New Nutation-Period $\mathbf{f_N}$= n$\frac{(1+\sqrt{5})\sigma}{4\pi r}$ as in Fig-3. and a New wavelength $\boldsymbol{\lambda}_\mathbf{N} = \frac{\mathbf{2\,r}}{\mathbf{n}}$, where λ = 2r.

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Since frequency $\mathbf{f_N} = n\frac{(1+\sqrt{5})\sigma}{4\pi r} = \frac{\lambda_N}{c}$, then $\boldsymbol{\lambda_N} = \frac{n\sigma c\,(1+\sqrt{5})}{4\,\pi\,r} = \frac{3\,c}{nr\sigma\bar{B}}$ which is the New wavelength.

If Material-point is ticked with a field of another frequency then is unlikely to transition only-when acquire a common frequency $\mathbf{f_T}$. This common Transition-frequency is the *M-Point-Resonance*.

In Mechanics, *Resonance* occurs in a Mechanical-System, under the EXCITATION of an Oscillatory-System. If the frequency of excitation coincides with one of the natural-frequencies of the system, a condition of Resonance is encountered. Vibrating Systems are all subject to damping because energy is dissipated by the resistances of motion.

In Physics, *Physical – Resonance* occurs in a Physical-System when another Vibrating - system or external forces DRIVE the System to oscillate with greater amplitude at specific frequencies called Resonance-frequencies. This property is found in Orbits either in Atoms, or in Universe.

In Electricity, *Electrical-Resonance* occurs in an Electric-circuit, Resistor [R], Inductor [L], Capacitor [C] at a particular, *Resonant – frequency*, when the Imaginary-parts of Impedance Z = R + i X of the circuit elements cancel each other.

In Medicine, *MRI-Medicine-Resonance* occurs between the Nucleus, *of the Two-Hydrogen-atoms in water-molecules*, consisted of a single Proton and when *excited by an Strong-Magnetic-field* then is twisting its orientation so that aligned with the field. Proton all by itself may absorb and reemit 900 MHz photons, but when it gets near other charges it gets twisted and distorted and its Resonance frequency is shifting to 906 MHz. This means that MRI Machine maybe used to generate Spectra corresponding to the amount of Resonance at various frequencies and which in turn reveals the details of the structure of molecules. Newton`s, First-Law states that, *Any change in vector* $\bar{\mathbf{v}}$*, to motion or direction* $\mathbf{d}\bar{\mathbf{v}}$*, involves acceleration* a=F/m =2S/t², or E=F.dS=(ma).d(at²/2) = m.a²t dt, i.e. *Resonance* $\mathbf{w^2_R} \cong$ *acceleration* $\bar{\mathbf{a}}_\mathbf{R}$

In Momentum-Paradox of light, MP-*Light-Resonance* occurs, when the Photon as a System, S, as {[$\mathbf{B_P} \equiv$ EM-R $\equiv \mathbf{f_{1=N}}, \mathbf{f_2}, \mathbf{f_3}, \mathbf{f_D}, , \mathbf{f_n}$] and $\boldsymbol{\lambda_N} = \frac{\sigma.(1+\sqrt{5})}{4\pi r} = \frac{n\,.\bar{B}}{4\pi r^2}$}, *and which is a moving Energy-tank as EM-Radiation and,* DRIVES the System of the Dielectric-Medium [$\mathbf{S_D} \equiv \mathbf{f_D}$] to oscillate with a common amplitude, *the Dielectric-Polarization frequency* $\mathbf{f_D}$, with a → New-mass Density-Wave, becoming from *the Reaction to the New Reorientation of Spin*. It was proved that when Spin = $\bar{\mathbf{B}}$ vector changes direction, then frequency is between [$\mathbf{f_1}$,..,$\mathbf{f_n}$] and becomes another Particle.

A light-Pulse, Driven forward, in a sort of Optoelestic shock-wave, E.M-R ≡ $\mathbf{f_{1=N}}, \mathbf{f_2}, \mathbf{f_3}, \mathbf{f_R}, , , , , \mathbf{f_n}$, *Electromagnetic-Radiation*, then Photon`s momentum $\bar{\mathbf{B}} = \frac{r\sigma.(1+\sqrt{5})}{n} = [\frac{\sigma.(1+\sqrt{5})}{2}]\,\frac{2r}{n} = \mathbf{v_R}.\frac{2r}{n} = \frac{2rc}{n.N_R}$ i.e. *Photon`s momentum* follows the Inverse-dependence of *Radiation-pressure* on the *Refractive-Index*, and since also Momentum $\bar{\mathbf{B}} = \frac{(1+\sqrt{5})}{2}[\frac{2\sigma r}{n}]$, then follows the *Golden-ratio-Momentum* in all nature.

In Gravity which is a Potential-energy with binder Energy-Field [∇i], *the called Gravity force without Vibration but only local rotation*, *Gravity-Resonance* occurs in any Material-Point, *as the Photons is*, when collides with one of the { [± s²] Spin-constituent in MFMF} – Field*, and say this is an Energy - Vector Resonance,* because happens axially on Spin-Vector.

In Orbits which are Negative – Energy-Rims with binder Energy the atraction between the opposite forces $\mathbf{P_A} \leftrightarrow \mathbf{P_B}$ at points A,B, is created the Central motion where, *Orbital-Resonance*, are the Plane Surfaces, representing a Constant-Energy-Rim followingthe Celestial Kepler Laws, *and say this as an Plane-Energy-Resonance,* because happens in-Plane and on Energy-Field-vectors → the Spin $\bar{\mathbf{B}}$.

In Figure. 8-11- are shown the Ellipse-Orbits,1=c.$\mathbf{f_n}^2$.r³, with their content which is The Spin-Field-vectors $\bar{\mathbf{B}}$ in all area *π*ab of MFMF field. During orbiting centripetal-acceleration $\bar{\mathbf{a}}_\mathbf{P} = \sigma = \pm\frac{4\pi r}{(1+\sqrt{5})}.\mathbf{f}$ i.e. *Orbit is subject to a Mechanical-stress,* σ*, becoming from the Centripetal-acceleration* $\bar{\mathbf{a}}_\mathbf{P}$, therefore *is appeared the* Piezoelectric-effect with Positive-charge *at the Nucleus* and Negative-charge *at the Planet* ≡ Material-point. The two faces at N, P *are connected by the in-between Gravity-field*[∇i] =[± s²] in[MFMF] Field *so flows Current which is the Resonance on Orbit*. In the *Inverse* Piezoelectric-effect on Orbit , *when a voltage is applied across its opposite* faces at N,P becoming from the[⊕↔⊖] stretching then Orbit becomes mechanically stressed and *Deformed in Shape by the Resonance at* N,P.

From above, motion needs the Granular-Gravity-field [∇i]to make a circuit in Orbit tiny Battery.

In Atoms Negative-Energy-Rims are the *Energy-Plane-Field-vectors* the *Rims*, so that at focus the Proton and at Orbits the electron or electrons , *to follow the Central motion*, and motion conserved.

The Energy, *is motion*, is transformed into *velocity vectors*, *the moving Energy-tank in wavelength* $\boldsymbol{\lambda_N} = \frac{2\,r}{n}$, and the Velocity vector, $\bar{\mathbf{v}}\mathbf{i}$, to a *Field-Vector*,$\boldsymbol{\nabla}.\bar{\mathbf{v}}\mathbf{i}$, *which is the Stationary Surface of the Motion in Orbit*, because follows the *Extrem a Principle*, as Figures - 12 -17 - 18 -

c) *The Energy Dissipated by Damping*

Energy dissipated by damping, is the amount of loss of energy from the oscillatory system which results in the decay of amplitude of free vibration determined under conditions of cyclic oscillations.

It was shown before that Energy dissipated per cycle (x) in Material point is,

$\mathbf{W_d} = \oint \mathbf{c\dot{x}.dx} = \oint \mathbf{c\dot{x}^2.dt} =$ cw²x²$\oint \mathbf{c\dot{x}.dx} \int_0^{2\pi/w} \mathbf{\cos^2(wt-\varphi)dt}$ where,

w = $\sqrt{\mathbf{k/m}}$ = the circular velocity per circle $\mathbf{\sin^2(wt-\varphi)}$,

c = $2\zeta\sqrt{\mathbf{km}}$= the linear velocity per circle, and at Resonance

$$\mathbf{W_d} = 2\zeta\,\pi kx^2 \quad \text{.....(a)}$$

Writing the velocity in the form $\dot{\mathbf{x}}$ = wX $\mathbf{\cos(wt-\varphi)}$= ±wX $\sqrt{\mathbf{1-\sin^2(wt-\varphi)}}$= ±w$\sqrt{\mathbf{X^2-x^2}}$ the damping force becomes

$$\mathbf{F_d} = c\dot{\mathbf{x}} = \pm w\sqrt{\mathbf{X^2-x^2}} \quad \text{.....(b)}$$

and by rearranging (b) then,

$$[\tfrac{\mathbf{F_d}}{\mathbf{cwx}}]^2 + [\tfrac{\mathbf{x}}{\mathbf{X}}]^2 = 1 \quad \text{.....(c)}$$

Equation (c) is an ellipse with $\mathbf{F_d}$ and x, plotted along the Vertical and Horizontal axis respectively and the Energy dissipated per cycle is the area enclosed by the ellipse.

In material point $\mathbf{W_d} = 2\zeta\,\pi kx^2 = 8.k\zeta(\pi r^2) = 8.k\zeta\mathbf{A_c}$ where $\mathbf{A_c}$= The area of the cave, *Golden-ratio Energy* $E = h.f = \frac{\mathbf{h(1+\sqrt{5}\,])}}{\mathbf{4\pi}}.[\frac{\sigma}{r}] = \mathbf{W_d} = 8.k\zeta\mathbf{A_c}$, *where* h = Planck`s constant, k = Stiffness in N/m.

The force displacement curve, *the Stress-common-curve*, will enclose an area, *hysteresis loop*, that is proportional to the Energy lost per cycle. Considering the simplest case of energy dissipation, *that of a spring-mass system with viscous damping*, then is → Damping force

$$\mathbf{F_d} = c.\dot{\mathbf{x}} = \pm\, c.w.\sqrt{\mathbf{A^2-x^2}} \quad \text{.....(a)}$$

with steady-state displacement, x, and velocity $\dot{\mathbf{x}}$, natural frequency $\mathbf{w_n} = \sqrt{\mathbf{k/m}}$, and the constant $c = 2\zeta\sqrt{\mathbf{k/m}} = 2\zeta\mathbf{w_n}$,where ζ = the dumping ratio,

For A = maximum amplitude, then Dumping Force is graphically represented as $[\mathbf{F_d}/\text{ c.w.A}]^2+[x/A]^2 = 1$, i.e. an Ellipse with $\mathbf{F_d}$, x, plotted in vertical and horizontal axis of velocity vector and equal to the area enclosed by the ellipse, and if added to $\mathbf{F_d}$ the force, k.x, of the lossless spring (pressure) then the +hysteresis loop is rotated through $\mathbf{F_d}$ axis. (Voigt model). Quantized Energy is the enclosed by ellipse.

In Material point of cave r = λ/2 , and since $\dot{\mathbf{x}}$ = w.r → w = $\dot{\mathbf{x}}$/r then *Golden ratio Damping-Force* is,

$$\mathbf{F_d} = c.\dot{\mathbf{x}} = 1m.\mathbf{w_n}.\dot{\mathbf{x}} = 1.[\,(\pi r^2/2)\,\mathbf{v^2}].\frac{\dot{\mathbf{x}}^2}{r} = [\frac{\pi r v^4}{2}] = g = \frac{2}{r}(\,\sigma\,[1+\sqrt{5}\,])^2 = \frac{4\sigma^2}{r}[\,3+\sqrt{5}\,] \quad \text{.....(b)}$$

This dissipation of energy is determined under conditions of cyclic oscillations, and dependent on Gluebond σ, and r, cave. Since r, is in denominator then for the very small caves, *the under Planck`s caves*, Damping-Force becomes infinite independently of Glue-bond. This may be considered as a type of *Black hole* as this happens in algebra inverse fractions. For Planck level r = 4,453.$\mathbf{10^{-35}}$ then *Damping – Force*

$$\mathbf{F_d} = \frac{4\sigma^2}{4{,}453.10^{-35}}[3+\sqrt{5}\,] = 4{,}7.\mathbf{10}^{35}\ \text{N} = [\,\text{Kg.m/s}^2].$$

From relation $[\frac{\pi r v^4}{2}] = 4{,}7.\mathbf{10}^{35}$results a velocity v = 2,8630656.$\mathbf{10}^{17}$ m/sec, squared that of light.

d) *The Sharpness of Resonance*

The sharpness of resonance is a quantity Q, related to damping and by assuming viscous damping then start with equation (3a) where for $\frac{w}{w_n} = 1$, the Resonant amplitude is $\mathbf{X_{res}} = (\mathbf{F_o/k})\,/\,2\zeta$.

We seek the two frequencies on either side of Resonance, *the sidebands*, where exist the half-power points $[0{,}707\boldsymbol{X}_{res}]^2 = X^2$. By squaring (3a) then → $\frac{1}{2}[\frac{1}{2\zeta}]^2 = \frac{1}{[1-(\frac{w}{w_n})^2]^2+(2\zeta\frac{w}{w_n})^2}$, or equation $\left(\frac{w}{w_n}\right)^4 - 2(1-2\zeta^2)\left(\frac{w}{w_n}\right)^2 + (1-8\zeta^2) = 0$ and by solving for $\left(\frac{w}{w_n}\right)^2$ then $\left(\frac{w}{w_n}\right)^2 = (\,1-2\zeta^2\,) \pm 2\zeta.\sqrt{\mathbf{1-\zeta^2}}$ and by assuming $\zeta < 1$ and neglecting higher –order terms of ζ, then → $\left(\frac{w}{w_n}\right)^2 = 1 \pm 2\zeta$ .....(6)

Letting the two frequencies corresponding to the roots of equation (6) be $\mathbf{w_1}$ and $\mathbf{w_2}$ we obtain

$4\zeta = \frac{w_2^2 - w_1^2}{w_n^2} \equiv 2\left[\frac{w_2 - w_1}{w_n}\right]$ and quantity Q is defined as $\rightarrow Q = \frac{w_n}{w_2 - w_1} = \frac{f_n}{f_2 - f_1} = \frac{1}{2\zeta}$ .....(7)

Remarks:

1. Resonance is the phenomenon in which a *Vibrating-System* (1)*or External-force*, Drives *another-system* (2) to oscillate with greater amplitude at specific frequencies. This is a way of Energy-penetration in a system by using the *Golden ratio frequencies*.
2. It is the Mechanism by which virtually all Sinusoidal-Waves and Vibrations are generated. The Sounds we hear by strucking on, *metal glass or wood*, are caused by brief resonant vibrations in the object. *Light and other short wavelength Electromagnetic-Radiation* is produced by Resonance on an atomic scale such as electrons in atoms. *Photon*, which is, *Material Point*, and of the Eternal Rotation of (+) Opposite around (-) Opposite, due to Centifugal and Centripetal Glue-Bond Principal stresses $\pm\boldsymbol{\sigma}$, *creates in Primary and in caves which are Standing waves as Resonance phenomenon,* the *Golden-Angular-momentum-vector* being Identical to the Spin of Particles and which is trapped in caves`s loops always being in Phase with each other. Their amplitude of Oscillation varies from Zero at Nodes to maxima at Antinodes. In two dimensions reasoning antinodes, the six simple modes of vibration are of plus and minus signs, so shows the Phase of antinodes at a particular instant. The N *loops are*, the N, *Sub - Stores* created in the *Main-Store*, r, because Energy is this motion.
3. Increase of amplitude as damping decreases, and the frequency approaches Resonant - frequency of a driven damped simple harmonic oscillator.
4. When damping is small, the resonant frequency $\mathbf{f_r}$, is approximately equal to the natural frequency $\mathbf{f_n}$ of System $\mathbf{f_s}$ which is a frequency of unforced vibrations, or matches the system`s natural frequency. Energy is transferred by the wave-mechanism, *the Electromagnetic fields*, from one place to another, carrying, *the Energy-Storage*, the matter being transferred.
5. The sharpness of a Resonant System and of quantity Q, is dependent on amplitude $2\zeta = \mathbf{w_2} - \mathbf{w_1}$*i.e. in all cavities* of *Mechanical-material-systems in all levels*, on *Longitudinal and Transverse* modes in *Electricity* and circuits, in Optical cavities, in all Formations which are forming standing waves, to Particles as → *Position and configuration* ← in *Atomic nucleus and Dipoles*, in *Chemical bonding*, molecules and Crystals and in *Material Points*.
6. Stationary Interference happens when two *Wave-Sources are coherent*, i.e. when these have a constant Phase different , the same frequency and the same wave-form.
7. It was proved that in Material-point of a cave r, issues $(\bar{\boldsymbol{\rho}})^2 + (\bar{\mathbf{a}})^2 = (\bar{\mathbf{M}} = \mathbf{J_a})^2$, where $[\bar{\boldsymbol{\rho}}$= Energy-vector$]^2$ + [$\bar{\mathbf{a}}$= Space-vector $]^2$ = [Mass-meter $]^2$ or $s^2 + (iv)^2 = 1$ or → $s^2 - v^2 = 1$ or [Work ≡ Energy ≡ Torsional-momentum $]^2$ = [Moving-Space-Energy $]^2$ + [Rest-Space-Energy]^2 or [The Energy-vector $]^2$ = [The Space-vector $]^2$ +[The Mass-meter]^2, which is the Ellipsoid of motion and *a Cone relation* on where Total-energy, *Kinetic and Potential* is conserved and for Particle Photon *Electromagnetic-radiation* is the *Kinetic-energy* and Velocity-vector *The-Energy-tank* the Potential. Cone is the one of the only Four-Shapes of the allowed Conic-sections.

Power of a Free force

The Power developed by a free force $F = \mathbf{F_o}.\mathbf{sin(wt + \varphi)}$ acting on a displacement $x = \mathbf{X_o}.\ \mathbf{sin(wt)}$ where Power P is the rate of doing work, which is the product of the force, F, and velocity, $\bar{\mathbf{v}}$ = w.r, is Power $P = F(dx/dt) = (w.\mathbf{X_o}.\mathbf{F_o}).\mathbf{sin(wt + \varphi)}.\mathbf{cos(wt)} = (w.\mathbf{X_o}\mathbf{F_o}).[\cos\varphi.\sin wt.\cos wt + \sin\varphi.\cos^2 wt]$

$P = w.\mathbf{X_o}.\mathbf{F_o}/2\ [\sin\varphi + \mathbf{sin(wt + 2\varphi)}]$, where,

The first term is a constant, representing the steady flow of work per unit time.

The second term is a sine wave of twice the frequency which represents the fluctuation component of power, the average value of which is zero over any interval of time that is a multiple of the period.

The work W is found by the sinusoidal-equation → $W = \pi\ \mathbf{F_o}.\mathbf{X_o}.\mathbf{sin}\ \boldsymbol{\varphi}$.

In a cave, as electron of 2r = 3,56237. $\mathbf{10^{-14}}$m the period is $T = \frac{2\pi r}{c} = \frac{2\pi.3,56237.10^{-14}}{3.10^8} = 7,468.\mathbf{10^{-22}}$ s and for a force $\mathbf{F_o}$ = 1 N , displacement $\mathbf{10^{-14}}$m , Phase $\varphi = \pi/6$ Period T as above and the work done for a complete circle is → W = 2.1.3,56237. $\mathbf{10^{-14}}.\mathbf{sin}\ \mathbf{30^o}$ = 3,56237. $\mathbf{10^{-14}}$ N.m

Work in the second part is → $W = w.\mathbf{X_o}\mathbf{F_o}\ \boldsymbol{cos}\ \mathbf{30^o} \int_0^T \mathbf{sin\ \pi t}.\mathbf{cos\ \pi t}$.

e) Lagrange`s Equations

In reviewing the method of virtual work, the equation is $\delta W = \Sigma i[Fi.\delta\bar{r}i] = 0$ where Fi are applied forces excluding the constraint forces and internal forces of frictionless joints and $\delta\bar{\mathbf{r}}$i are the virtual displacements. By

including D`Alembert`s inertial forces – m.$\ddot{\mathbf{r}}$i, the procedure is extended to dynamical and problems by the equation $\delta W = \Sigma i[Fi - m\ddot{\mathbf{r}}i].\delta\bar{\mathbf{r}}i = 0$.

This equation leads to Lagrange`s equation when the displacement,$\bar{\mathbf{r}}$, is expressed in terms of the generalized coordinates. The difference between, $\delta\bar{\mathbf{r}}$i, and, d$\bar{\mathbf{r}}$i, takes place in the time, dt, whereas, $\delta\bar{\mathbf{r}}$i, is an arbitrary number that maybe equal to, d$\bar{\mathbf{r}}$i, but is assigned instantaneously irrespective of time, ensuring compatibility of displacement.

For kinetic Energy, E, as a function of the generalized coordinates displacements, x, and the generalized velocity, $\dot{\mathbf{x}}$i , whereas Potential energy, U, is a function of, x, is, $(d/dt)(\partial E/\partial\dot{\mathbf{x}}i) - (\partial E/\partial xi) + (\partial U/\partial xi) = 0$ and fori =1 and for a system without potential (U=0) then,

$$(d/dt)(\partial E/\partial\dot{\mathbf{x}}i) - (\partial E/\partial x) = 0 \qquad \text{.....(L1)}$$

Note: The elastic behavior of a system can be expressed in terms of stiffness, k, or the flexibility, $\mathbf{f}_{\boldsymbol{l}}$, as

Stiffness formulation:
Force, F = Stiffness, k, displacement ,x, and then F=k.x where[k=N/m]

Flexibility formulation:
Displacement, x, ={ Flexibility ,$\mathbf{f}_{\boldsymbol{l}}$ }. { force ,F,} → x = $\mathbf{f}_{\boldsymbol{l}}$.F and in measures [$\mathbf{f}_{\boldsymbol{l}}$ = m/N]

i. *Work*

Work ,W, by a force, F, exerted on an object which moves with distance times, dx, in the direction x-x of the force is W=F.dx, and in the special case of a constant force, the work maybe calculated by multiplying, the distance times dx . the component of force F.cos$\boldsymbol{\varphi}$ or W = (F.$\boldsymbol{\cos\varphi}$).dx.

Since the component F.$\boldsymbol{\cos\varphi}$ of force F when acting in the perpendicular direction y-y (dy⊥dx) of the motion x-x , produces zero work, therefore,

Work ,*as Kinetic Energy*, produced as *Stiffness,* k, in the dx Formulation , is stored in the perpendicular y-y direction as *Flexibility ,*$\mathbf{f}_{\boldsymbol{l}}$, in the, dy, Formulation.

The Analogues in Gravity

Work W by a constant force F=2(wr)^2, or by the constant velocity, c, exerted on an object [breakage (wr)^2] which moves with a distance times dx = |(wr)^2|, and because Surface is zero is calculated in two perpendicular Formulations (dx⊥dy) as,

Stiffness k = N/m → velocity vector$\mathbf{v_E}$ → Electric field E
Flexibility af= m/N→ velocity vector$\mathbf{v_P}$ → Magnetic field P

The why Energy, *the motion*, is transformed into velocity vector, *a moving wavelength* $\boldsymbol{\lambda}$, and velocity to a field, *a Stationary Surface motion*, is explained through *Extrema Principle*.

f) The Extremes Principle or Extrema

All Principles are holding on any Point A. For two points A, B not coinciding, exists Principle of Inequality which consists another quality. Any two points exist in their Position under one Principle, *Equality of Stability*,(*Virtual displacement which presupposes Work in a Restrain System*).[16-17].
This Equilibrium presupposeshomogenous Space and Symmetrical Anti-Space.

For two points A , B which coincide, exists the *Principle of Superposition* which is a Steady State containing Extrema for each point separately.

Extrema, for a *point* A is the Point, for a *straight line* the infinite points on opposite line , either these coincide or not or these are in infinite, and for *a Plane* the opposite infinite lines and points with all combinations and Symmetrical ones,
i.e. all Properties of Euclidean geometry, compactly exist in Extreme opposite, Points, Lines, Planes, circles by following anode or descend sequence.

Since Extreme is holding on Points, lines, Surfaces, Volumes, bodies etc., therefore all their compact Properties(*Principles of Equality, Arithmetic and Scalar, Geometric Segments and Vectors, the Proportionality, Qualitative, Quantities, Inequality, Perspectivity etc.*), exist also in the common opposite context *magnitude to direction*, therefore in Superposition the magnitude AB is equal and constant in both directions, or any other direction ≠ 0 , [|A,B| – P$\bar{\mathbf{A}}$, P$\bar{\mathbf{B}}$] i.e.

Any Segment $\overline{\mathbf{AB}}$ between two points A,B consist a Vector, described by the magnitude, |AB|, and directions $\overline{\mathbf{A}}$B , B$\overline{\mathbf{A}}$and in case of Superposition $\overline{\mathbf{A}}$A, A$\overline{\mathbf{A}}$, whereProperties of Vectors, Proportionality, Symmetry, etc.exist either on edges A,B, or on segment AB as →

A quantity to Anti-quantity, *a monad to Anti-monad*, and since it is either a scalar or a vector and by their distinct definitions which is, Scalars, are quantities that are fully described by a magnitude or numerical value alone in *Anti-Scalars*. *Energy*, which is motion to Anti-motion, i.e. to the Anti-trajectory.

According to Thales theorem , Figure - 5. 3, if two intersecting lines PA, PB are intersected by a pair of Parallels AB//A′B′ , then ratios PA/AA′ , PB/ BB′, PA/PA′ , PB/ PB′ of lines, or ratios in similar triangles PAB, PA′B′ are equal or ratio λ = [PA / AA′] = [PB / BB′]. In case line A′ B′ coincides with AB, then AA′ = AA ,BB′ = BB , i.e. exist Extreme and thenλ = [PA/AA] = [PB/BB], (the Principle of Superposition), where property of scalar exists on common segment AB.

Vectors are Imaginary quantities that are fully described by a constant magnitude and change direction in order to keep their constant numerical value or move to *Anti -Space*.

Strain ($\boldsymbol{\varepsilon}$) = change of length / length → It is the relative change in shape or size of an object due to externally-applied forces . Young modulus (E) = tensile stress / tensile Strain.

Stress (σ) = E. Strain = E.$\boldsymbol{\varepsilon}$, Strain = Stress / E = $\boldsymbol{\varepsilon}$ = $\boldsymbol{\varepsilon}$(u,v,w)

G = shear modulus = E.m2(m +1) where m= Poisson`s ratio = 1/μ = 10/3. [26-27]

In Elastic material Configuration, the Strain Energy is absorbed as Support Reactions and displacement field [$\nabla\boldsymbol{\varepsilon}$ ($\bar{\mathbf{u}}, \bar{\mathbf{v}}, \bar{\mathbf{w}}$)] upon the deformed placement, (where these alterations of shape by pressure or stress is the equilibrium state of the Configuration [26] , then equations of Elasticity are [22-23], G.$\nabla^2.\boldsymbol{\varepsilon}$ + [m G/(m-2)].∇[$\nabla.\boldsymbol{\varepsilon}$]= F) or in isotropic material [μ .$\nabla^2.\boldsymbol{\varepsilon}$ + (λ+μ).∇($\nabla.\boldsymbol{\varepsilon}$)] + F = 0].

In Central motion*, Extrema cases for Energy - Orbits are*,

From Ellipse to Parabola is as e → 1 where then *Energy from Negative becomes Zero*.

From Hyperbola to Parabola is as 1 ← e where then *Energy from Positive becomes Zero*.

From eccentricity e equation $e = \sqrt{\mathbf{1 + 2EL^2/G^2M^2m^3}}$, $e^2 - 1 = \frac{\mathbf{2E\,L^2}}{\mathbf{G^2M^2m^3}} = \frac{\mathbf{E\,k^2\,L^2}}{\mathbf{8\pi^4 m^3}} \equiv \frac{\mathbf{A\,L^2}}{\mathbf{GMm^2}} \equiv \frac{\mathbf{b^2}}{\mathbf{a^2}}$

During collision of Photon in [MFMF] with other Photons ,by means of Cross-Product is produced a constant Work , which is stored into the *Only-Four Geometrical-Energy-Shapes*, of the motion. The Geometrical energy shapes are the Plane-Orbits of Kepler-laws, denoting that *Macrocosm and Microcosm* Obey Newton`s Laws of motion in all Scales and consist the *Extreme-Energy-Shapes.*

For the Interior motion to be conserved, *is kept in its Wavelength-Tank* 2r = n λ, and for the Linear motion tobe conserved , *is kept in its Plane-Orbits* when continued by the Propagating Electromagnetic-Wave-conveyer . *Extrema Energy - Orbits help,* The Moving-Energy-Stores*, to enter the Zero-energy-Caves.*

g) The Volume and Surface, Extreme Plane stresses

A material is said to be under Plane stress if the stress-vector is zero across a particular surface, i.e. σ3 = 0 or σz = $\boldsymbol{\tau_{yz}}$ =$\boldsymbol{\tau_{xz}}$ = 0, a shearless case with Principal stresses only .

From mathematical theory of Elasticity a Surface ,S, under Pressure, p, due to a transverse force ,P, is p = P/S pervaded in all surface, and around surface and if force direction forms an angle θ, then the Principal stresses σ1,σ2 and Shear stresses $\boldsymbol{\tau_{12}}$areas,$\sigma = \sqrt{(\boldsymbol{\sigma 1 - \sigma 2})^2 + 4\,.\,\tau_{12}}$,$\boldsymbol{\tau_{12}}$

$$\sigma 1,2 = (\sigma 1 + \sigma 2)/2 \pm (\tfrac{1}{2})\sqrt{(\boldsymbol{\sigma 1 - \sigma 2})^2 + 4\,\tau_{yz}^2} \text{ and } \rightarrow \tan\theta = 2.\boldsymbol{\tau_{12}}/(\sigma 1 - \sigma 2) \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{(a)}$$

When surface becomes a point [*This is the Extreme case where surface is interchanged as line or line-segment, it is the same as the infinite small, ds, in Calculus*], then σ2 = 0 and $\boldsymbol{\tau_{12}}$ is very small i.e. a type of vanishing-shear due to layers laterally shifted.

Since force P is a vector, then as in cross-product to a right–handled coordinate system where exists σ2 = 0 and $\boldsymbol{\tau_{12}}$ = σ1, equation (a) becomes as *the Golden ratio of stresses* as (b) or

$$\sigma 1,2 = \sigma 1/2 \pm (\tfrac{1}{2}).\sqrt{\boldsymbol{\sigma 1^2 + 4.\sigma 1^2}} = \sigma 1.[\,1 \pm (\sqrt{5})]/2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(b)}$$

i.e. The Stress, σ, on a Point is manifested as σ = P / dS and as dS = 0 then is moving as → $\bar{\boldsymbol{\sigma}}$= P / [dS→0] and becomes $\bar{\boldsymbol{\sigma}}.\bar{\mathbf{v}}$ = *The Reaction to the motion*, as$\bar{\mathbf{v}}$ ≡*momentum* ≡m$\bar{\mathbf{v}}$.

Since Stationary force P exists independently of the acting area then for zero surface (*a point*) stresses P/S vanish, and *Stationary force* P becomes a *Moving force* $\bar{\mathbf{P}}$ and exists as momentum mv with m=1 (*Extreme hypothetical Reaction to the motion*), i.e. the velocity $\bar{\mathbf{v}}$at this point and which is decomposed in the two perpendicular velocities$\bar{\mathbf{v}}$1,$\bar{\mathbf{v}}$2, where then equation (b) is transformed as,

$\sigma 1 = \bar{\mathbf{v}}1 = (\sigma 1)/2\,(1+\sqrt{5})$ and $\sigma 2 = \bar{\mathbf{v}}2 = (\sigma 2)/2\,(1-\sqrt{5})$ .....(c)

$\sigma = P/dS = 0 \rightarrow \bar{\mathbf{P}} = m.\bar{\mathbf{a}} \rightarrow \bar{\mathbf{v}} = \{\bar{\mathbf{v}}1 \perp \bar{\mathbf{v}}2\} = \{\bar{\boldsymbol{\sigma}}1 \perp \bar{\boldsymbol{\sigma}}2\} =$ Constant, where,

$\bar{\mathbf{v}}1 \rightarrow$ represents the *Inward compressible* radial velocity and

$\bar{\mathbf{v}}2 = \bar{\mathbf{v}}1 \rightarrow$ represents the *Transverse Outward stretchable* radial velocity of point, *which is transformed into*,

$\sigma 1 \neq 0 \rightarrow$ representing the *Inward compressible* radial pressure

$\sigma 2 = \sigma 1 \rightarrow$ representing the *Transverse Outward stretchable* radial pressure of material point,

Since Principal-stresses $\bar{\boldsymbol{\sigma}}1$,$\bar{\boldsymbol{\sigma}}2$and Principal-velocities $\bar{\mathbf{v}}1$,$\bar{\mathbf{v}}2$ are perpendicular each other and both follow the vector rule $\{\bar{\mathbf{v}}1^2+\bar{\mathbf{v}}2^2\} = \{\bar{\boldsymbol{\sigma}}1^2+\bar{\boldsymbol{\sigma}}2^2\} = \pm 1$ then for their between angle $\varphi = 90^o$ issues,

1. $\bar{\boldsymbol{\sigma}}1 \neq 0$, $\bar{\boldsymbol{\sigma}}2 = 0$ and $\bar{\boldsymbol{\sigma}}1^2 = \pm 1$, $\bar{\boldsymbol{\sigma}}1 = 0$, $\bar{\boldsymbol{\sigma}}2 \neq 0$ and $\bar{\boldsymbol{\sigma}}2^2 = \pm 1$
2. $\bar{\mathbf{v}}1 \neq 0$, $\bar{\mathbf{v}}2 = 0$ and $\bar{\mathbf{v}}1^2 = \pm 1$, $\bar{\mathbf{v}}1 = 0$, $\bar{\mathbf{v}}2 \neq 0$ and$\bar{\mathbf{v}}2^2 = \pm 1$ and since velocities in a medium can be expressed by their Stiffness $\mathbf{k_x}, \mathbf{k_y}$ in solids, Permittivity-Permeability$\boldsymbol{\varepsilon_o}, \boldsymbol{\mu_o}$ in Electromagnetism mass m in Newton`s change of velocity, Generalized mass and Stiffness M, Kin Eigenvector-Dynamics reaction to any motion $\mathbf{r_m}$in monads, then since $\bar{\mathbf{v}} = \bar{\mathbf{v}}\mathbf{1}/\varepsilon$, $\bar{\mathbf{v}} = \bar{\mathbf{v}}\mathbf{2}/\mu$, and $\bar{\mathbf{v}}.\bar{\mathbf{v}} = \frac{\bar{\mathbf{v}}1.\bar{\mathbf{v}}2}{\varepsilon\mu} = 1 \rightarrow \bar{\mathbf{v}} = \frac{1}{\sqrt{\varepsilon\mu}}$, which is the known formula of Maxwell`s EM-Propagating wave and, where

m = the reaction to the change of velocity motion (the mass),

$\bar{\mathbf{a}}$ = the change of velocity motion (the acceleration),i.e.

Force P, In a Material body *appears as Kinetic energy*, In an Elastic surface *is appearing* as *Principal and Shear stress*, In a Material line or segment as *Tension*, *in Euclid line becomes velocity on line or, a Free Velocity moving Line-Segment, or a moving Vector (quaternion ≡ monad), In-Particles as an Electromagnetic wave in cave* r = λ/2, *Out-Particles* as an system *S* ≡ *Electromagnetic-Radiation with* n, *frequencies in*$\boldsymbol{\lambda_N}$*as*{ [S ≡ $\mathbf{B_P}$ ≡ EM-R ≡ $\mathbf{f_{1=N}}, \mathbf{f_2}, \mathbf{f_3}, \mathbf{f_D}, , \mathbf{f_n}$] *and*$\boldsymbol{\lambda_N} = \frac{8.r\,c}{n\sigma^2.(1+\sqrt{5})} = \frac{8\,r^2 c}{n\sigma\bar{B}}$]}.

The *minimum Quantized Energy, the Quanta*=2s², is diffused through the *minimum Quantized Space, Quanta s², in* all quantized spaces, which are all Particles, [MFMF] , moving Vectors, Free velocity monads, Material lines, Material Surfaces, *the Energy Rims*, and Bodies.

Since also it is a moving energy then diffusion (decomposition) of stored energy follows Pythagoras theorem in a New Configuration with Scalar and Vector magnitudes such that satisfy the principle of conservation of linear momentum.

Points in Space carry a priori the work W = ∫A↔B [P.ds]= 0, or$\boldsymbol{\nabla}^2$ds = 0, where magnitudes, P, d$\bar{\boldsymbol{s}}$, can be varied leaving work unaltered.

Using the work formulas of Elasticity then In and On Surface work W is,

$W = [(\sigma 1^2 + \sigma 2^2)/2 - (\sigma 1.\sigma 2)/m]/ES$ and$\mathbf{W_v} = [(\sigma 1^2 + \sigma 2^2 - \sigma 1.\sigma 2)/6.GS]$ where,

σ1, σ2, Are the Principle stresses,

W, Is the work Inward radial surface,↔ ,

$\mathbf{W_v}$, Is the work Onward radial surface (*the Transverse*, ↻↺,)

Placing equation (c) in above work equations then become , $W = [P^2/4.EF^2].(6+4/m)$

$\mathbf{W_v} = [2P^2/3.GS^2]$ and for m= 4 and G=2E/5, $W = (7/4).[P^2/ES^2]$, $Wv = (5/3).[P^2/ES^2]$ .....(d)

Remarks:

1. *Kinetic Energy*, *motion*, in Primary-Particles becoming *from Circular rotation* of ⊕ to ⊖ is,
   Total Energy in n loops $\rightarrow \mathbf{W_{n(n+1)}} = [\frac{4\pi r^2 f1}{3}].n.(n+1)$ where n = 1,2,3,4… n ...∞ and Mass → $m \equiv \frac{2E}{a_a} \equiv [\frac{\bar{B}.\bar{w}}{\bar{B}x\bar{w}}].J \equiv W \equiv [\frac{4\pi r^2 f1}{3}].n.(n+1)$ where$\mathbf{f_1} = [\frac{(1+\sqrt{5})}{2}][\frac{\sigma}{2\pi r}] = \frac{E}{h}$,
   Frequency $\mathbf{f_1}$, *is the Golden-ratio-pattern of stress* σ, *from the generation of frequency. At Resonance the Real-Part is Zero*, *and the Response is given by the Imaginary-Part only.*
2. *Kinetic Energy*, *motion*, in Primary-Particles becomes *from Cycloidal rotation* of ⊕ to ⊖ is, Total Energy is Spin≡$\bar{\mathbf{B}} = [\mathbf{r}.\boldsymbol{\sigma}.(\mathbf{1}+\sqrt{\mathbf{5}})] = (\frac{8\,r^2}{n}).\mathbf{f_n} \equiv [\varepsilon E^2 + \mu H^2]/2 = 2rc.\sin.2\varphi$, and $\mathbf{f_n} = (\frac{n\sigma}{8\,r^2}).\bar{\mathbf{B}}$ i.e. Stationary Energy-lobes are the Stationary Wave-Fringes and Broglie Mass $m = \frac{h.f}{c^2}\sqrt{1-\frac{v^2}{c^2}}$
3. *Kinetic Energy*, *motion*, in Compound-Particles follows the, *Breakage-Principle*, which is (-)the Anti -Space as the Transverse -Electric-field, $\bar{\bar{\mathbf{E}}}$, (+) the Space as the Horizontal -Magnetic-field, $\bar{\bar{\mathbf{B}}}$, and (λ) the Energy-loop ≡ Energy-tank of particle. Motion in Primary-Particles is circular or cycloidal while in Compound Particles, *motion*, occurs by Symmetric [⊕←→⊖] or Antisymmetric [⊕→←⊖]Stretching and of Bending [⊕↻↺⊖]. By this way Energy is absorbed or emitted in the different caves.

4. *Kinetic Energy*, *motion*, in Orbits becomes from, *Piezoelectric-effect*, where Orbit is subject to a Mechanical-stress, σ, *becoming from the Centripetal-acceleration* $\bar{\mathbf{a}}_{\mathbf{P}}$, and is appeared Piezoelectric Effect with Positive-charge at the *Nucleus* and Negative-charge at the *Planet*.

The two faces at N, P are connected by the in-between Gravity-field [∇i]=[± s²] in[MFMF] Field.

h) The Relationship between Light and matter

Above relations happen between Electromagnetic radiation which can be described in terms of a *Stream of mass-less particles, the Photons*, each travelling in a wave - like pattern at light speed and containing a certain amount of Energy. As above referred Energy ≡ motion ≡ The rotation of ⊕ to ⊖ in Energy caves, or the Up-down vibration in lobes of particles` wavelength, λ is transferred as Propagation. As for a Greenhouse where gas is gas in an atmosphere that absorbs and emits radiant energy within the Thermal range < i.e. a regulating valve of Absorption and Emission of radial-energy >.

Waves transfer energy but not mass, meaning that mass is only a meter for measurements.

In atoms, *Stretching* occurs when atoms move in the same (←←) or opposite (←→) directions as the bonds shrink or stretch. *Bending* occurs when different (any two) atoms move Downward and Upward away from axis-lobe, thus causing an imbalance-Unbalanced in Electronegativity and change in polarity *the dipole-moment during a vibration*. This motion can result from the absorption of Infrared radiation.

Conclusion

Mass of Photon is the reaction to the Electromagnetic Spectrum which contains all known types of Electro-Magnetic Radiation, and which is Energy that travels and spreads out as it goes, and are for → Radio $\lambda=1.\mathbf{10^{3}}$ m, Microwave, Infrared, Visible, Ultraviolet, X-ray, Gamma-ray ≡ $\lambda=1{,}5.\mathbf{10^{-20}}$ m $\mathbf{M_1}$-ray ≡ $\lambda = 8{,}9.\mathbf{10^{-35}}$, $\mathbf{M_2}$-ray ≡ $\lambda = 2{,}3.\mathbf{10^{-48}}$,$\mathbf{M_7}$-ray ≡ $\lambda = 4{,}5.\mathbf{10^{-171}}$, $\mathbf{M_n}$-ray ≡ $\lambda = 1.\mathbf{10^{-n=\infty}}$, i.e. If *EM radiation with* , λ - $\mathbf{f_{Ir}}$, of the *molecule* cave [$\lambda =1.\mathbf{10^{-5}}$ m , $\mathbf{f_{Ir}}= 1.\mathbf{10^{12}}$ Hz =s/mm] and *of Infrared-radiation*[$\lambda= 1.\mathbf{10^{-8}}$ m, $\mathbf{f_m} = 1.\mathbf{10^{16}}$] *is absorbed by Stretching and Bending, by atoms of Ultraviolet–radiation, where then is caused an Unbalance in molecule Electronegativity, Resulting to the Emission of the travelling and spreading Energy of the Infrared – radiation*.

This means that Energy as Ultraviolet-radiation travels from cave $\lambda= 1.\mathbf{10^{-8}}$ to cave $\lambda= 1.\mathbf{10^{-5}}$*of Infrared - vibration by following the Breakage-Principle and because of Waves - Resonance, this consists one way of transportation of Energy . Mass is the Reaction-meter to the change of motion.*

Photon has a frequency $\mathbf{f_{Ph}} = 1{,}34.\mathbf{10^{21}}$ Hz *and mass* $\mathbf{m_{Ph}} = 4{,}868.\mathbf{10^{-33}}$ Kg .

The Wavelength $\lambda = c / \mathbf{f_{Ph}} = 2{,}00.\mathbf{10^{-13}}$ m *momentum* mv =1,458.$\mathbf{10^{-22}}$ Kg.m /s

For *Gravity- length- caver* =3,969.$\mathbf{10^{-62}}$mass $m=[\frac{\bar{B}.\bar{w}}{\bar{B}x\bar{w}}].J = \frac{1}{1}J = \frac{\pi r4}{2}$ =248,156.$\mathbf{10^{-248}}$ Kg.

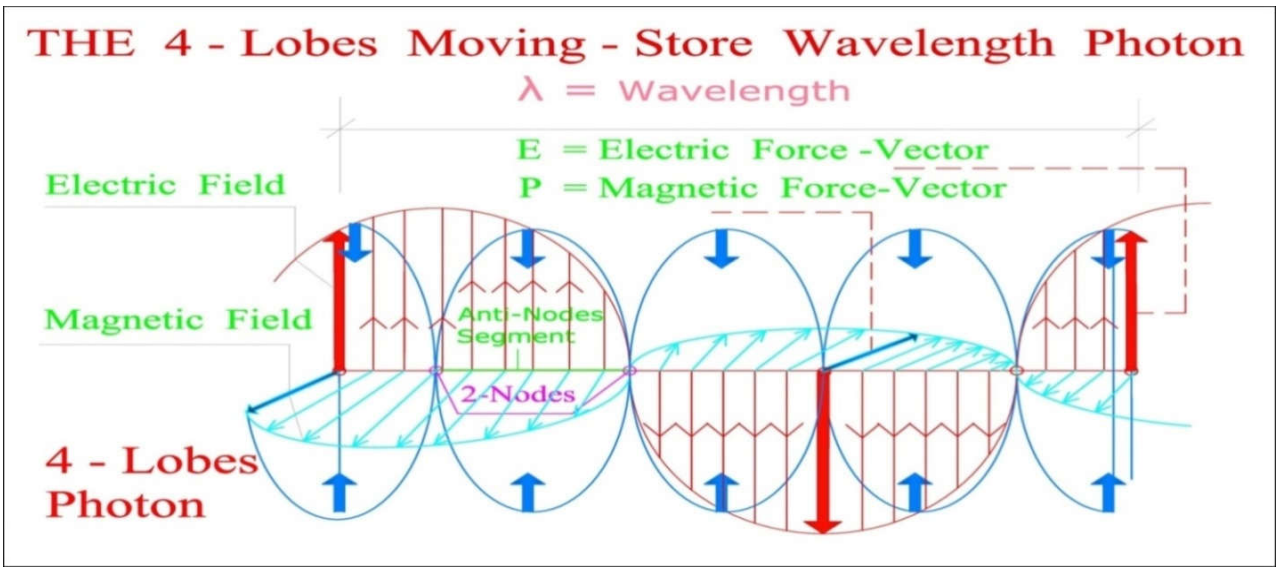

Figure 20: The Inner-Structure of a, 4-lobe, Stationary Wavelength $\lambda = 2\pi r = 2r / n$

Stationary Wavelength $\lambda = 2\pi r$ *is executing a Free vibration,* and under an Outward light motion as the Electromagnetic – radiation E ⊥P. The *Wavelength* λ, contains 3 all lobes plus 2 halve lobes and, *is the moving Energy-Storage* r, because of the Closed-end-Node of Material-Point-motion. *Work* W, *from the Wave-Energy-Pattern and with wavelengths* $\boldsymbol{\lambda_n}$, *created from all Points of the Periodic Oscillation in any Cave,* r , *is Stored into the,* n, *Integer and Energy-Lobes of cave* r.

Energy is the Work, the *motion* in One - Two and Three directions, which is conserved.

In order that *Motion is conserved* as *Displacement*, then must be *Quantized* in a *Finite Space*, differently is annihilated. In Mechanics the only-possible motion in *Finite-Space* is, *the Periodic excitation*, and *the Revolving motion.* It was shown before that,

For the Interior motion to be conserved, *motion is kept in its Wavelength-Tank* $2r = n\,\boldsymbol{\lambda}$, and for the Linear motion tobe conserved, *motion is kept in its Plane-Orbits* and is continued by the Propagating Electromagnetic-Wave which is the conveyer of lobes [$\mathbf{B_P} \equiv$ EM-R $\equiv \mathbf{f_{1=N}}, \mathbf{f_2}, \mathbf{f_3}, \mathbf{f_D}, , \mathbf{f_n}$].

i) The Breakage Principle

When a Particle meets its Antiparticle, the two annihilate each other to form two Photos, *gamma rays consist the two Opposites and the Subatomic particles as Ionizing radiation, the Neutral part*, due to conservation of Momentum ,with sum total energy equivalent to the total mass-energy of both particles. Energy, *which is motion*, in Photons is conserved in their, *Neutral Energy lobes*. Photon following the Breakage-Principle, may produce another pair of particles and this because it is a composition of other Sub-monads which again annihilate each other and produce another energy particle and so on, until the *Primary Particles* which are the Material points of the caves. *i.e.*

Breakage Principle, *applied to any two Primary or and Compound Particles, is presented as any two Opposite matter* (+) *antimatter* (-) *, and energy part* $2L = \bar{\mathbf{B}}.\bar{\mathbf{w}}$ *becoming from Spin or angular-velocity*

Since Atom is a New monad, so follows the *Breakage - rule* → [+] ,[-] , [+ ,-] ← and because Atom is a composition of other monads then is, $\mathbf{L_T} = 1{,}887\,.\mathbf{10^{-7}}$m

Nucleus → [+] ≡ [+ cave] , *the minimum acceleration Planck`s cave* r <3,56237 .$\mathbf{10^{-14}}$m

Electron → [-] ≡ [- cave] , *the minimum acceleration Planck`s cave* r <3,56237 .$\mathbf{10^{-14}}$m

Orbitals → [+↔-] ≡ [± cave ≡ Material Point] *In mini-acceleration cave*r >3,56237 .$\mathbf{10^{-14}}$m

From Math,[1nm =$\mathbf{10^{-9}}$m ,1$\dot{\mathbf{A}}$ =$\mathbf{10^{5}}$ fm, 1fm =$\mathbf{10^{-15}}$m , 1$\dot{\mathbf{A}}$= $\mathbf{10^{-10}}$m, 1amu = 1,66.$\mathbf{10^{-10}}$ Kg] due to conservation of Momentum, with sum total energy equivalent to the total mass-energy.

An Atom is characterized so because, is composed of a *Proton*⊕ an *Electron* ⊖ *Orbit* ≡ Energy Energy is transferred by the *Absorption or Emission of a Photon* while in Orbit via Piezoelectric-effect and of *Electromagnetic force* between *Nucleus-Planet* chain of the Stationary Material-points-Spins.

A Protonis so characterized because, is composed of a *Quark*⊕ an *Quark* ⊖and *Gluon*≡ Energy

Energy is transferred by the *Strong nuclear force of Photons* which is the Centripetal of Material-point Force $= v^2/r = \frac{(3+\sqrt{5}\,])\ \boldsymbol{\sigma}^2}{2\mathbf{r}}$ which is dependent on Glue-bond stress **σ**, and cave r.

Quarks are electrical-charged as 1/3, 2/3, n/3 of Spin $\bar{\mathbf{B}}$, meaning that rotation occurs on Small-circles. *Leptons* are electrical-charged as 1, -1, 0 of Spin $\bar{\mathbf{B}}$, meaning that rotation occurs on Great-circles.

For all cases issues the *Breakage Principle*, applied to any *two Primary* or and *Compound Particles*.

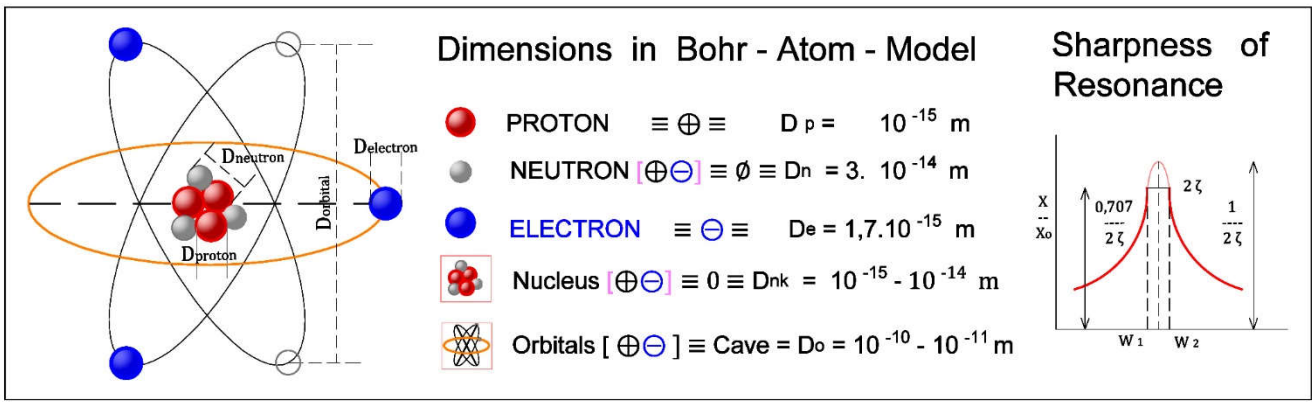

Figure 21: The Bohr-Atom-Model

Atom, Proton, Electron, Neutron, *Photons*, are Compound and Stable Wave-Energy-monads.

Proton is a Stable and Stationary Particle, *the Matter*, and consists the → [⊕] Positive Breakage of the three constituents of Atom monad,

Electron is a Stable and Moving Particle, *the Anti-Matter*, and consists the → [⊖] Negative Breakage of the three constituents of Atom monad,

Neutron is a Stable and Stationary Granular lattice Energy, and consists the → [⊕↔⊖]

Neutral Breakage [∅] and are Orbitals and Nucleus structure of the three constituents,

Orbit, or, *Negative-Energy-Rim,* is the Stable and Stationary Granular–lattice –Energy-Disk, *which is kept in the Plane-Orbit of motionas Gravity-field*, and in a way *Opposite* to that which *follows the Central motion*, i.e. *Gravity force is packet into the Orbit-Rim as energy-conveyer for the interaction between, Nucleus and the orbiting object*, and consists the quanta, which is *the minimum constant energy*, of motion→ [⊕↻↺⊖]← *in monad atom*.

Neutral Breakage [∅] are Orbitals and Nucleus structure of the three constituents,

Proton is composed of three Fermions, Two up-quark = (+ $\frac{1}{3}$ e) + (+ $\frac{1}{3}$ e) = (+ $\frac{2}{3}$ e) and One down-quark = (- $\frac{1}{3}$ e). Constituents (+ $\frac{1}{3}$ e), (- $\frac{1}{3}$ e), consist *Matter* and *Anti-matter* of Proton-monad while the remaining (+ $\frac{1}{3}$ e) consists the, third *Strong-Energy-Breakage part*, showing that Decay of the Proton does not violate the conservation of baryon number.

Electron is the Negatively charged particle that makes Electricity by its flowing force and which consists the Anti-matter. Breakage Principle applied on Muon produces +Muon, - Muon, netrino and Electron. Because electron is a *Primary-Particle*, it is composed of the N energy tanks, the N loops in its Main-store λ=r= h/p ≡ [$\mathbf{f_1}$,$\mathbf{f_2}$,$\mathbf{f_n}$≡ n lobes] following the *Stationary-Wave-Nodes-Principle.*

Electron Decay from $\boldsymbol{n_2}$ to $\boldsymbol{n_1}$ orbital, causes an electron to jump to a lower energy level orbital, by releasing the extra energy in the form of light photon, *meaning that electron loses energy*. Instead of this, because electron is a *Stationary-Energy-Store*, Energy is complemented from its Main-store.

Neutron is composed of three Fermions, Two down-quark = (- $\frac{1}{3}$ e) + (- $\frac{1}{3}$ e) = (- $\frac{2}{3}$ e) and One up-quark = (+ $\frac{2}{3}$ e) . Constituents (+ $\frac{2}{3}$ e), (- $\frac{2}{3}$ e), consist *Matter* and *Anti-matter* of Neutron-monad consisting the (+) particle rotating around (-) particle of the *Neutron-Primary-Material- point*.

Photons are the Neutrally charged massless particle that make up light and are the Inner-force carriers for Electromagnetic force which consists the Matter. Electromagnetic force is composed of the Electric Field denoting, *the matter = Particle* and Magnetic field denoting *the Anti-matter= Anti-particle*.

Force carrier denotes the Energy-Storages of Photon which are, the N energy-lobes in its main store λ= r = h.c/ $\mathbf{E_{ph}}$ of Photon .*Photon Decay* causes a Photon to jump to a lower energy level, releasing the extra energy in the form of light photon from its Main-store λ= h/p. This issues because Photon is a, *Moving-Energy-Store*, in-where energy is conserved as frequency from formula E = h.f =$\frac{\mathbf{hc}}{\lambda}$, or as increasing wavelength λ= r, i.e. *corresponds to an increase in light`s wavelength* λ, where, λ ≡ [$\mathbf{f_1}$, $\mathbf{f_2}$, $\mathbf{f_n}$≡ n loops≡the lobes which follow the *Stationary-Wave-Nodes Principle*].

Photon follows Cycloidal motion of Space Anti-space *on Stress-common-curve* of λ, so exists centrifugal acceleration and the Total-energy 2E = w B as Stationary Wave *Inward* the N lobes is thus producing the Skin-effect as, n, frequencies $\mathbf{f_n}$, and moving *Outward* as Electromagnetic Wave with light velocity.

j) The Total - Energy in loops

It was shown in [58] *that the maximum velocity in a closed system occurs in Common circle, when the two velocities,* $\bar{\mathbf{c}}$, $\bar{\mathbf{v}}$ *are perpendicular between them, and are not producing Work, from where then dispersion follows Pythagoras theorem and the resultant Quantized linear Space length, r, becomes, as the Resultant of Energy Vectors,* r = $|(\bar{\mathbf{c}}.T)|$ =$\sqrt{\mathbf{v^2+c^2}}$*and by using Space Vector*$\bar{\mathbf{r}}$= $|(\bar{\mathbf{c}}.T)|$ =$\sqrt{\mathbf{v^2+c^2}}$ *then, The total Rotating energy is* → ± $\bar{\mathbf{\Lambda}}$= $\bar{\mathbf{p}}$.r = (M.c).r = (M.c).$\sqrt{\mathbf{v^2+c^2}}$ *and squaring both sites* [± $\bar{\mathbf{\Lambda}}$] ^{2} = $p^2.r^2$ = M $^2.c^2.(v^2+c^2)$ = $(M^2.v^2).c^2$ + $M^2.\mathbf{c^4}$= $(p^2.c^2)$ + M $^2.\mathbf{c^4}$ = [p.c] ^{2} + [$\mathbf{m_o}$.c^2] ^{2} or is $\mathbf{E_T}$ = $\mathbf{E_R}$+ $\mathbf{E_K}$ → Total - Energy of Elementary- particle = Intrinsic Rotational + Kinetic Energy,

The velocity of Elementary particles is the light velocity c = v = 2πr.$\mathbf{f_e}$and frequency → $\mathbf{f_e}$=$\frac{\mathbf{c}}{\mathbf{2\pi.r}}$.....(a)

Rotational Energy $\mathbf{E_R}$ =$\bar{\mathbf{B}}.\bar{\mathbf{w}}$= 2L= J.$w^2$ and → $\mathbf{E_R}$ = [$\frac{\pi r^4}{8}$].[$\frac{c^2}{r}$] = $\frac{\pi c^2}{8}r^2$ = 3,535.$\mathbf{10^{16}}$. r^2 .....(b)

Energy and frequency of Elementary particles can be found from cave r , only since ,c, is constant .

Total - Energy→ $\mathbf{E_T}$ = $\mathbf{E_R}$+ $\mathbf{E_K}$ = $\frac{\pi c^2}{8}r^2$ + $\frac{1}{2}$m.v^2 = 3,535.$\mathbf{10^{16}}$. r^2 + $\frac{1}{2}$ m.v^2 .....(c)

Mass of elementary particles is m = $\frac{\mathbf{E}}{\mathbf{2r^2.w^2}}$ = $\frac{\mathbf{J.w^2}}{\mathbf{2}}$.$\frac{\mathbf{1}}{\mathbf{2r^2.w^2}}$ = $\frac{\mathbf{J}}{\mathbf{4.r^2}}$ = $\frac{\mathbf{\pi.r^2}}{\mathbf{16}}$, i.e. dependent on radius of cave.

i. *Dot product and Cross product*

The *Dot-product* happens for interactions between *Similar dimensions*, while the *Cross-product* between *Different-dimensions*. Cross-product of two vectors $\bar{\mathbf{a}}$, $\bar{\mathbf{b}}$ is $\bar{\mathbf{a}} \times \bar{\mathbf{b}} = |\bar{\mathbf{a}}|.|\bar{\mathbf{b}}| \sin\theta.\bar{\mathbf{n}}$ and for $\bar{\mathbf{a}}=\bar{\mathbf{b}}$ and $\theta=90^{o}$ then $\bar{\mathbf{a}} \times \bar{\mathbf{a}} = \bar{\mathbf{a}}^{2}$, and for Quaternion, s, which performs the Work of rotating the one vector around the other →Work $= \bar{\mathbf{a}} \times \bar{\mathbf{a}} = \bar{\mathbf{a}}^{2}.\bar{\mathbf{r}}$, and for $\bar{\mathbf{a}}= \bar{\mathbf{v}}$then, Work $= \bar{\mathbf{v}}^{2}.\bar{\mathbf{r}} = |\bar{\mathbf{v}}|.|\bar{\mathbf{v}}|.\bar{\mathbf{r}} = v^{2}.\, r.\bar{\mathbf{n}} = (wr)^{2}r.\, \bar{\mathbf{n}} = (\, 2\pi r/T)^{2}\bar{\mathbf{n}} = (\, 4\pi^{2}r^{2}/\, T^{2}).\, r.\, \bar{\mathbf{n}} = \frac{4\pi^{2}r^{3}}{T^{2}}.\, \bar{\mathbf{n}} = W = 4\pi^{2}\,.\, \frac{r^{3}}{T^{2}}\,.\, \bar{\mathbf{n}} = 4\pi^{2}.r^{3}.\mathbf{f}^{2}_{\mathbf{p}}.\bar{\mathbf{n}}$, is the Kepler celestial law for microcosm. Since in Mechanics issues $z^{2} = s^{2} - s^{2} + 2.s.s = 1$, and from Unit-quaternion $s^{2} + [iv]^{2} = 1$ then is → $s^{2} - v^{2} = 1$ ….(d) Equation (d) is a *Cone relation* on where Total-energy, *Kinetic and Potential* is conserved and for Photon , Electromagnetic radiation is the Kinetic-energy and the Velocity-vector–energy-tank is the Potential .Photon is an Energy-store, r, in a Stationary-wave of wavelength n $\lambda = 2r$ consisted of n stationary lobes filled in λ *with inner motion* the Electromagnetic-Displacement-current and Outward Propagating with light speed as Energy-store $\lambda = 2r / n$, {+ Electric-field,- Magnetic-field.

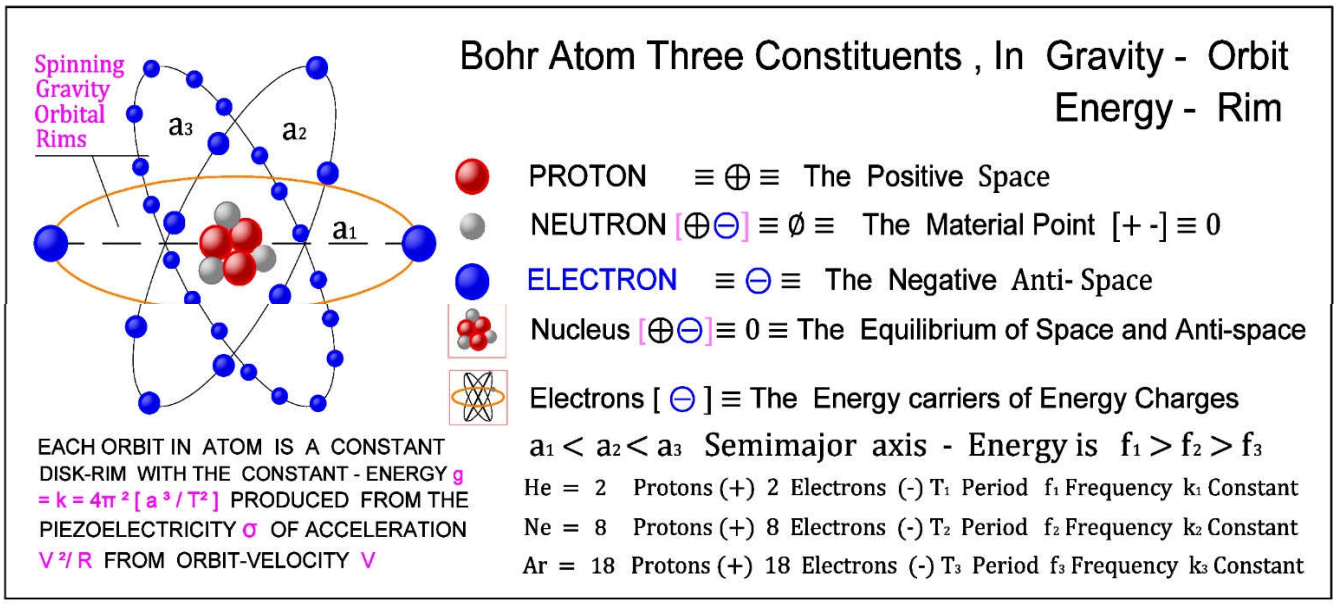

Figure 22: The three constituents in Bohr-atom and the *Spinning-Gravity* in Orbit *Energy-Rim*

Proton, in Bohr-model, consists the → Positive Breakage (+) of the three constituents,
Electron consists the → Negative Breakage (-) of the three constituents,
Neutron consists the → Equilibrium Material Point (+ -) of the Spaces and Anti-spaces.
Nucleus consists the → Equilibrium Positive Breakage Store , in Atom –Model.
Electron Orbits are the → Equilibrium Negative Breakage Store-Rims in Atom –Model.
Orbital Electron is the → Moving-Charge-carrier of Energy in Atom –Model.

Remark

It was prior referred that , when Matter and Antimatter annihilate at rest or when Anti-space comes in contact with its regular Space counterpart , they mutually destroy each other and all of their Energy is converted to the *Three Breakages* → s^{2}, $-|\bar{\mathbf{v}}|^{2}$, $[2\bar{\mathbf{w}}].|s|\,|r|.\nabla i$ ← where for, $\bar{\mathbf{v}} = s \equiv$ the cave,

$[\, s^{2}\,]$ → is the Real part , *Matter*, of the new monad , and is *a Positive Scalar magnitude*.
$-[\, s^{2}\,]$ → is the always Negative part, *Anti-matter*, which is always *a Negative Scalar magnitude*.
$2\, s^{2}.\nabla i$ → is the double Angular-Velocity Term, *The Energy Term*, and which is *a Vector magnitude.*

Since Photon is a Material-point in cave r, where its *Inner is Stationary*-Electromagnetic-Wave $[E^{2}+H^{2}] = 2(2r).c.\sin 2\varphi$ with n Lobes representing the *Normal mode vibration* with frequencies $\mathbf{f}_{\mathbf{n}} = n.\mathbf{f}_{\mathbf{1}} = \frac{E}{h} = \frac{n.v}{4r} = \frac{n\sigma}{8r}[1+\sqrt{5}]$, its *Outward as the Propagating Electromagnetic-Wave* → $\{[\varepsilon E^{2} + \mu B^{2}] = 2.\lambda c.\sin.2\varphi\}$ ← *where* $2r = n\lambda$, Cave r, is the *Electromagnetic-Energy-Storage*, and Electromagnetic-Radiation E, B is *the conveyer*. Following above constituents of Photon then,

Since *Energy is motion* and the, *Total – Energy of Elementary - Particle* is equal to the → *Intrinsic Rotational+Kinetic Energy from velocity*, *then* according to the conservation law of Energy, *This Energy is stored into Neutral caves as Stationary Loops consisting the Lobes*, and thus producing the *Space and the Anti -Space Particles with velocity vector the remaining of the Energy Term*.

The Breakage - Principle, is the way of Energy conservation in all levels, *where Energy never annihilates and which is always reverted into* → the *two Opposites* {(±s^2) or the Conveyers ≡ *Carriers* }*and an Neutral Part*2 .∇I which is the Energy-store ≡ Storage ≡ Energy-tank ← or as *Matter*(+s^2) ,as *Antimatter* (- s^2) *and as Energy part*, 2L $=\overline{\mathbf{B}}.\overline{\mathbf{w}}$

In case of complex-structures is found their Energy-State and then the *Breakage-Principle-Constituents.*

Motion is obtained either by *Pushing* or *Attracting*.

Both cases presuppose *NOT the Continuity of points*, which points are nothing *But Discontinuity*, *the Discrete*, with the dimensional Units as filling as this was shown in Zenon Paradox [70], and *this because of their way of existence*, while their *Velocity - Vector,* is the rest part of Energy. *Pushing*, *Repulsion*, happens in Attractive Electric Fields where a Positive charge is dropped near another Positive charge or a Negative charge is dropped near another Negative charge.

Attractive, happens in Static - Electricity where there exists a Build-up of opposite charges on objects which are separated, *gathered and remaining at rest*, by an Insulator and balance the system out, OR an Electric field which is a large source of Negative charges that can propel electrons which Attractive Electric Fields will flow through a circuit towards positive charges. In Fig-21. Atoms exist in over Two hundred different forms as chemical elements like Hydrogen, Carbon, Oxygen Copper etc. [54-55].

Atoms of many types can combine to make molecules which built the Matter – Antimatter and energy (motion) we can physically see and touch. Atoms are tiny about 300 picometers long equal to 3.$\mathbf{10^{-10}}$m An Atom is built with a combination of the three distinct particles , the Protons Neutrons and Electrons i.e. define Protons ≡ *The Space* , Neutrons ≡ *The Material point* , Electron ≡ *The Anti-space* , and as was seen before → *Energy* ≡ *Motion* ≡ *Space* + *Anti space* + *Kinetic Energy* , therefore the above combination is completed with a Structural–Lattice–Design, which is the Bohr Atom-model , i.e.

A core nucleus, of Protons and Electrons, surrounded by orbiting Electrons. Since the Structural design must be stable (*balanced state*) in all parts, therefore nucleus is combined of Protons and equal Neutrons determined the isotope of an atom, which define the equilibrium of *Space Anti-space*. The same also for Proton composed of Fermions, Electron which are primary particles and *Stress-common-curve* for Orbital.

The Kinetic Energy Part (Energy) is stored in Orbits as bounded orbiting electrons as below referred. In order that Energy, *motion*, is stored somewhere else then in the outer orbit of the atom, the Valence electrons with enough outside force may escape orbit of the atom and become free. These free electrons are the charge carriers (*Dimensional units as filling*) because Energy is motion and is quantified as the charges which these have. We refer that energy as charge is the same either for Space and Anti-space as this is [⊕↔⊖], therefore Protons and Electrons carry the same amount of charge and so in Bohr model for stability, *balanced state*, atoms have the same number of electrons and protons (*Breakage Principle*).

Potential energy , is the stored energy where then the Build-up of the opposites is at rest. The same also the Electric Potential Energy where a charge`s Electric potential Energy describes the how much stored energy it has when is set into motion and that energy is kinetic and charges can do Work . [67]

k) The Vibrations in Systems

For Orbits issues →W = $4\pi^2 . \frac{\mathbf{r}^3}{\mathbf{T}^2} . \overline{\mathbf{n}} = 4\pi^2 . r^3 . \mathbf{f}^2{}_{\mathbf{p}} . \overline{\mathbf{n}}$ →which is Kepler celestial law for microcosm.

For the vibration of systems *of many degrees of freedom* and because an estimate of the Fundamental and a few of the lower modes is sufficient *Rayleigh`s method and Dunkerley`s equation*, are of great value and importance in the theory of *Resonance*.

For M and K, the Mass and Stiffness matrices and X the assumed Displacement vector for amplitude of vibration, then *for Harmonic motion*, the maximum Kinetic and Potential energies are written as $\mathbf{T_{max}} = \frac{1}{2} w^2 . \mathbf{X^T}.M.X$ and $\mathbf{U_{max}} = \frac{1}{2}\mathbf{X^T}.K.X$ where, w, are the frequencies of the System.

By equating the two and solving for w^2 then $w^2 = \frac{\mathbf{X^T.K.X}}{\mathbf{X^T.M.X}}$ which is the lowest natural frequency from the high side and by expressing the assumed displacement curve, *wavelength* λ, in terms of the normal modes $\mathbf{X_i}$ as X $= \mathbf{X_1} + \mathbf{C_2X_2} + \mathbf{C_3X_3} + \ldots$. then by normalizing to the same number equation becomes,

$$w^2 = \mathbf{w}^2{}_{\mathbf{1}} . [1 + \mathbf{C}^2{}_{\mathbf{2}} (\frac{\mathbf{w}^2{}_{\mathbf{2}}}{\mathbf{w}^2{}_{\mathbf{1}}} - 1) + \ldots] \quad \ldots\ldots (a)$$

i.e. *a relation between the Fundamental frequency* $\mathbf{f_n} = \frac{\mathbf{w}}{\mathbf{2\pi}}$

which is found as the Natural-Frequency $\mathbf{f_n} = \frac{\mathbf{n.v}}{\mathbf{4r}} = \frac{\mathbf{n\sigma}}{\mathbf{8r}}[1+\sqrt{\mathbf{5}}] = [\frac{\mathbf{(1+\sqrt{5})}}{\mathbf{2}}] \frac{\mathbf{n\sigma}}{\mathbf{4r}}$, *and the other harmonics in any cave* r, *of the* n *lobes filled with the Golden-ratio-harmonics. Golden-ratio-frequency in any System is identified with the first harmonic* $\mathbf{w_n} = 2\pi.\mathbf{f_n}$

The plus and minus signs show the phase of the antinodes at a particular instant.

In Mechanics equation (a) is a regression method as the, *Least Squares*, to approximate the solution of over determined systems for angular velocity vector $\bar{\mathbf{w}}$. Because $\bar{\mathbf{w}}$is related to the Total work 2L=$\bar{\mathbf{B}}.\bar{\mathbf{w}}$ then w_1 = 2π.$\mathbf{f_1}=\frac{(1+\sqrt{5}\,]\,).\sigma}{8\pi r}=\frac{[1+\sqrt{5}\,]\sigma}{4\,.\,r}$ i.e. dependent on cave, r, and Glue-Bond, σ. Moreover since in monads exist n, frequencies as equation of, Spin =$\bar{\mathbf{B}}=\mathbf{f_n}.(\frac{8\,r^2}{n\,\sigma})$ = Energy in n wave-node-loop where

$$\mathbf{f_n}= [\,\mathbf{n}\,\frac{\sigma(1+\sqrt{5})}{\pi\,(2r)^3}]\ ,\ \bar{\mathbf{B}}=[\mathbf{r}.\sigma.(1+\sqrt{5})\,]\ ,\text{ and }\ 2L = 2n(3+\ \sqrt{5}\,][\,\frac{\sigma^2}{\pi r^2}\,]\text{.............................}[70]$$

Orbitals in an Atom are the three dimension standing waves because electrons are waves following the Breakage-Principle and consist the eigen values or and, the Eigen-frequencies. Since the wavelength λ, follows the sequence $\frac{1}{1},\frac{1}{2},\frac{1}{3},\frac{1}{4},\frac{1}{n}$,.. and frequency in, n, lobes the Odd and Even sequences 1, 2, 3, 4, 5, 6 … and 1, 3, 5, 7, 9, wavelength is fractionally quantized while Energy as whole numbers. Equation (a) shows the fundamental deflection (*or mode)* $\mathbf{X_1}$which is the greatest of all.

Since infinite large number in algebra, is what is called *Maxima* in Geometry, and Zero in the New *Material–Geometry* then article [65 -70] consists *The Energy- Beacon*, for understanding nature.

Laplace`s Orbital Angular-momentum

The Solid-Harmonics were homogeneous polynomial solution of the Laplace`s equation as equation $\frac{\partial u^2}{\partial x^2}+\frac{\partial u^2}{\partial y^2}+\frac{\partial u^2}{\partial z^2}=0$ and represent the Eigenvalues of the Torsional-momentum L, *as the classical Rayleigh`s Method* which is analytically presented in [70]. Spherical harmonics are the eigen functions of the Square of the orbital angular-momentum $\bar{\mathbf{B}}$ and for $\bar{\mathbf{B}}$=1 then unity-work is,

L = - $\mathbf{i}\bar{\mathbf{B}}$(Xx$\nabla$) = $\bar{\imath}\mathbf{L_x}+\bar{\jmath}\mathbf{L_y}+\bar{\mathbf{k}}\mathbf{L_z}$ where L² = $\mathbf{L^2}_x+\mathbf{L^2}_y+\mathbf{L^2}_z$. Because Spherical-coordinates are related to the Cartesians as , x = r.$\sin\vartheta\cos\varphi$, y = r.$\sin\vartheta\sin\varphi$, z = r.$\cos\vartheta$, then after some Algebra

$\mathbf{L_x}$= -i.$\bar{\mathbf{B}}(-\sin\varphi.\frac{\partial}{\partial\theta}-\cot\theta.\cos\varphi.\frac{\partial}{\partial\varphi})$, $\mathbf{L_y}$= -i$\bar{\mathbf{B}}.(\cos\varphi\frac{\partial}{\partial\theta}-\cot\theta.\sin\varphi.\frac{\partial}{\partial\varphi})$, $\mathbf{L_z}$= -i$\bar{\mathbf{B}}.(\frac{\partial}{\partial\varphi})$. Squared is

$L^2 = -\bar{\mathbf{B}}^2.[\frac{1}{\sin\vartheta}\frac{\partial}{\partial\theta}(\sin\vartheta\frac{\partial}{\partial\theta}\ )+\frac{1}{\sin^2\vartheta}.\frac{\partial^2}{\partial\varphi^2}]$ or $L^2 = -(r\nabla)^2+(r\frac{\partial}{\partial r}+1)r\frac{\partial}{\partial r} = -\frac{1}{\sin\vartheta}\frac{\partial}{\partial\theta}(\sin\vartheta\frac{\partial}{\partial\theta})-\frac{1}{\sin^2\vartheta}.\frac{\partial^2}{\partial\varphi^2}$

Since in spherical coordinates $\mathbf{L_z}$depends Only on φ, we can denote its eigenvalue by , n $\bar{\mathbf{B}}$, and the corresponding eigen functions by $\mathbf{\Phi_n(\varphi)}$ thus these are,

$$\mathbf{L_z}= -i.[x\frac{\partial}{\partial y}-y\,\frac{\partial}{\partial x}\,] = -\,i.\frac{\partial}{\partial\varphi}\quad\text{or}\quad \mathbf{L_z\Phi_n} = n\bar{\mathbf{B}}.\mathbf{\Phi_n(\varphi)}\ \text{ namely is-}\ i.\frac{\partial}{\partial\varphi}\mathbf{\Phi_n(\varphi)} = n.\mathbf{\Phi_n(\varphi)}\ \text{.........................}\ (1)$$

The solutions to (1) are →

$$\mathbf{\Phi_n(\varphi)}=\frac{1}{\sqrt{2\pi}}\mathbf{e^{in\varphi}}\text{...}\ (2)$$

This equation (2) is satisfied for any value of n , however physically the wave-function must be any quantized number differently is continuous, namely $\mathbf{\Phi_n(2\pi)}=\mathbf{\Phi_n(0)}$, *from which*

$$\mathbf{e^{i.2\pi n}} = 1\ \text{...}(3)$$

This equation is satisfied for n = 0 , ±1, ±2 , ±3 , ..± n , which consist the eigenvalues of operator $\mathbf{L_z}$ *and agree with prior* $\mathbf{f_E}$ [$\mathbf{B_P}$≡$\mathbf{f_{1=N}}$,$\mathbf{f_2}$, $\mathbf{f_3}$,$\mathbf{f_E}=\mathbf{w^2}$] [70-P61], λ ≡ [$\mathbf{f_1}$, $\mathbf{f_2}$,,, ,$\mathbf{f_n}$≡ the loops ≡ n lobes, or → $\mathbf{f_N}$ = n $\frac{(1+\sqrt{5})\sigma}{4\pi r}=\frac{n\sigma.\bar{B}}{8\,r^2}$, which is the Golden-ratio-Energy Stored in lobes of Material-points.

Since Waves transfer energy but not mass, interactions between Electrons ⊖ and Protons ⊕, *in Orbit Rims*, happen because of the enclosed *Gravity-force as packet in these Energy-Orbit-Rims*.

A Positive-charge *at the Nucleus* and a Negative-charge *at the Planet* ≡ Material-point is created due to Piezoelectric-effect. The two faces at N, P *are connected by the in-between Gravity-field*[∇i]=[± s²] dipole-Spins $\bar{\mathbf{B}}$, in[MFMF] Field, *so flows Current which is the Resonance on Orbit*.

l) Stress →Strain - Displacement–Deformation??? : Energy→ Kinetic–Potential

Stress: Stress is a Physical quantity that expresses the internal Forces that neighboring particles.

Strain: Strain is the Description of Deformation in terms of relative displacement of the Initial to the Final Configuration of a Body either [Solids, Liquids, Gases, Crystals, Molecules, Atoms Particles, Fields, Material-points] *in Euclidean-Geometry*.

Displacement: Displacement is a vector whose length is the shortest distance from the Initial to the Final Position of a point P, *in Euclidean-Geometry*.

Deformation: Deformation is the transformation of Body from a Reference-Configuration to a Current-Configuration, either for *Position or Direction*, *in Euclidean-Geometry.*

Energy: Energy is a Physical-Property that when transferred to an Object performs Work i.e*. motion On or In the Object*, producing [*Displacement, Strain, Deformation, any Changes*].

Kinetic-Energy: Kinetic-Energy is the Energy possessed On or In an Object, *when in motion*.

Potential-Energy: Potential-Energy is the Energy On or In an Object, because of its *State or position.*

➢ *Question*. How Energy ≡ Work ≡ Motion is penetrating matter ???

Given the External-Forces that are acting on a System, to determine the distribution of Internal-Stresses throughout the system. Explicitly is the Cauchy-stress-tensor at every point. In a Solid-object, *By Newton`s laws of motion where any external forces that act on a system must be balanced by internal reaction forces or cause the particles in the affected part to accelerate*, all particles must move substantially Resonated in order to keep overall the shape, so follows that any force applied to one part must give rise to internal reaction forces that propagate from particle to particle of the system.

All these internal forces are due to the very short-range intermolecular interactions, manifested as surface contact forces σ, between adjacent particles, which is what is said as Stress. *Since now*, the Work executed in the Elastic material Configuration as the Strain energy is absorbed as Support Reactions and displacement field in the three dimensions [$\nabla\varepsilon$ ($\bar{\mathbf{u}},\bar{\mathbf{v}},\bar{\mathbf{w}}$)] upon the deformed placement (these alterations of shape by pressure or stress is the *Euler`s-Lagrange Equilibrium-State* of the Configuration and is as

$$G.\ \nabla^2.\boldsymbol{\varepsilon} + [m.G / (m-2)]\ .\nabla\ [\ \nabla.\ \boldsymbol{\varepsilon}\ ] = F \quad \text{...(1)}$$

where

E = Young modulus of elasticity. G = Shear modulus = E.m/2(m+1)

m = Poisson`s ratio = 1 / μ ≈ 10/3 $\boldsymbol{\sigma}$ = Stress = Force / Area.

$\boldsymbol{\varepsilon}$ = Strain = change of length / length . F = External forces.

In Electricity, the linear Electrical behavior, *Field and Strength*, of a Material point is $\check{\mathrm{D}} = \boldsymbol{\varepsilon}\ \hat{\mathrm{E}}$,
where $\check{\mathrm{D}}$ = the Electric displacement field, $\hat{\mathrm{E}}$ = the Inside Electric field strength and then according to Maxwell`s equations → $\nabla.\check{\mathrm{D}} = 0$ , $\nabla x\hat{\mathrm{E}} = 0$ and since in Elasticity, Hook`s law → $\boldsymbol{\varepsilon} = \mathrm{E}.\boldsymbol{\sigma}$ then
$\nabla.\ \sigma = 0$, $\boldsymbol{\varepsilon}=\frac{\nabla\mathbf{u}+\mathbf{u}\nabla}{2}$ *where* u = the displacement. All above when combined in *coupled equations then*

$$\boldsymbol{\varepsilon} = \mathrm{E}\ .\boldsymbol{\sigma} + \boldsymbol{\partial}\hat{\mathrm{E}} \ \text{ and } \check{\mathrm{D}} = \boldsymbol{\varepsilon}\ \hat{\mathrm{E}} + \boldsymbol{\partial\sigma} \quad \text{...(2)}$$

and since in Material-point $\boldsymbol{\sigma} = 2(1+\sqrt{5}).\bar{\mathbf{v}}$ = constant,*and because*

v = w.r , then (1) becomes, $\boldsymbol{\varepsilon} = \mathrm{E}\ .\ \boldsymbol{\sigma} + \boldsymbol{\partial}\hat{\mathrm{E}} = 2.\mathrm{E}(\ 1+\sqrt{5}).\bar{\mathbf{v}}+\boldsymbol{\partial}\hat{\mathrm{E}}$, $\check{\mathrm{D}} = \boldsymbol{\varepsilon}\ \hat{\mathrm{E}} + \boldsymbol{\partial\sigma} = \boldsymbol{\varepsilon}\ \hat{\mathrm{E}} + 0 = \boldsymbol{\varepsilon}\ \hat{\mathrm{E}}$ ....(3)

System (3) defines the Strain$\boldsymbol{\varepsilon}$, and the Electric displacement field $\hat{\mathrm{E}}$ = [⊖] , in Material-point, which is the Work in a much deeper to stresses-level $dW = \frac{\boldsymbol{\sigma}^2}{\mathbf{2E}}(dx.dy.dz)$. *Work is always motion in three* dimensions dx, dy, dz and so *must be conserved in Storages,* in order that *these are transported*.

Motion which is kept in Storages is *a Stationary-Box* (which is moving with light velocity *and carried* by an Electromagnetic Radiation), *a wave created in this Stationary-Box*. This Electromagnetic wave is entering into the other Energy-structures ≡ matter, *penetrates into matter*, carrying always the Box = r In case that Electromagnetic wave EM-R is absorbed, *The Work produced in Stationary-Box becomes an Inward Electromagnetic wave of the Box and after leaves the Box*, as a New Electromagnetic wave from the *In-Box* to *Out-Box* ,which New E-M Radiation carries the Box further.

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m) The Permeable Resonance-Path to a Common-motion

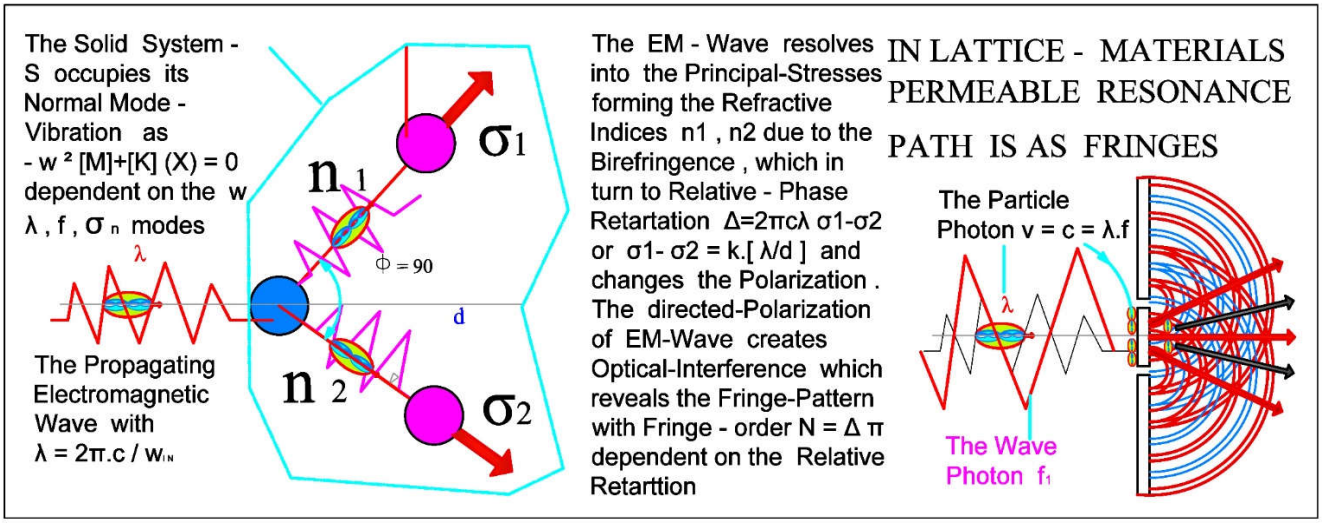

Figure 22: The Permeable *Resonance - Path* of Photon in *Lattice-Materials*

a) The Transmitted Electromagnetic Wave of wavelength $\lambda = 2\pi c/w \equiv c / f$ follows the Hook`s Elastic deformation and resolves into the Principal-Stresses-Pattern $\boldsymbol{\sigma_1}$,$\boldsymbol{\sigma_2}$.

b) The Permeable-Resonance-Path is always the *Resonance-frequency* and is for,

1) Solids → The Normal-mode-Vibration System $\{ - w^2 [M] + [K] (X) \} = 0$
2) Liquids → The Cauchy Stress-Tensor as Momentum equation $\boldsymbol{\nabla}.\sigma = - \nabla p + \boldsymbol{\nabla}.\tau$
3) Gases → The combined Avogadro`s Pressure-law $PV = n RT = n.mv^2/3$
4) Crystals → The Cauchy Ellipsoid-Stress-tensor where $E \perp B \perp r \equiv \boldsymbol{\sigma_1 \perp \sigma_2 \perp \sigma_3}$
5) Molecules → The Lattice - Crystal -Arrangement
6) Atoms → The Chemical Bonds relation
7) Particles → The Resultance One-Dimensional-Collision $\bar{\mathbf{v}}_{ij} = \bar{\mathbf{v}}_j - \bar{\mathbf{v}}_i = \bar{\mathbf{w}}_{ij}.\bar{\mathbf{r}}_{ij}$
8) M-Points → The Resonance-frequencies $\mathbf{f_R}\ [\mathbf{B_P} \equiv \mathbf{f_{1=n}}, \mathbf{f_2}, \mathbf{f_3}, \mathbf{f_{R=}w^2}] = \mathbf{f_n} = n\frac{(1+\sqrt{5})\sigma}{4\pi r} = \frac{n\sigma.\bar{B}}{8\,r^2}$
9) Cave-Orbit→ The Relation $c.\mathbf{L_s} = \mathbf{L_v}$,Light-velocity $3.\mathbf{10^8}$m/s*$1.\mathbf{10^{-42}}$m cave =$3.\mathbf{10^{-34}}$m²/s

Are the Cave-Energy-Plane-Rims, which are the Atom`s and Planet`s orbitals.

Remarks:

The Path Permeable to a common motion is following one of, w, f,$\boldsymbol{\sigma_n}$, quantities asbelow procedure,

1. A transmitted Electromagnetic wave with angular velocity vector $w = 2\pi f = 2\pi c/\lambda$ strikes on a Body.
2. The Electromagnetic wave entering into the Body follows Hook`s Elastic deformation, and resolves into the Principal Net-Stresses-Pattern.
3. Because of Principal-Stresses resolving, different Refractive-Indices are experienced on their perpendicular components due to the Birefringence.
4. The difference in the Refractive-Indices leads to a Relative-Phase –Retardation between the components given as

$$\Delta = (2\pi c/\lambda).k.(\boldsymbol{\sigma_1 - \sigma_2}) \text{ or } \boldsymbol{\sigma_1 - \sigma_2} = [\tfrac{\lambda}{d}] .\tfrac{\Delta}{2\pi c} = k .[\tfrac{\lambda}{d}] \quad \text{.....} \quad \text{(a)}$$

where

Δ = The Controlled Phase-Retardation from the transmitted Electromagnetic wave

$\Lambda = \frac{2\pi c}{w}$, is the vacuum wavelength dependent on light, and angular velocity.

d = The thickness of the Body or of Specimen

5. The Relative Phase Retardation changes the Polarization of the transmitted EM Wave, which changes also the Polarization of the Principal stresses, and thus many different waves are so produced. The Optical interference of the Waves Fringe-Pattern are revealed with Fringe-order $N = \Delta/2\pi$ dependent on Relative-Retardation.
6. *Photon is proved to be a Material-point embodied with the Golden-ratio-frequency* $\mathbf{f_P} = \Phi.\sigma/2\pi r$ and *when collides with another Particles*, *the Vibrating Physical Structures*, *occurs Resonance*(w) between the fundamental

frequencies of the colliders, *and then the Real-Part is Zero, and the Complex-Resonance is given by the Imaginary-Part only which is* → H(w) = - i .$\frac{1}{2\zeta}$,

7. Since Real-part is zero , then by Studying the Fringe-Pattern is determined the State of stresses at the points of materials and the General Permeable Paths of the Electromagnetic-State of the body.

In Figure-4.(3)is seen the Energy-Storage, p, which is transported by the Electromagnetic conveyer $\mathbf{f_n}$. *The Energy-Storages* r = n.[$\frac{\lambda}{2}$]≡$\mathbf{W_{n(n+1)}}$= [$\frac{4\pi r^2 f1}{3}$].n.(n+1), *are travelling through Bodies and follow, Lame Stress Ellipsoid*$\mathbf{n_1}^2$ + $\mathbf{n_2}^2$ +$\mathbf{n_3}^2$=$\frac{T_1^2}{\sigma_1^2}$ + $\frac{T_2^2}{\sigma_2^2}$ +$\frac{T_3^2}{\sigma_3^2}$ = 1, on principal stresses ±$\boldsymbol{\sigma_1}$,±$\boldsymbol{\sigma_2}$,±$\boldsymbol{\sigma_3}$, which *is the Passage* through which Forces (*The EM-Radiation*) travel in any Solid either in Motion or at Rest .

Laplace`s Orbital Angular-momentum $\mathbf{e^{i.2\pi n}}$= 1 and for n=0, ±1,±2, ±3,.±n ,consist the eigen values operator $\mathbf{L_z}$*which agree with prior* Resonance-frequencies $\mathbf{f_R}$ [$\mathbf{B_P}$≡ $\mathbf{f_{1=N}}$, $\mathbf{f_2}$, $\mathbf{f_3}$,$\mathbf{f_R}$ = $\mathbf{w^2}$] *as wavelengths* λ ≡ [$\mathbf{f_1}$, $\mathbf{f_2}$…$\mathbf{f_n}$= w²]≡*the* n *lobes*, or → $\mathbf{f_N}$ = n$\frac{(1+\sqrt{5})\sigma}{4\pi r}$= $\frac{n\sigma.\bar{B}}{8 r^2}$, a Principal-Stresses σ , and a Resonance -frequencies $\mathbf{f_R}$ relation, which is the Energy stored in the MP-lobes. [70]

8. From the analysis of the Complex wave Systems (Page -55) is proved that , *The Complex frequency response* H(w) is composed of the Real and the Imaginary part.

At Resonance the Real part is zero and the *Response is* given by the *Imaginary part* H(w) = -i.[$\frac{1}{2\zeta}$] i.e. Energy transportation through *any Type of Material*, is independent of Collision, Impact or Adhesiveness between any two vectors, but from their *Common-frequency*, that of *Principal* or Fundamental mode $\mathbf{f_1}$of the Material, and that of the Incident Wave-frequency $\mathbf{f_n}$.

Physical Properties and Crystal-types:

The *Physical properties* of Crystals, depend on the *Kinds and Strengths of the Attractive forces* that hold the particles together in the Bodies [Solids, Liquids, Gases, Crystals etc.] while the *Types* depend upon the Kinds of Particles located at sites in the lattice-Material-geometry-formation.

An Ion is an Atom or Molecule in which the number of Electrons differs the number of Protons, or $\mathbf{E_n} \neq \mathbf{P_n}$, and if $\mathbf{E_n}>\mathbf{P_n}$ or $\mathbf{E_n}<\mathbf{P_n}$ then is *Negative or Positive Ion*.

Lattice-crystal is a Regular 3D geometrical arrangement of Atoms, Molecules or Ions in a crystal, which follows the Material–Geometry rules of Figure 6.

Lattice- energy is the Energy required to separate the Ions of an Ionic, with Atoms or Molecules Solid.

The mapping of Crystal-types is as below,

Type - Particles at sites- Type of Bounding-Force-Properties- EM-Radiation

Ionic : ⊕, ⊖ Ions - Electrostatic⊕↔⊖ - non-conductors - Infrared

Molecular : Atoms or Molecules - Dipole Attraction-Repulsion - non-conductors - Chemical-Bonds

Covalent : Atoms - Network-Bonds between Atoms -non-conductors - EM-Spectrum

Metallic : Atoms - Ions and Electrons Attraction -Conductors - E-conduction

The *Kinetic-Energy* $\mathbf{E_K}$ of a moving Material-point, *as this is the Photon*, is stored as motion in its Storage, r = [n.λ/2]with the, n frequencies $\mathbf{f_n}$ = n.$\mathbf{f_1}$, with n lobes and fundamental frequency $\mathbf{f_1}$.

From above is seen the *Passage and The-How EM-Radiation can travel in Crystals*and which are the Cauchy-stress-tensor where E⊥B⊥r ≡ $\boldsymbol{\sigma_1}$⊥$\boldsymbol{\sigma_2}$⊥$\boldsymbol{\sigma_3}$, in-where Energy Propagatesalong Directions *without Birefringence*, and carries the Energy-Storage r, which is *The conveyer.*

Above procedure can be used in Cells, where cells are cases of an Birefringence material and the Resonance-Passage happens as the Force, *the EM-Radiation in Two directions can travel in Cell* through Cauchy-stress-tensor where the two Conveyers E ⊥ B ⊥ r ≡ $\boldsymbol{\sigma_1}$⊥$\boldsymbol{\sigma_2}$⊥$\boldsymbol{\sigma_3}$, can carry the Energy-Storage*,* r, in Cell, and change the Inner-Structure of Cell to another desirable Property.

From Inner-velocity equation v = wr = (2π/T).r = 2π.$\mathbf{f_1}$ r , wavelength λ= cT = c/$\mathbf{f_1}$,cave r = n.[λ/2], then r = n.(c /2$\mathbf{f_1}$) and from

v = w.r = 2π.$\mathbf{f_1}$ [n.c/2$\mathbf{f_1}$] = n.π.c existsv = n.π.c ……………………………..….(4)

showing that velocities in lobes are, n.π, times velocity that of light and for n = 1 then v = π.c, more than three times faster of light velocity. Because of the above velocity v, an E field is produced, and which then produces the $\mathbf{\partial D/\partial t}$ field, which in turn produces the H field and which then produces the $\mathbf{\partial B/\partial t}$ field and which again produces the E field and so on ,i.e.

The total EM-field regenerates itself as it rotates, *a Phenomenon happening in a Propagating Plane Wave in Material-Points only*, and because the Work produced by any motion is stored in its Storage. From the above relation v = π.cis seen a possible way of entering the lobes and which is that of Black-holes. Permeable-Resonance-Path is impossible in an three-times stronger EM-field. Since Resonance happens between the Energy-frequencies of the Harmonic and Forced Excitation a new cave is needed.

VIII. The Energy in Caves

a) The Energy in Atoms

The Electronic Structure of Atoms And Molecules, and Energy- Quantization:

a. As prior referred [54-55] for the First-Rotating-Monad, the common point on *Stress-common-curve* executes circular motion on the Positive breakage of radius, r. Wheel-Loop is a closed Stereo-Slate-Tube for Positive and Negative breakages, and Free to undergo transverse vibrations ,then this gives Odd-numbered harmonics only, and simultaneously as Open-Tube, gives both Odd-and-Even numbered harmonics.
b. Energy of loop or, Energy-Level, become from Rotational-Energy only , therefore issue Mechanical equations of motion, Independently of magnitude,
c. Rotational energy $\mathbf{E_R}$ = r.m.v ….(1) where r = The radius of rotation, m = The mass of inner-motion of particle (it is the reaction to inner change of velocity vector),

v = The tangential velocity to inner central motion,
w = The angular velocity. f = The frequency of motion,

Velocity v = w r , w = 2π/T = 2π f and (1) becomes $\mathbf{E_R}$ = (v/w).(mv) = v² m/w = mv²/2πf = mv² [T/2π] = v² [mT/2π] = v² [h/2π] → because mT = m/f = The stored energy in loop for the fundamental frequency $\mathbf{f_o}$ = 1 , or T =1 and becomes from the relation λ = 2L of the Stationary Waves as this is →

$$\mathbf{f_o} = v \cdot \lambda = v.2L$$

From the definition and the essence of motion, it is either *Displacement* ds = r , or Velocity-vector $\bar{\mathbf{v}}$. Motion may be *Linear or Rotational* for any displacement ,r, so exists a constant-work → k = $\bar{\mathbf{v}}$x$\bar{\mathbf{v}}$.$\bar{\mathbf{r}}$ = v².r. $\bar{\mathbf{n}}$. i.e. Constant-Work = k = v². r = (wr)².r = $[\frac{2\pi}{T}]^2$.r = $\frac{4\pi^2 r^2}{T^2}$. r = $\frac{4\pi^2 r^3}{T^2}$ = 4π^2. $\frac{r^3}{T^2}$ = 4π^2.r³.$\mathbf{f^2_p}$ → or, A Photon during Motion in [MFMF] Chaos, collides with other Photons by means of Cross-Product and produces a constant Work which is stored into the Only-Four *Energy –Geometrical -Shapes*, of the motion which are the Conic-sections. The Interior motion is kept in its Wavelength-Tank 2r = n λ while the Linear motion is continued by the Propagating Electromagnetic-Wave Energy-conveyer.

i.e.

The stored energy in the loop is → $\mathbf{W_1}$ = v² $[\frac{h}{2\pi}]$ = 4π^2.r³.$\mathbf{f^2_p}$, is depending on velocity, v, and Planck`s constant h, or on loop, r , and frequency, $\mathbf{f_1}$. Atoms are compound elements, while atoms of many types combine and make molecules building matter. It was proofed that in Primary particles, *Energy in* n = 1 *loop is* $\mathbf{E_1} = [\frac{4\pi r^2}{3}].\mathbf{f_1}$

As prior referred the Planck length $\mathbf{L_P}$, i.e. *The minimum distance* ≡ *The Granular Space*, can be defined from the fundamental Physical constants, Speed of light, Planck constant, and the Gravitational constant $\mathbf{L_P} = \sqrt{\frac{hG}{2\pi c^3}}$=1,616229.$\mathbf{10^{-35}}$ m = *which agrees with one of the Energy - caves* $\mathbf{L_p} = \mathbf{e^{i.(\frac{\pi}{2}+2k\pi).b}} = \mathbf{L_p} = \mathbf{e^{i.(\frac{\pi}{2}+2k\pi).b}} = \mathbf{e^{-i.(5\frac{\pi}{2}).b}} = \mathbf{e^{i.(-5\frac{\pi}{2}).10}} = \mathbf{e^{-.(78,5398).}}$ = 8,906.$\mathbf{10^{-35}}$m = {$\sqrt{3}$.π. 1,616199.$\mathbf{10^{-35}}$m}. Planck length is one of the too many , *Cave - lengths* , that can be formed in our Energy nature in all levels as in [54-55]. [As 1nm = $\mathbf{10^{-9}}$ m, 1A° = $\mathbf{10^{-10}}$ m and h/2π = 1,616.$\mathbf{10^{-35}}$ eVs, Velocity light is 2,9979.$\mathbf{10^8}$ m]

For a single photon of Red-light with λ = 700 nm = 700.$\mathbf{10^{-9}}$ m, then fundamental frequency $\mathbf{f_o}$ is, $\mathbf{f_o}$ = v/λ = c / λ = 2,9979. $\mathbf{10^8}$ m / 7.$\mathbf{10^{-7}}$ m = 4,283.$\mathbf{10^{14}}$, and the Energy of the first loop (Total) is

$$\mathbf{E_1} = v^2 [\, h / 2\pi \,] = (2,9979)^2.\mathbf{10^{16}}. [\, 1,616. \mathbf{10^{-35}}] = 14 , 524 \text{ eV.s} \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

The How many Negative breakages, *Units* = *Positions*, can be filled, is dependent on the Possible Repetitive Permutations of *Moulds*= *Orbitals* = $\mathbf{R_C}$, Positive $\oplus$ breakages, and Units which are 2 Units and is the maximum number in a Point, i.e. The Possible Repetitive Permutations for Moulds = Orbitals and Units which are 2.$\mathbf{Mould^{Units}}$ = 2.M², for every Mould = Space = Number of Non - coinciding Points , and the available Extrema Positions Units , for M = N = 4 , the Total Positions in Mould is → 2.4² = 32 Position - Units which are the Electrons

in each orbital. All these happen because in Fig.14 *Atom - Orbitals, are the Equilibrium Negative Breakage Energy Stores, in Atom - Model*.

For Neutrons Units is 2N and for N-Mould, and for N = 4 is 2.4 = 8 Position-Units.

Energy of the first Slice-Wheel-Rim or Orbital is distributed to orbit Electron, while energy of the second Slice -Wheel-Rim to the couple of permitted Electrons (2e) of the orbital is as,

$\mathbf{E_1} = v^2\,[\,h/2\pi\,] / \mathbf{R_1}^2 = 1^2 = 1$

$\mathbf{E_2} = v^2\,[\,h/2\pi\,] / \mathbf{R_2}^2 = 2^2 = 4$, and for the, c, Space Number,

$\mathbf{E_C} = v^2\,[\,h/2\pi\,] / Rc^2 = \mathbf{R_C} \,.\, \mathbf{R_C}$

Because any Next-Atom Energy, is equal to Prior + the distributed $[\,\frac{\mathbf{E1}}{\mathbf{Rc^2}} \,.\, \frac{\mathbf{1}}{\mathbf{2.Rc^2}}\,]$ then in, c, cave

Energy in, c, cave orbital is $\mathbf{E_c} = v^2\,[\,\frac{\mathbf{h}}{\mathbf{2\pi}}\,] \;/\mathbf{R_c}^2$ where $\mathbf{R_C}$= Number of Spaces.

Energy of Hydrogen W-Rim.1 $\mathbf{E_1} = \frac{\mathbf{E1}}{\mathbf{1^2}} = 14\,,524$ eV.s

of Helium W-Rim..2 $\mathbf{E_2} = \mathbf{E_1} + [\,\frac{\mathbf{E1}}{\mathbf{1}} \,.\, \frac{\mathbf{1}}{\mathbf{1.2^2}}\,] = \mathbf{E_1} + \frac{\mathbf{E1}}{\mathbf{4}}$

of Lithium W-Rim..3 $\mathbf{E_3} = \mathbf{E_1} + \frac{\mathbf{E1}}{\mathbf{4}} + [\,\frac{\mathbf{E1}}{\mathbf{2^2}} \frac{\mathbf{1}}{\mathbf{2.2^2}}\,] = \mathbf{E_1} + [\,\frac{\mathbf{E1}}{\mathbf{4}}\,] \,.\, \frac{\mathbf{1}}{\mathbf{8}}$ and so on .

For c, W-Rim $\mathbf{E_c} = \mathbf{E_{c-1}} + [\frac{\mathbf{E1}}{\mathbf{Rc^2}} \,.\, \frac{\mathbf{1}}{\mathbf{2.Rc^2}}]$ …….. where, W-$\mathbf{R_C}$= 1,2, … c, Number of W-Rim.

Following above logic all Particles or Atoms are formulated in this Geometrical formula of Moulds, [Space – Anti space - Energy]≡[⊕↔⊖]-[$\bar{\mathbf{v}}$.∇i], *the Breakage Principle, without any Assumptions, or Axioms, or Exclusion Principles, or any other Starting Points.* [54 -55]

Using Energy in loop 1 → $\mathbf{E_1} = [\frac{\mathbf{4\pi r^2}}{\mathbf{3}}]\mathbf{f_1} = v^2\,[\frac{\mathbf{h}}{\mathbf{2\pi}}]$ ← then $8\pi^2.r^2.\mathbf{f_1} = 3v^2.h$, and $r^2 = \frac{\mathbf{3v^2h}}{\mathbf{8\pi^2 f_1}}$, where for Planck Length $r^2 = \frac{\mathbf{3.3^2.6{,}626.10^{-34}.10^{16}}}{\mathbf{8.\pi^2.4{,}283.10^{14}}} = 2{,}2658.\mathbf{10^{-32}}$, the corresponding cave of Photon is, $r = 1{,}505.\mathbf{10^{-64}}$ m →*a cave beyond, in, Gravity length* →$3{,}969.\mathbf{10^{-62}} - 2{,}295.\mathbf{10^{-48}}$m

d... Atoms Mould:

A -It is probably fake than true, that Matter and Antimatter annihilate at rest ,instead of that when Anti-space comes in contact with its regular Space counterpart ,they mutually destroy each other, *decay*, and all of their Energy is converted ,*transformed*, to the *Three Breakages*→ s^2 , $-|\bar{\mathbf{v}}|^2$, $[2\bar{\mathbf{w}}].|s|\,|r|.\nabla i$ ← and for$\bar{\mathbf{v}}$= s ≡ the cave

$[\,s^2\,]$ → is the Real part, *Matter*, of the new monad, and is *a Positive Scalar magnitude*.

$-[\,s^2\,]$ → is the always Negative part, *Anti-matter*, which is always *a Negative Scalar magnitude*.

$2\,s^2.\nabla i$ → is the double Angular-Velocity Term, *The Energy Term*, which is *a Vector magnitude.*

The Breakage – Principle, is the way of Energy conservation, *where Energy never annihilates and which is always reverted into* → the *two Opposites* (± w) *and an Neutral Part*2 .∇i← or as *Matter*(+ w =s^2), as *Antimatter* (- w = s^2) *and as Energy part*2L = $\bar{\mathbf{B}}.\bar{\mathbf{w}}$.

All above issue for Quaternion ≡ monads which follow the *Breakage Principle*

B–Stationary Fragments → $[-s^2+s^2]$ = [MFMF] = *The Chaos*, is the base for all motions. Because Pure energy happens at s = 0 where then $2[\bar{\mathbf{s}}]^2.\nabla i = 0$, i.e. $\nabla i \neq 0$ or $[\nabla i]^2 \neq 0$, meaning that *Energy as motion* is as Electromagnetic wave only without the energy-store. In this case, *Matter,* looks like, is moving perpendicularly to *Energy vector as Anti-matter*, without annihilate each other.

Photon is a Wave and Particle in all Levels, of Energy-magnitudes, and thus traversing gaseous-media of any Temperature experiencing redshift without losing energy, *because Energy is stored in Photons lobes which are continuously filled*. Redshift happens because of the in staneous wavelength-amplitude happening by the excitation due to interactions where some lobes-resonances will be excited. Star-light passing near the Sun is bending because of its refraction in the dense-Sun, and of Newton`s gravitation, while Red-shift happens as low f and-Blue-shift, as high f being as Particle and Wave.

The base of motion $[-s^2+s^2]$ = [MFMF] is of the Spin $\bar{\mathbf{B}}$ of the infinite Stationary-Pointy-Material-points. Because of the chains of Spins, is thus created a Magnetic field due to LRC-circuit and which is tuning to the critical Quantum-critical-State $\mathbf{g_G}$.The chains of Spins are pointy vibrating with their characteristic frequencies $\bar{\mathbf{w}} = 2\pi f = \frac{\bar{\mathbf{v}}}{\mathbf{r}} = \frac{\boldsymbol{\sigma}}{\mathbf{2r}}[1+\sqrt{5}]$following the *Golden-ratio-Pattern on stresses* and then, Quantum energy $\mathbf{g_G}$ produced, is the State

causing them to Magnetically-Resonate. The Back-Up Electromagnetic current is flowing in opposite direction by changing the Spin direction of the Sector-Material-Points.

C-*Energy is the motion of the* [⊖↔⊕]≡[Space ↔ Anti-space] charge, *as is the Electrostatic force*, in the N loops which *as Work can be stored in the,* n*, Energy loops of the Stationary Wave of cave,* r. The N loops are the Energy-Stores in M-P, and *mass the Reaction* to the *Up - Down oscillatory motion in Loop* of each wave Segment at frequency, $\mathbf{f_n}$, which describe each *mode* and characterized by a different λ and f. This happens because of charges alternation [+, - to - , +], i.e. (AC) which exists on Antinodes amplitude of this *Inverse* oscillation.
As prior referred frequency, $\mathbf{f_n}$, is the Golden ratio frequency creating the whole universe.

All monads can immediately be other monads with different frequency, f, by following the *Breakage rule* → $s^2 - |\bar{\mathbf{s}}|^2 + 2|s|^2.\nabla i$ ← i.e. matter (+), antimatter (-), energy (+ -) or, *Material Point* A- $\mathbf{K_R}$ ≡ monad ≡ Dipole ≡ [⊕⊖] = ∅=$\mathbf{K_r}$ **A** $\mathbf{K_{R=r}}$*where* →{ $\mathbf{K_R}$≡ [⊕]}↔{ $\mathbf{K_r}$≡ [⊖] }→ ≡ 0 . i.e. *motion Kinetic - energy in stores*, *happens in antinodes-regions as vibrations or movement in lobes* .

From relation, c.$\mathbf{L_s}$ = $\mathbf{L_v}$ the *Light-velocity-moving-Store*3.$\mathbf{10^8}$m/sentering cave1.$\mathbf{10^{-42}}$m =3.$\mathbf{10^{-34}}$ m²/s *becomes the Cave-Energy-Rimi.e. the Energy-Storage of light as velocity,* v *, Enters in cave* 1.$\mathbf{10^{-42}}$m, *and becomes the Constant-Energy-velocity-Plane-cave* and equal to 3.$\mathbf{10^{-34}}$m²/s.

This quantity is constant in Planck`s scale cave $\mathbf{10^{-34}}$ m and exists, in Plane Rims, becoming from the continuous *Central - Rotation of masses* in scales. It is shown in, *Kepler`s third law*, that this constant is k = $[\frac{\mathbf{4\pi^2 r^3}}{\mathbf{T}^2}]$ =$4\pi^2.r^3\mathbf{f_e}^2$, where for the Sun-Earth-Rim Semi-major-axis, r = 15.$\mathbf{10^{10}}$ m, the period T=1year, then the Energy is in Plane-Sun-Earth Rim k = 3.$\mathbf{10^{-34}}$ m.

This result issues for the moving energy stores which enter in caves under the Planck`s level and create the Plane – Energy-Rims in all Energy-levels.

IX. Summary

a) *The Discrete Chaos*

1. Material points become from the Un-clashed Matter ⊕, and Anti-matter ⊖ through O, which is the Stationary [MFMF] ≡ [-$|\bar{\mathbf{s}}|^2$, +$|\bar{\mathbf{s}}|^2$] ≡ CHAOS, where the two opposite spaces , *come in contact*, according to the *Glue-Bond-Principle* and Not by *Forced-collision*, which happens in STPL mechanism.
2. The *Circular motion* of ⊕ space, to ⊖ anti-space creates in Material point, the Angular momentum vector $\bar{\mathbf{B}}$ and angular velocity vector $\bar{\mathbf{w}}$, related to the Total Work W, according to formula 2W = $\bar{\mathbf{B}}\bar{\mathbf{w}}$, and was proved that vector $\bar{\mathbf{B}}$is the Spin of particles [63]. Work W is the produced energy E in material point and it is the eternal motion of [⊕↻↺⊖] charge, which is trapped in the N lobes of the material point, *as the Up-Down oscillatory motion in loops*, of each Wave-Segment, at frequencies, $\mathbf{f_n}$,which describe each mode characterized by a different λ and f. Inward wavelength λ, Energy is stored as a stationary Energy - cave while Outward as the Spin of particles. The Work produced from this eternal motion is conserved in lobes and can be transferred anywhere and in case of absorption, is substituted by the in lobes motion.
3. The *Cycloidal rotation* of⊕ space, to ⊖ Anti-space creates in Material point as in circular motion *Spin = Vector* $\bar{\mathbf{B}}$≡ $\frac{\mathbf{2W}}{\bar{\mathbf{w}}}$, and *additionally* because of Centrifugal acceleration, is created the *Skin-effect*, which is the tendency of the alternating Electric current (AC) to become distributed within the material point at the *common-point-of-bonding*, and this because of *Principal-Stress* σ=ρ ,[59]. At the very high frequencies the thin layer of material point (λ= 0 → 3,969.$\mathbf{10^{-62}}$m) carries most of the Electromagnetic force as this is from Maxwell`s equations in complex form ∇ x E =- j.w. B and ∇ x H = J, and since, E = J/σ and H = B/μ , then ∇ x J = - jwσ. B , ∇ x B = μ J which give the Skin-depth d = $\sqrt{\frac{\mathbf{2}}{\mathbf{w\mu\sigma}}}$ Spin (m) So , *because of the Skin effect*, Kinetic-Energy moves *Outward the cave*, as an Electromagnetic Wave and this because is consisted of the → Space ≡ Electric Field , Anti-space ≡ Magnetic Field which are perpendicular each other and thus no Work is produced ,and of the Energy part which is *the Energy tank*, *the energy cave* λ , with zero conductivity ← and all Breakages travelling with light velocity. With this way are created the Photons and the other Energy Particles as Gauge Bosons and the exceeding the light velocity particles of [MFMF] field. In case of r <$\mathbf{L_p}$ = 1,616199.$\mathbf{10^{-35}}$m, Electromagnetic wave occupies the velocity of $\mathbf{C_c}$ = 3.$\mathbf{10^{10}}$m/s in order to exist the conservation Total Energy Principle. It was shown that from Inner-velocity equation v = wr = (2π/T).r = 2π.$\mathbf{f_1}$ r, wavelength λ= cT = c/$\mathbf{f_1}$, cave r = n.[λ/2] , then r = n.(c /2$\mathbf{f_1}$) and from

$$v = w.r = 2\pi.\mathbf{f_1}\ [n.c/2\mathbf{f_1}] = n.\pi.c \text{ exists} v = n.\pi.c \quad \text{.......................................(4)}$$

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showing that velocities in lobes are, n.π, times velocity that of light and for n = 1 then v = π.c, more than three times faster of light velocity . i.e. Each , n, lobe in Material point occupies the velocity $v = n\pi c = n\pi\,(2rf) = n(2\pi r)f$, *needing* n(2$\pi$r) *times energy to be zipped*, *with draw*.

4. For the circular rotation in wavelength λ, of the material points exists the stationary wave in loops with Spin $\overline{\mathbf{B}}$ which is getting Out the wavelength and is *locally-equilibrium* by this eternal - rotation. With this way are produced all Positive (+) and Negative (-) particles according to the Spin direction, as the Flavours and Leptons. For Primary particles under Planck`s length, the local-equilibrium of $\overline{\mathbf{B}}$ vector creates the ocean of [MFMF] ≡ Chaos in where exists the Gravity force.
5. In case of the Compound particles (*the Not Primary particles*) as the Bohr model of atoms, Breakage principle is still existing, *particularly* on each of the three Constituents and *on the all* Total formation as
   Nucleus ≡ ⊕ ≡ The Space ≡ The matter → and the equal in charge counterpart
   Electron ≡ ⊖ ≡ The Anti-Space ≡ The Anti-matter → and the Energy loop as,
   Orbitals ≡ [⊕↔⊖] ≡ [∅] denoting the constant-Energy-tanks-Rims of atom following Kepler laws.

It was shown in [65] that frequency-equation $\sin\frac{w.l}{c} = \sin\frac{2rw}{v} = 0$ is satisfied by $\frac{2rw}{v} = \pi$, 2π, 3π, nπ, *Each,* n, *represents a Normal -Mode -Vibration* with natural frequency determined from equation, Natural frequency →

$$f_n = \frac{n}{2.l}c = \frac{n}{2.l}.\sqrt{\frac{T}{\rho}} = \frac{n}{2.l}\sqrt{\frac{\sigma}{\rho}} = \frac{n}{4r}\sqrt{\frac{\sigma}{\rho}} = \frac{n}{4r^{3}}.\sqrt{\frac{(1+\sqrt{5})^2\sigma^2}{4\pi^2 r4}} = [\,n\frac{\sigma(1+\sqrt{5})}{\pi\,(2r)^3}] \quad \ldots\ldots\ldots (9)$$

When n = 1 we have the fundamental mode $f_1 = [\frac{\sigma(1+\sqrt{5})}{\pi\,(2r)^3}] = [\frac{(1+\sqrt{5})}{2}]\,[\frac{\sigma}{8.r^3}]$, *a Golden ratio frequency* or from E = h f*the ubiquity Golden ratio Energy* in nature, when n = 2 we have the second mode $f_2 = 2.[\frac{\sigma(1+\sqrt{5})}{\pi\,(2r)^3}] = 2.f_1$, with a node at the center, when n =3 we have the third mode $f_3 = 3.[\frac{\sigma(1+\sqrt{5})}{\pi\,(2r)^3}] = 3.f_1$ with two nodes on both sides of the center etc. resulting to the Mode-Shape-Diagram. Above property and because motion in , *contour of equal heights loops*, is the Downward and Upward motion of opposites from axis-lobe, defines theWHY *Photon is an Endless Store of Energy*.

Energy in n = 1 *loop* → $W = [\frac{4\pi r^2}{3}].f_1$*and for the*$n^{th}$→ $W = [\frac{4\pi r^2}{3}]\,.f_n = n\frac{(1+\sqrt{5}).\sigma r}{3}$ and *Total Energy in* n = n *loops*→ $W = [\frac{4\pi r^2 f1}{3}]$. n.(n+1) where n = 1,2,3,4… n .... ∞

The Work in n = 1 loop is $W = [\frac{4\pi r^2}{3}].f_1 = [\frac{4\pi r^2}{3}]\frac{(1+\sqrt{5}]).\sigma}{4\pi r} = \frac{(1+\sqrt{5}])\,r.\sigma}{3}$ which is only dependent on cave, r, and Glue-Bond ,σ, and for n = n loops $W = [\frac{(1+\sqrt{5}])\,r.\sigma}{3}]$ .n. ……………………………………………………..….(w)

Above equation (w) defines the HOW, *conservation law of Energy in Photon is working, and it is an Index for future Energy-Sources-Technology attempt*.

It was proved that Energy of wave is , → $E = m.\dot{y}^2 / 2 = (m/2).(-w)^2.A_0$, and $m = \frac{2.E}{r.w^2}$i.e.

Mass of cave, r, is → $m = \frac{2.E}{r.w^2} = \frac{2.\overline{B}}{r.w^2} = \frac{W}{r.w^2} = \frac{(1+\sqrt{5}])\,4r^2\sigma}{6r\sigma^2\,(1+\sqrt{5})^2} = \frac{2\,r}{3\sigma\,(1+\sqrt{5}]} = [\frac{4\pi r^2}{3}].f_1$ …………………………….....(12)

Equation (w) *denotes Energy in all Volume while* (12) *in all Surface of the Material-point.*

The frequency of Photon with light velocity v = c = 2πr.f is → $f = \frac{v}{2\pi.r} = \frac{3.10^8}{2\pi.3{,}5610^{-14}} = 1{,}34.10^{21}$ Hz . From Photon and (12), mass → $m = [\frac{4\pi r^2}{3}].f_1 = 4{,}18879.[86{,}73.10^{-56}].(1{,}34.10^{21}) = 4{,}868.10^{-33}$ Kg i.e. *Photon has a frequency*$f_{Ph} = 1{,}34.10^{21}$ Hz *and mass*$m_{Ph} = 4{,}868.10^{-33}$ Kg .

In *Gravity- length- caver* $=3{,}969.10^{-62}$→mass is $m = [\frac{\overline{B}.\overline{w}}{\overline{B}x\overline{w}}].J = \frac{1}{1}J = \frac{\pi r4}{2} = 248{,}156.10^{-248} = 2{,}482.10^{-246}$ Kg andfrom Energy equation E = mv²/2 , velocity v² = 2E/m = $\frac{2.1{,}22910^{21}\,Joule.}{2{,}482.10^{-246}\,Kg} = 0{,}94.10^{146+21=267}\,\frac{Kg.m^2}{Kg.s^2}$ $=9{,}4.10^{266}$.(m/s)² , *and the velocity of Photon in Gravity- length-cave* is $v_G = \sqrt{2E/m} = 3{,}066.10^{133}\,\frac{m}{s}$, a velocity Sixteen times faster than that of light and,

$$\textit{Total - Energy}\rightarrow E_T = E_R + E_K = \frac{\pi c^2}{8}r^2 + \frac{1}{2}m.v^2 = 3{,}535.10^{16}.\ r^2 + 1{,}229.10^{21}\,\textit{Joule} \quad \ldots\ldots\ldots (c)$$

Mass of elementary particles is $m = \frac{E}{2r^2.w^2} = \frac{J.w^2}{2}.\frac{1}{2r^2.w^2} = \frac{J}{4.r^2} = \frac{\pi.r^2}{16}$, i.e. dependent on radius of cave.

From above, Energy is the Work, The motion in *Stationary-Waves-Lobes* , which consist the energy-stores of Particles, and in case of Photon is a *Moving-Energy-Lobes-Radiation-Wave*. markos 6/4/2016

6. Generation, ***Δημιουργία***, Transmission, ***Μεταφορά***, Emission, ***Εκπομπή***, Diffusion, ***Διάχυση***, and Absorption, ***Απορρόφηση***, of *Potential and Kinetic Energy.*Fig.4

Generation of Potential and Kinetic Energy:

Question ?? Where, How and of What is generated? Answer,

Energy, Spaces $\mathbf{q^w}$and Anti-spaces$\mathbf{q^{1/w}}$, consist the *Granular-Vacuum* of Spaces in all levels.

In-between, Spaces$\mathbf{q^w}$and Anti-spaces$\mathbf{q^{1/w}}$ consist the *Absolute-Vacuum* of Spaces in all levels.

The eternal rotation of the ⊕ constituent on the ⊖ constituent due to Glue-Bond, σ, and with the constant angular velocity$\bar{\mathbf{w}}=\frac{\bar{\mathbf{v}}}{\mathbf{r}}=\frac{\boldsymbol{\sigma}}{\mathbf{2r}}[1+\sqrt{5}]$ creates *Material-Point*$\boldsymbol{KK_1}$, which is the *first Energy-automobile-monad of this cosmos*. From the definition of Work, W = *Work* = *Force* x *Displacement* = *Energy,* results the where this Energy, *as Momentum Vector* $\bar{\mathbf{B}}$≡ *Spin* ≡ *Energy,* is stored. It is in the r, cave of $\mathbf{KK_1}=\bar{\mathbf{q}}=[s+\bar{\mathbf{v}}\nabla i]$ as *Potential Energy*. Cave, r, IS, *Inward a Stationary Wave*, with infinite Lobes = Stores ≡ The Frequencies$\mathbf{f_1}....\mathbf{f_n}\rightarrow\mathbf{f_\infty}$which follow the *Stationary–lobe-Principle* with Energy part, *The Potential Energy*, E = W= $[\frac{4\pi r^2}{3}]$.$\mathbf{f_n}$= n$\frac{(1+\sqrt{5}).\boldsymbol{\sigma}\mathbf{r}}{3}$, and which is the motion in lobes.

In case of *Cycloidal rotational motion*, which is Isochronous, the acceleration $\ddot{\mathbf{x}}$ = - w^2 $\dot{\mathbf{x}}$ where w = 2π/T, produces the *Skin-effect* at *common-point-of-bonding*, this because of *Principal-Stress* σ=ρ from the Up - Down Oscillatory motion in Lobes, and thus produced an Electromagnetic Wave in the Outer Cave ≡ Loop, and *Kinetic Energy as EM radiation*, is travelling with light velocity c.

Transmission of Potential and Kinetic Energy:

Question ?? What is, How and Where is transmitted ? Answer,

Energy which is *motion as frequencies* n = 1 … n, in lobes ≡ Stores of cave 2r = λ wavelength , *consists the Potential Energy* of monad λ, for the Stationary Primary-Particles, while *EM radiation* as Electromagnetic Wave , is the *Kinetic Energy* part, the transporter, the conveyer.

Electromagnetic Wave follows the *Breakage -Principle* as Electric-field ≡ *Space*⊥ Magnetic-field ≡ *Anti-Space* and *Energy-part*≡ E = $\frac{\boldsymbol{h.c}}{\boldsymbol{\lambda}}$for the PlanckScale and for $\mathbf{v_G}>>c$ for Under-Planck-Gravity- Scale. Transmission as *EM radiation* occurs in the In-between Spaces$\mathbf{q^w}$andAnti space s$\mathbf{q^{1/w}}$ consisting the *Absolute-Vacuum* of Spaces in all levels and as Diffusion inEnergy Spaces $\mathbf{q^w}$andAnti-spaces$\mathbf{q^{1/w}}$, consisting the *Granular-Vacuum* of Spaces in all levels also.

From mechanics, Energy as motion of Forces is Diffused → as below,

7. *To Elastic material Configuration*, as *Strain energy* and is absorbed as *Support Reactions* and Displacement field $[\nabla\boldsymbol{\varepsilon}\ (\bar{\mathbf{u}}\ ,\bar{\mathbf{v}}\ ,\ \bar{\mathbf{w}})]$ upon the deformed-placement where these alterations of shape by Pressure or Stress is the equilibrium-state of the Configuration $G.\nabla^2.\boldsymbol{\varepsilon}+[m.G/(m-2)].\nabla[\nabla.\boldsymbol{\varepsilon}]=F$, a relation between *Forces* (F) and *Displacement field* $[\nabla\boldsymbol{\varepsilon}\ (\bar{\mathbf{u}}\ ,\bar{\mathbf{v}}\ ,\ \bar{\mathbf{w}})]$ *through Catalysts*, G, m, where G = shear-modulus = E.m/2(m+1), m = Poisson ratio = 1/μ ≈10/3, and Laplace symbol →

$\nabla^2=\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}+\frac{\partial^2}{\partial z^2}$.In [25-27] are presented Cauchy equations and the Energy-Principles followed by the, *Math Theory of Elasticity*, concerning Work = Force x Displacement and the Stability as,

1. The demand of conservation of stability between the exerted forces (and gravity F), and the tensions that are applied on an infinitesimal unit volume and satisfy the equilibrium equations.
2. The conservation demand of the geometrical continuum (ρ = mass density) during the Elastic (E=Young modulus) Deformation and also the principle of conservation of the angular momentum.
3. The Elastic constitutive equations, where Hookeℑs law represents the material behavior which relates the unknown stresses and strains (Cauchy-Navier equations of Virtual work for solids).

8. *To Solid material Configuration*, as *Kinetic* (*Energy of motion* $\bar{\mathbf{v}}$) and *Potential* (*Stored Energy*) energy by displacement (*the magnitude of a vector from initial to subsequent position)* and rotation, on the principal axis (*through center of mass of the Solid*) *as ellipsoid*, which is mapped out , by the nib of vector $(\boldsymbol{\delta}\bar{\mathbf{r}}c)=[\bar{\mathbf{v}}\ c+\bar{\mathbf{w}}.\bar{\mathbf{r}}.\ n]\ \boldsymbol{\delta}t$,as the Inertia ellipsoid [*Poinsot's ellipsoid construction*] in (AF) which instantaneously rotates around vector axis $\bar{\mathbf{w}}$,φ with the constant polar distance $\bar{\mathbf{w}}.Fe/|Fe|$ and the constant angles $\boldsymbol{\vartheta_s},\boldsymbol{\vartheta_b}$, traced on, Reference (BF) cone and on (AF) cone ,which are rolling around the common axis of $\bar{\mathbf{w}}$, vector, *without slipping* , and if $\mathbf{F_e}$, is the Diagonal of the Energy Cuboid with dimensions a,b,c *which follow Pythagoras conservation law*, then the three magnitudes (J,E, B) of Energy-state follow Cuboidal, Plane, or Linear Diagonal direction, and if Potential Energy is zero then vector $\bar{\mathbf{w}}$ is on the surface of the Inertia Ellipsoid.

Emission of Potential and Kinetic Energy:

Question ?? What, How and Where is Emitted ? Answer,

Potential Energy which is motion is trapped in caves or lobes, and needs a Mechanism, *a Medium*, between The A - Phase and B – Phase motion, i.e. is needed a Catalyst containing both Phases. How is this *Mechanism*, called Catalyst = C ?

Catalyst in Nature

Nature needs a Regulative valve for Programming the task which is the transformation of a substance of *Activation-Energy-monad-A-Phase*, to another substance, *Reactive-Energy-monad-B-Phase*, by changing Energy to another Energy consumption without alternating the Equilibrium-State as schema A ← C → R From above, Catalyst must contain what A and R contain independently of Energy-Level, as *Catalyst for*

1. Energy-caves *Is the Resonance* of EM-Radiations as Electromagnetic-Waves between the caves.
2. Material-Point *Is* the *Stress-common-curve* where exists $\sigma = \rho \cong$ f.
3. Moving Primary Particles *Is the Resonance* of EM-Radiations of the moving Waves with the Fundamental Harmonic of the Energy-stores of the other moving or not Particles.
4. Sub-atomic and Atoms *Are* the → *Photo, Electro, Nano* ← Catalyst PLUS all priors.
5. Inorganic-Molecules *Are* the lattice → *Electric field, Magnetic field* ← Catalyst PLUS all priors
6. Organic-Molecules *Are* the → *Chemical Waves*, Homogenous ← Catalyst PLUS all priors.
7. Biochemical reactions *Are* the → *Enzymes*, Bio, Organo ← Catalyst PLUS all priors.
8. Compound Elements *Are* the lattice → *Crystal*, *Cells*, *Enzymes* ← Catalyst PLUS all priors etc.

while *EM radiation* as Electromagnetic Wave, is the *Kinetic Energy* part .Electromagnetic Wave follows the *Breakage-Principle* as Electric-field ≡ *Space*⊥ Magnetic-field ≡ *Anti-Space* and *Energy-part* ≡ E = $\frac{h.c}{\lambda}$ as work W = 2L = $\bar{\mathbf{B}}.\bar{\mathbf{w}}$= J.w^2, for the Planck Scale.

Sound is a vibration, a Signal, *linear as* K ≡ [⊖] ↔ $\mathbf{K_1}$≡ [⊕], that typically propagates following the *Breakage principle*, as *an audible wave of pressure converted to E-Voltage*, *conservation law of Energy* through a transmission medium, *material monads as composition of opposites or following the Breakage* Principle, such as gas, liquid or solid. The Signal is converted, transmitted to receiver and reconverted. A Digital Signal is a Signal that is constructed from a discrete set of wave forms of a physical quantity so as to represent a sequence of discrete values which is succeeded by a discrete space of a topological chart The Golden-ratio-frequency in Sound happens for *Resonant note* A at 432 Hz between the prior 267 Hz and 699 Hz frequencies of the Harmonic and the Forced Excitation.

Enzymes are *Catalysts*, i.e. *make the Chemical reactions go faster but not consumed.*

Enzymes are Proteins that act as Catalysts in the Biochemical reactions. They break molecules into smaller, absorb and combine (build up) molecules and Finally *release-energy* (ATP) . By changing molecules smaller or bigger or turn other molecules into another Finally *capture-energy*. i.e. *Nature changes energy by transforming a Substance into Another-Substance*, energy consumption.

By changing shape, Permanently or Temporary, can become Stores of Energy and be best working in an optimum Temperature, *a critical*, and also on PH.

9. Diffusion of Potential and Kinetic Energy:

Question ?? What, How is done and Where is Diffused ? Answer,

Motion in Spaces $\mathbf{q^w}$and Anti-spaces $\mathbf{q^{1/w}}$, consists the *Granular-Vacuum* of Spaces in all levels. *Motion* in Material-Points, *is as frequencies* $\mathbf{f_n}$and n = 1 ... n, are the first Energy-automobile-monads.

The Motion in Elastic material Configuration, as *Strain energy* is absorbed as *Support Reactions* and Displacement field $[\nabla \boldsymbol{\varepsilon}\ (\bar{\mathbf{u}}, \bar{\mathbf{v}}, \bar{\mathbf{w}})]$ upon the deformed placement where these alterations of shape by Pressure or Stress is the equilibrium-state of the Configuration $G.\nabla^2.\boldsymbol{\varepsilon} + [mG / (m-2)] .\nabla [\nabla. \boldsymbol{\varepsilon}] = F$.

Motion to Solid material Configuration, as *Kinetic* (*Energy of motion* $\bar{\mathbf{v}}$) and *Potential* (*Stored Energy*) Energy by displacement (*the magnitude of a vector from initial to subsequent position)* and rotation, on the principal axis (*through center of mass of the Solid*) *as Ellipsoid*, which is mapped out , by the nib of vector $(\boldsymbol{\delta}\bar{\mathbf{r}}c) = [\bar{\mathbf{v}}\ c + \bar{\mathbf{w}}.\bar{\mathbf{r}}.\ n]\ \boldsymbol{\delta}t$, as the Inertia ellipsoid [Poinsot's ellipsoid construction]. i.e. *Motion in Spaces* is done by the three Breakage-Substances, that *of Matter* which is the Electric-field that *of Anti-Matter* which is the Magnetic-field, and that *of Energy-Part* which is the Energy-Store $\boldsymbol{\lambda}$.

When a Part meets another moving substance then *Motion is continued* with the same velocity and by their in-between *Resonance*while their *Harmonic Energy part* is added. When a Part meets another obstacle in the way, then is Diffused as above.

Absorption of Potential and Kinetic Energy:

Question ?? When, How is done and Which is Absorbed ? Answer,
Since Potential-Energy is *motion as frequencies* $\mathbf{f_n}$ and n =1 … n, in lobes of wavelength, λ,
Absorption *as the opposite of transmission* , may occur only in Primary particles if λ, changes.

In compound Particles or molecules when exist *Refrigerator-system* where Heat energy travels in only one direction, from a warmer to a cooler, *or transferred by virtue of a difference in temperature*, object, substance or area. The Refrigeration-cycle is based on the known physical principle that of a liquid is expanding into a gas, extracts heat from the surrounding substance or area *or* as above referred*, the is odynamous Breakage-Principle*, where the two opposites follow the Expansion into gas and Energy Part the Absorption or Transmission energy, *transferred by virtue of a difference in temperature*, i.e. *Breakage-Principle*, is followed for Absorption of energy, and issues for all energy levels. *For travelling Waves*, the high and low points, *crests and troughs*, in the transverse case, OR in the longitudinal case where *points are compressed or stretched*, travel through the Medium which is their wavelength $\lambda = 2r$ .Waves transfer energy but not mass .

Because Energy in wavelength is as *Natural-frequencies*, that energy be fed into this system is the appropriate frequency condition, known as *Resonance* identified by increasing in amplitude. The Set of all possible standing waves are the harmonics of the Systems and simplest *Fundamental one*. Absorption occurs in a wave when the *Amplitude of the Standing wave* is much larger than the *Amplitude of another Disturbance diving it*. Accumulation into that with the greater energy is because follows *The Stationary-Wave-Nodes-Principle*. This ability to amplify a wave of one particular frequency over those of any other frequency, *Fundamental frequency plus its multiples*, has numerous applications in musical instruments and others, by amplifying which due to resonance of some selected frequencies. [65B]

b) Dark – Matter and , Dark – Energy: [43]

Dark-matter becoming from the center ,O, of Common-circle where there ,v = 0 , and is ($\pm$ c.s²) moves with the constant light velocity, $\bar{\mathbf{c}}$, and is composed of the two opposite signed elements , (+cs²) , (-cs²) , and Dark - Energy [$\bar{\mathbf{c}}.\nabla$i] moves also with the same velocity of light, so is continually effecting *on the two* fragments separately and are slinging them further, formulating the attracting, *the mixture of the spherical opposite signed elements*, highlights, *while* dipole, form the heavy and massive invisible dark matter which repel, *the dipole energy blobby volumes as the* massive Dark – Fringes. The parallel motion of this mixture, *not parallel universes*, is the rolling on Gravity field as the Base *of expanding.* Using Kepler`s laws and Newton`s laws of motion is possible to define the What is Dark-matter and Dark-energy and Why these are so defined. A wide analysis of both and that of Black-holes in [73].
The [*Geometrically Rolling*, *Moved mixture* DM-DE] *Expansion* for the constructing universe. [56]

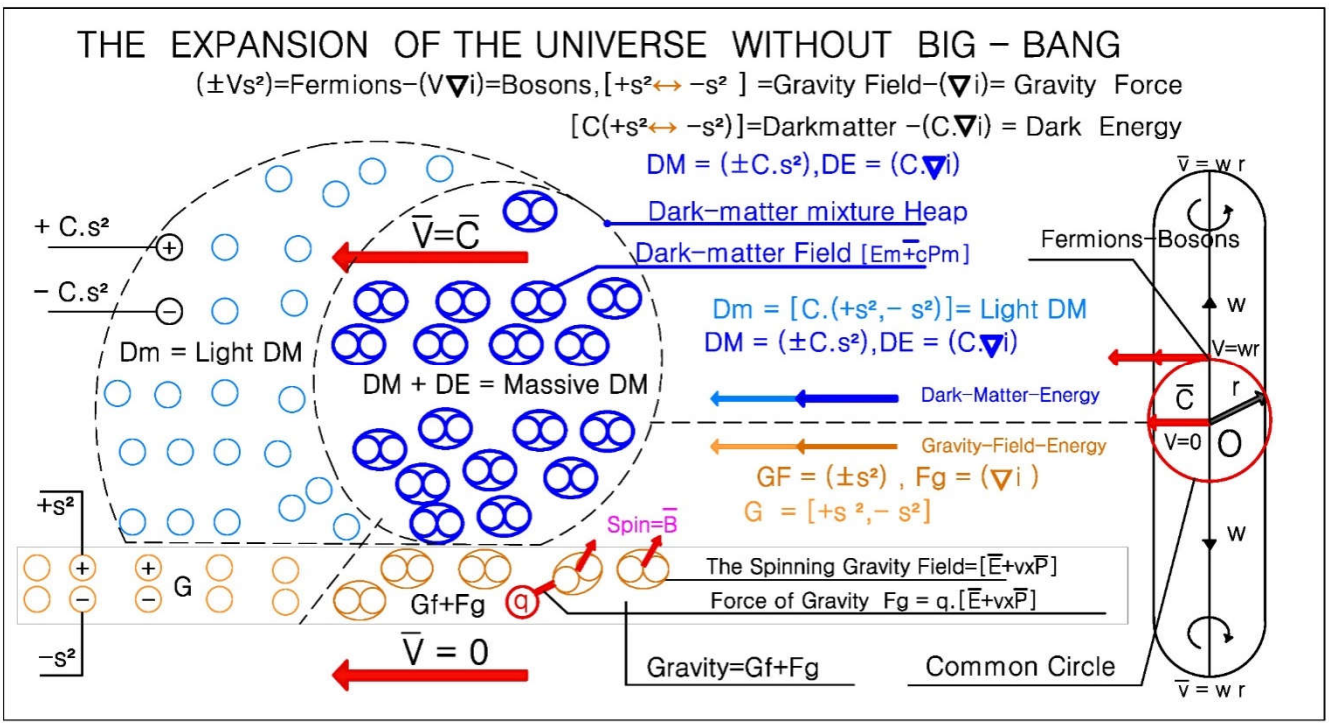

Figure 24: The Expansion of the Universe, without *Big-Bang*

The Cause Expansion of the Universe, is the continuous and simultaneous Rolling of mixture Heap [DE-DM], *The Fragments Heap*, on the Rest Gravity-field [$\mathbf{G_f}+\mathbf{F_g}$] as the Base of rolling.

The three properties of Dark-matter [DM] are → [(+c.s²),(-c.s²),(±c.s ²)] and Dark-energy [DE] →[$\bar{\mathbf{c}}$.∇i] Since [DM] = ±$\bar{\mathbf{c}}$.s², is of opposite signed (±), then consists the Dipole,[|+c.s²|↔|-c.s²|] = |λ| ≡ [|+c.($\bar{\mathbf{w}}$.r)²|↔|-c.($\bar{\mathbf{w}}$.r)²|] of Dark matter which is a more massive base than that of gravity, *and this because of ,*c, so issues DM field = [$\mathbf{E_m}$+ $\bar{\mathbf{c}}$.$\mathbf{P_m}$] = [$\mathbf{c}.\mathbf{E_g}$+ $\bar{\mathbf{c}}^2$.$\mathbf{P_g}$] and as this is also a Stationary field then follows equation $\mathbf{E_m}$= 2.A.c.$\mathbf{sin}(\frac{2\pi}{\lambda}).\mathbf{cos\,wt}$ where $\mathbf{P_m}\perp\mathbf{E_m}$. Since also the tiny volume of wavelength |λ|≡[|+c.s²|↔|-c.s²|, consists a, *sink*, then DM attracts and it is an infinite ocean in all universe .

Since also Dark energy is effecting then, DE = q . [$\mathbf{E_m}$+ $\bar{\mathbf{c}}$.$\mathbf{P_m}$] align with the field, so on [DM] dipole [$\mathbf{E_m}$+ $\bar{\mathbf{c}}$.$\mathbf{P_m}$] exist also a torque (τ) and in this way [DE] repels.

Dark-energy [$\bar{\mathbf{c}}$.∇i] acting on the three constituents of [DM] = [(+c.s²) ,(-c.s²) ,(±c.s²)] separately and being also a non-uniform field, then is not canceled but is a pushing force, i.e. *DE is influencing as an expansion of the universe* . Because [DE] is a stationary force on [DM], so is exerting a very strong gravitational pull on gravity field (participates in gravity). Action of Dark matter, Dark Energy is, [DE] © [DM] ≡ [$\bar{\mathbf{c}}$.∇i] ©[DM] → [$\bar{\mathbf{c}}$.∇i].(+c.s²), [$\bar{\mathbf{c}}$.∇i].(-c.s²) , [$\bar{\mathbf{c}}$.∇i].|(±c.s²)| = [$\bar{\mathbf{c}}$.∇i].[|+c.s²|↔|-c.s²|] , and Results to,

1. DM → [|+c.s²|↔|-c.s²|] attracts and DE → [$\bar{\mathbf{c}}$.∇i]repels and not competing.
2. DE is exerting a pull and gravitational pull on all visible matter on the largest universe cosmic scale.
3. DE by exerting pull on DM → [$\bar{\mathbf{c}}$.∇i].(+c.s²) and on [$\bar{\mathbf{c}}$.∇i].(-c.s²) *highlights* , and on → [$\bar{\mathbf{c}}$.∇i].[|+c.s²|↔|-c.s²|] the Darkness which is the tiny energy volume consisting the dipole of dark matter, *and formulates the massive Dark Fringes and this because are not particles*.[41] Dark-matter becomes from the *Effective-Potential-energy* in a Central-motion and from Kepler constant k = 4π².r³.$\mathbf{f_P}^2$, or 1 = [$\frac{4\pi^2}{k}$]r³.$\mathbf{f_P}^2$ or → 1 = c. r³.$\mathbf{f_P}^2$ which is the dipole[|+c.s²|↔|-c.s²|] and attracts . *The Cause Expansion of the Universe, is the continuous and simultaneous effection of Dark-Energy* DE= [$\bar{\mathbf{c}}$.∇i] *on all Five Energy-Fragments with light velocity*$\bar{\mathbf{c}}$,*as* [$\bar{\mathbf{c}}$.∇i] →{(∇i),(+s²),(-s²),(+cs²),(-cs²)} *which is the rolling Heap . Energy Quantities* [∇i = 2(wr)²], *in the rolling Heap, acting on the dipole breakages* [± s²] *formulate the Gravity-Field and Gravity-Force while acting on dipole breakages* [±$\bar{\mathbf{c}}$.s²] *formulate Dark matter*, DM, *and Dark Energy* , DE, *respectively, while* DE acting on Baryons*, Leptons and Quarks Anti-Leptons and Anti - Quarks, Bosons, formulate the whole existing Material worlds*.
4. DM and DE are not visible because both travel with light velocity and so light is not interacting with them. Light, photon, *which is a particle and wave*, is interacting with the Rest Gravity field and all others with less velocity and so are detectable . Only velocities greater than that of light, *or a New simultaneity mechanism* , can make them visible. These velocities exist into Material points. From Inner-velocity equation v = wr = (2π/T).r = 2π.$\mathbf{f_1}$ r, wavelength λ= cT = c/$\mathbf{f_1}$, cave r = n.[λ/2], then r = n.(c /2$\mathbf{f_1}$) and from v = w.r = 2π.$\mathbf{f_1}$ [n.c/2$\mathbf{f_1}$] = n.π.c existsv = n.π.c showing that velocities in lobes are, n.π , times velocity that of light and for n = 1 then v = π.c, more than three times faster of light velocity . Becauseof the above velocity v, an E field is produced, and which then produces the $\boldsymbol{\partial D/\partial t}$ field , which in turn produces the H field and which then produces the $\boldsymbol{\partial B/\partial t}$ field and which again produces the E field and so on . Lobes [v = n.π.c] emit No-light, c, and cannot be seen. When Anti-matter annihilates with matter, gamma rays are produced , because Energy is converted to the *Three Breakages* → s², - s ², 2[$\bar{\mathbf{s}}$] ².∇i ← , *the Breakage Principle* ,and because in Energy- space continuum remains only the energy while DE acting on DM fragments|+c.s²|↔|-c.s²| ≡∅ formulates the massive compact spherical objects and massive compact anti-spherical Anti-objects.
5. Because of the DM and DE structure , which is breakages and force, collision of galaxies does not predict stars to be smashed into others. As above are created the, *gas clouds*, which are smashed into the other and get heated and so be a visible effect.
6. Because light is a particle with velocity, c, interacts with the REST gravity field by the Gravity force while DM, DE having the same velocity have a parallel motion, *not parallel universes* , which cannot see it. DE has exactly the same effect as that of a very small constant vacuum energy MFMF field. Energy density of the Rest base MFMF is that of gravity, $\mathbf{I_g}$, while of the Moving DE,DM is that of, c .$\mathbf{I_g}$, so in this way occurs expansion of the universe. GR being confined in Planck`s length $\mathbf{L_p}$,*could not* see the whole Energy- space beyond this length and the way and how could expansion occurs. Cosmological constant is the value of the energy density of the vacuum in the tiny space, without describing the how this tiny volume is expanded, so why to presume this as constant ..?.? The answer is that, this was then introduced just to surpass the problem. [41]
7. Because DM, DE consist a not homogeneous Heap of mass distribution (anomalous mass) and permeate the whole universe is causing what is said, the expansion of the universe to accelerate without any Big-Bang

explanation and any other mysteries force. The motion of this DM, DE, *mixture of the spherical opposite signed materials and dipole energy blobby volumes*, is not in contrary to gravity $\mathbf{F_g}$, because both have already passed from the center of STPL contracted mechanism.

Dark matter is the *Balancing of, Spinning-Momentum* of mass-energy in the Expanding universe . Gravity field is the Rest-Base of all universe which doesn`t exist apriori but is the Base, *the carpet* on which *the* DE-DM *Heap mixture*, with the same velocity ,c, is rolling*, expanding* , with the maximum constant velocity, c, and continually formulating the, *Zero → any Number,* the Discrete ≡ Granular*, → Infinite → Geometrical Universe,* Energy density of base.

8. *Black Holes are gravitational wells*, *caves*, in [MFMF] - Field ≡*The Energy - Chaos*, so any next constituent is dissipated or collapsed, swallowed. Following above analysis it is a kind of mechanism which is source of energy and because of conservation of energy law, Black-holes, *the quasars* exist in the centers of galaxies and are the beacons for astronomers and *consist the Recycled Space machines* of the Universe. DE, DM being also *constituents* are also recycled in Black-holes. The why are embedded in DM is a problem of stability and conservation of space and energy circle [STPL]→[DE,DM]→$\mathfrak{O}\bar{\mathbf{\Lambda}}\mathfrak{O}$
9. The principle of Virtual Work is the energy method for static procedure of interconnected Systems of material points or bodies of higher DOF and associated with the equilibrium of them and may be stated as follows, <If *a System in equilibrium under the action of a set of Forces is given a virtual displacement and the virtual Work done by the Forces will be zero*, and the opposite, *The virtual work done by the forces is zero for any equilibrium System under the Action of a set of forces* >. In case of two material points the static procedure is , *the Virtual work done by two forces is zero, for adual equilibrium system which results to the equality of opposite signed forces.*
10. It was shown that, *in the Rest base,* [MFMF]*field ,* $\pm s^2$*, issue the Kepler - laws* , denoting that Macrocosm and Microcosm Obey, *Newton`s Laws of motion in all Scales*. Photon and the other Primary-Material-Points during Motion in [MFMF] Chaos, collide with the others, *by means of vector products,* and produce Work which is stored into the Only four Energy-Geometrical-Shapes of the motion . Evidently, the Rotation of the $\oplus = +s^2$ around the $\ominus = -s^2$ constituent , in any Material-Point executesa Circular motion on a circle of radius, r, where then the Total Energy E is Negative.

It was Prior shown that, Any moving Particle when is Tangentially-colliding with a Material-Point executing Circular motion, then the Total Energy Eis Negative ,and the Particle follows constant Elliptical – Energy - Orbits on the same semi major axis, and of the same constant Energy.

If the New Orbit *is of eccentricity*e = 0 *and Zero Total Energy, the Particle follows constant Circles*
If the New Orbit *is of eccentricity*e = 0*and Negative Total Energy , the Particle follows constant Elliptical – Energy - Orbits on the same semimajor axis, and of the same constant Energy.*
If the New Orbit *is of eccentricity* 0 < e < 1 *and Negative Total Energy, the Particle follows constant Elliptical – Energy - Orbits on the same semimajor axis, and of the same constant Energy.*
If the New Orbit *is of eccentricity*e = 1*, and Zero Total Energy the Particle follows constant Parabola – Energy - Orbits on the same semimajor axis, and of the same constant Energy.*
If the New Orbit *is of eccentricity*e > 1*, and Positive Total Energy , the Particle follows constant Hyperbola – Energy - Orbits on the same semimajor axis, and of the same constant Energy.*

If the New Orbit is of eccentricity e = 0 and Negative Total Energy , the Particle follows constant Elliptical-Energy-Orbits on the same semi major axis, and of the same constant Energy $\mathbf{f_P}^2$. From relation $1 = c.\ r^3.\mathbf{f_P}^2$, which is the attracting dipole[$|+ n.\pi.c.s^2|\leftrightarrow|- n.\pi.c.s^2|$] and because in lobes light-velocity is $n.\pi.c$ times faster than that of light , No one velocity cexit can happen.

So all Planets move in this way, either in Atoms, *in microcosm*, or in Planetary - System, *in macrocosm* , obeying Newton`s equations of motion.

The New Creation Hypothesis is Summarized as follows F- 19:

a. From Nothing (*i.e. the Point*) to Existence (*i.e. tobe another Spherical Point*) issues the Zero Virtual work law, where zero Work is the equilibrium of two equal and opposite forces on points. Thus Space [S] is *the Point* and Anti-space [AS] is the *Other Point.* Infinite points are between, *the Point* and *Other Point* , and between the Infinite points also which consist the Primary Neutral Space [PNS] ≡ The Vacuum-space, as[$\nabla i = 2(wr)^2$] x [$\pm s^2$].
b. Work as, *Opposite forces*, exist on the infinite points between, *the Point,* and, *the Other Point*, which Opposite forces with different lever-arms exert the equal and opposite Angular Momentum $\bar{\mathbf{B}}$ which equilibrium, *as Work* $\mathbf{W_{n(n+1)}}$*, which is zero*.
c. Opposite Momentums are only in the Rest curl Energy volumes differently would not be rest. This inverse *Vortical motion*results to velocity vectors collision which are so crushed into three Energy-Fragments , and after clashed

with the velocity vectors $\bar{\mathbf{v}},\bar{\mathbf{c}}$ are thrown OFF , *the curl Ellipsoid Energy volume* (*the Absolute System*), and through an Anti-diffused geometrical mechanism again in new Energy-Volume (*the Relative System are the parallel Inertial systems*).

d. This Anti-diffused mechanism drives all clashed fragments , either through the *Centre of the Common circle curl Ellipsoid forming the Rest Gravity Field - energy* [MFMF] *Chaos and the Movable Dark - Matter - Energy*, or through the Tangents on *Circumference of Common circle curl Ellipsoid and forming the Movable Particles – Antiparticles – Bosons,* to an Simultaneity Relative and cylindrical volume.

e. In this cylindrical volume , which are the parallel inertial systems, *is the Rest* Gravity-Energy - Field as the Base *carpet*, for *The Movable Dark* Matter-energy and for all Formation in *Rest or Movable*, *by Pulling and Repelling and also all* moving Particles–Antiparticles and Bosons, on where are applied laws of Chemistry and Physics.

11.. *Gravity-force and Force of gravity, g, in Black-Holes*

The principle of Virtual Work is the motion of a force, P, executed on a point A to reach point B, so A force acting on point A (*which is Nothing*) reaches point B (*which is also Nothing*), i.e. stability of the system A-B is obtained by the equal and opposite forces acting on points A , B . [|A|↔|B|]

On the infinite points between the two infinite and opposite forces are also acting on them resulting to a, *Whirling on a line*, perpendicular to A-B axis. Because of the Unbalance of Whirling, *it is a common source of vibration excitation*, the Rotating unbalanced, is represented by an angular velocity, w. The rest system of this opposite Whirling Energy, *vortices*, exists in the vibrating Ellipsoid volume which is a geometrical cave. This inverse vortical motion(w,- w), in cave results to *velocity vectors collision* which are crushed into fragments and after clashed with the velocity vectors are thrown, OFF *this curl Ellipsoid Energy volume (the Absolute System),* through an Anti-diffused geometrical mechanism to a new energy volume *(the rest Relative System)*. Fragments through, *The Centre* (where v=0) *of the Common circle Ellipsoid, form The Rest Gravity Field-energy* and the *Movable Dark Matter - Energy* , and through *The Tangent* (where v = v)on the *Circumference of the curl Ellipsoid circle , form the Movable Particles - Antiparticles – Bosons,* to an Simultaneity Relative cylindrical volume.

All movable elements are formulated, *by Pulling or Repelling and by Collision ,i.e.*

All moving Particles–Antiparticles and Bosons and all their producing`s, on where laws of Chemistry and Physics are applied, and the action of Energy[∇i] produces,

Dark Energy DE ≡ $[\bar{\mathbf{c}}.\nabla i]$ (©) → Acting on the Five Constituents → $[(\nabla i),(+s^2),(-s^2),(+cs^2),(-cs^2)]$

$[\nabla i].[\pm s^2]$ → MFMF Field $[\nabla i].[\pm\bar{\mathbf{c}}.s^2]$ → DM-DE Field, of Dark matter and Anti-matter.

$[\nabla i].[\pm\bar{\mathbf{v}}.s^2]$ → Fermions $[\nabla i].[\nabla i]$ → $\mathbf{G_f}$ = Gravity-Force (- i) in DM-DE Field.

$[\nabla i].[\bar{\mathbf{v}}.\nabla i]$ → Bosons, $[\nabla i].[\bar{\mathbf{c}}.\nabla i]$ ≡ DE → Dark Energy.

c x (©)[. ∇i] → Gravity Force DE ≡ $[\bar{\mathbf{c}}.\nabla i] = \bar{\mathbf{c}}[\nabla i]$ =The Travelling-Energy with c velocity and,

Regular Matter. → $\ominus s^2$ ≡ Electron, $\oplus s^2$ ≡ Proton , $[\ominus s^2 \circlearrowright\circlearrowleft\oplus s^2]$ ≡ Neutron ↺

Anti - Matter → + ⊖ ≡ Positron, - ⊕≡ Anti-Proton ,$[\ominus s^2 \circlearrowleft\circlearrowright\oplus s^2]$ ≡ Neutron ↻

Dark - Matter → $[+\bar{\mathbf{c}}.s^2]$ ≡ Matter, $[-\bar{\mathbf{c}}.s^2]$ ≡ Anti-Matter ,$[\bar{\mathbf{c}}.\ominus s^2 \circlearrowleft\circlearrowright\bar{\mathbf{c}}\oplus s^2]$ ≡ ± Matter

Dark – Energy→ $[+\bar{\mathbf{c}}.\nabla i]$ ≡ Energy, $[-\bar{\mathbf{c}}.\nabla i]$ ≡ Anti-Energy ,$[\bar{\mathbf{c}}.\ominus\nabla i\circlearrowleft\circlearrowright\bar{\mathbf{c}}.\oplus\nabla i]$ ≡ ±Spin

Degenerate-Matter $[+\bar{\mathbf{v}}.s^2]$ ≡ D-matter, $[-\bar{\mathbf{v}}.s^2]$ ≡ D-Anti-Matter,$[\bar{\mathbf{v}}\ominus s^2 \circlearrowleft\circlearrowright\bar{\mathbf{v}}\oplus s^2]$ ≡ ± D-matter

It was shown before that Atraction of opposite Forces $\mathbf{F_o}\leftrightarrow\mathbf{F_P}$ at two different points , O , P creates the Central motion and Kepler`s laws where Orbits are Plane-curves representing a Constant-Energy becoming from the squared Periods T^2 , or Frequencies $\mathbf{f}^2_{\mathbf{p}}$,representing the Imaginary-Energy- Part and $\mathbf{r_n}^3$ representing the Real-Space-Part of monad $1 = C.\mathbf{f_n}^2.r^3$.

All these constants are the Quantized –Energy - Curve-Rims from which Galaxies are created .

Galaxies are accelerated and expanded as equation → $ds = \frac{\mathbf{F}}{\mathbf{2m}}[\frac{\mathbf{1}}{\mathbf{f}^2}] \equiv \frac{\mathbf{F}=[\bar{\mathbf{c}}.\nabla\mathbf{i}]}{\mathbf{2m}}[\frac{\mathbf{1}}{\mathbf{f}^2}] \equiv \frac{[\bar{\mathbf{c}}.\nabla\mathbf{i}]}{\mathbf{2m}}[\frac{\mathbf{1}}{\mathbf{f}^2}]$ It was shown before that cavities, r, are *Inward a Stationary Wave* with infinite Frequencies $\mathbf{f_1}..\ \mathbf{f_n}\rightarrow\mathbf{f}_\infty$ and with Energy,

$$E = h.\mathbf{f_n} = \frac{h(1+\sqrt{5})}{4\pi}.[\frac{\sigma}{r}] = (\frac{n\sigma}{8\,r^2}).\bar{\mathbf{B}} = \mathbf{W_d} = v^2[\frac{h}{2\pi}], \text{ or } \rightarrow r = \frac{n\pi}{2h(1+\sqrt{5})}\bar{\mathbf{B}} \quad \text{..... (r)}$$

Equation (r) occupies a cave , r, in Space where *Glue-Bond pair of opposites*[⊖⊕], *Creates Rotation* and it is the *Material-point*, while *Collision of any two opposites*, $\pm\bar{\mathbf{B}}$, annihilate each other.

This is the case of a *Black-hole* where issues *The Breakage-Principle, and which is the way of Energy conservation*, *where Energy* L =(B/2).w, *never annihilates and which is always reverted into* → the *two Opposites* (± w) *and an Neutral Part*2 .∇i← or as *Matter*(+w), as *Antimatter*(- w) *and as Energy part*, 2L, *and always to its constituents, either to all or separate* following →L =(B/2).w.

Because Gravity-Force $\mathbf{F_G}$ becomes from the in-storages acceleration a = v²/r of MFMF material-points and force [∇i] is stationary because from the pointy-rotation [-s² ↻↺+s²], then for Planck length is, *Gravity force*

$$[\nabla i] \equiv \mathbf{F_G} \equiv \mathbf{m_G} g = g.\nabla[\frac{\sigma}{c^2}]^2.r = \mathbf{m_G}\frac{v^2}{r} = Jw^2.\mathbf{g_G} = [\frac{\pi r^4}{2}]\, w^2.\frac{v^2}{r} = \frac{v^2}{r}[\frac{\pi r^4}{2}]\frac{v^2}{r^2} = [\frac{\pi r v^4}{2}] \quad \ldots\ldots\ldots\ldots(s)$$

Substituting (r) in (s) and from relation, Spin S = $\frac{h\sqrt{3}}{4\pi}$ then , $\mathbf{F_G} \equiv [\frac{\pi v^4}{2}]\frac{n\pi}{2h(1+\sqrt{5})}\overline{\mathbf{B}} = [\frac{n\pi^2}{4h(1+\sqrt{5})}]\overline{\mathbf{B}}\mathbf{v^4}$

Gravity-force → $\mathbf{F_G} \equiv \frac{n\pi\sqrt{3}}{16(1+\sqrt{5})}\mathbf{v^4} = \frac{n\pi\sqrt{3}}{(1+\sqrt{5})}(\frac{v}{2})^4$, *which is the Black – hole - gravity - equation related to theInner velocity ,v, and to its,*n,*lobes* .

$\mathbf{g_G} = s[\frac{\pi r v^4}{2}] = [\frac{3{,}1415926([\sqrt{5}+1].\sqrt[4]{2}.10^{-35}).(299793458)^4}{2}]\boldsymbol{e^3} = 6{,}044981.\mathbf{10^{-35}}.80{,}776078.\mathbf{10^{32}}.20{,}085536 =$

$\mathbf{g_G} = 9{,}8076941$, *where* $1 / \mathbf{m_G} = s$ = mass-coefficient $[\sqrt{5}+1].\sqrt[4]{2}.\,\mathbf{e^3}$

The constant tensor $\mathbf{T_z}$ = Tensor (the length) of vector, z ≡ m, in Euclidean coordinates and which magnitude is, k = $\mathbf{T_z} = \sqrt{\mathbf{y_1}^2 + \mathbf{y_2}^2 + \mathbf{y_3}^2 + \mathbf{y_n}^2}$, denotes the Energy-Space relation From above the dimensionless coefficient of work W is , [v5+1] , for any Material-cave, r ,

The Unity-Plane-Quaternion coefficient is $\sqrt[2]{\sqrt[2]{2}} = \sqrt[4]{2},\overleftrightarrow{\mathbf{\imath} \perp \mathbf{\jmath} \equiv \sqrt{2}} + \overleftrightarrow{\mathbf{k} \perp \sqrt{2} \equiv \sqrt[2]{\sqrt[2]{2}}} = \sqrt[4]{2}$

The Three dimensions for the Rotation-System of Euler`s number is e . e . e $= \boldsymbol{e^3}$

All bodies produce gravity because are in MFMF field which is consisted of the stationary [∇i] = ± s² forces as Material points [⊕s²↻↺⊖s²] . By compressing it , the more intense of gravity is at its surface and this because of the principal stress-common-curve . By producing a body that *had such an intense gravity* , that even light could not escape from it , then this body would be called *Black-hole* .

It was shown that, ± *Energy in Orbits*, defines the Orbiting-path of Planet related to frequency f , and to the Semi-major axis a of the Conic. Plank`s formula for energy states that E = h .f .

From Kepler`s 2nd law the area , S , swept by any*Focus-Planet-Sector* ≡ FP is constant and equal to,

$S^2 = \frac{L^2 T^2}{4m^2} = \pi^2 a^2 [b = \pi a(\frac{L^2}{2mE})]$, or $\frac{T^2}{a^2} = \frac{4\pi^2 m}{2E} = \frac{4\pi^2}{2E/m} = \frac{4\pi^2 a}{GM}$ and → $\frac{T^2}{a^3} = \frac{4\pi^2}{GM} = k = \frac{1}{f^2{}_n.a^3}$ or→$1 = k.\mathbf{f^2{}_n.a^3}$

Above equation $1 = k.\mathbf{f^2{}_n.a^3}$, denotes that by increasing of frequency f, a decreases since k = constant Semi major axis ,a, is related to energy as → a = GMm / 2E, i.e.

For very large Energies , semi major axis tents to a Negative-Energy-Point ,which is the beginning of the Black-hole in microcosm and macrocosm. *For axis* a → 0 , *then* $\mathbf{f_n} \to \infty$, which is Black-hole.

The Phase speed of a Photon is defined the moving velocity of its rotating phase as, v =λ/T =λf= w/k. As the cycloid occupies the, *Isochronous*, property for velocities the same for, *Congruency property*, are the Logarithm-Spirals which are *congruent to their Involutes, Evolutes, and the Pedal-curves*.

Logarithm-Spirals are in Polar-coordinates as $r = a.\mathbf{e^{b\theta}}$ or $\theta = \frac{1}{b}\mathbf{ln}(\boldsymbol{r/a})$ and , $x(t) = r(t)\,.\mathbf{cos(t)} = a\,.\,\mathbf{e^{bt}.cos(t)}$,

$$y(t) = r(t)\,.\mathbf{sin(t)} = a.\mathbf{e^{bt}}.\,\mathbf{sin(t)} \ldots\ldots\ldots\ldots (1)$$

where

r = The distance from Initial point

e = The base of natural logarithm

a , b Arbitrary positive constants

For b = 0 then from (1) → θ = π / 2 Spiral is a circle

For θ = 0 then from (1) → limit b = ∞ and Spiral tends toward a straight-line

For a ≠ b ≠ 0 , then from (1) → θ ≠ π / 2 and Spiral is between an ellipse and a circle .

The constancy of , Tangential and Radial line angle, φ , for any point conserves the exponential properties of Euler`s complex exponential function r.cos [ r(θ),r`(θ)/{r(θ), r`(θ)}]=arc tan $\frac{1}{b}$ = φ and issue Euler`s equations,

$\frac{d}{dx}\mathbf{e^x} = \mathbf{e^x.log_e\, e} = \mathbf{e^x}$, $\mathbf{e^{-i.\theta}} = \mathbf{cos\,\theta} + i.\mathbf{sin\,\theta}$, $r/\mathbf{cos\,\varphi} = c$.

All above Curves *occupy properties* that can carry the nature of Quaternion ≡ monads ≡ Vibrations in Spaces and Anti-spaces as the $\mathbf{z^w}$, $\mathbf{z^{1/w}}$ equations of monads in the Logarithm-Spirals as is,

$$\to \mathbf{z^w} = (\mathbf{s} + \bar{\mathbf{v}}\nabla\mathbf{i})^{\mathbf{w}} = |\mathbf{z_o}|^{\mathbf{w}}.\,[\mathbf{cos\,w\,\varphi + \varepsilon.sin\,w\varphi}] = |\mathbf{z_o}|^{\mathbf{w}}.\mathbf{e^{i.w\varphi}} \quad \ldots\ldots(2)$$

$$\to \mathbf{z^{1/w}} = (\mathbf{s} + \bar{\mathbf{v}}\nabla\mathbf{i})^{\mathbf{1/w}} = |\mathbf{z_o}|^{-\mathbf{w}}.[\mathbf{cos\,(\varphi + 2k\pi)/w + i.sin(\varphi + 2k\pi\,/w)}] = |\mathbf{z_o}|^{-\mathbf{w}}.\mathbf{e^{i.(\varphi+2k\pi)/w}}$$

Since a Black-hole is a Place in Space where Gravity (*a force due to an acceleration in the stationary Material-point*[⊕s²↻↺⊖s²]) pulls so much(nπ.c) that even light cannot get out, therefore are invisible.
The only way, is to see directly the effect of its strong gravity, on the stars and gases around it.

Question, How and Why exist the Black-holes ??

It was referred before that Dark matter is the *Balancing of the Spinning-Momentum* of mass-energy in the Expanding universe, Differently *Unbalance in the rotating Spinning - Momentum* will be one of the common source of *Vibration excitation*. This is the why Dark matter, Dark Energy exists.

A. Two *Physical-Systems are in Thermal-Equilibrium* if there is no net flow of Thermal-Energy between them , when they are connected by a *Path Permeable to Heat*. Thermal-equilibrium obeys the zeroth law of Thermodynamics, where the temperature within the System is, *Flowing Spatially and Temporally Uniform*.

B. Two *Physical-Systems are in Mechanical-Equilibrium*, it is the condition of the Systems when neither their *State of motion* nor their *Internal Energy-State* tends to change with time and motion. Equilibrium is established even if the *Gradient of the Potential-Energy* with respect to the generalized coordinates is zero.

C. The two existing *Physical-Systems, that of Gravity-force* $\nabla\mathbf{i}$,and that of *all others*$\{[\nabla i].[\pm\bar{\mathbf{v}}.s^2]\}$, is the condition of the two Systems, *either Stationary or in Motion*, to react continuously either Internal or external and their *State of motion* either the *Internal Energy-State* or their *External Energy-State,* which tends to change between them, *to be connected by a Path Permeable to a common motion.*

Because *Gravity-force* $\nabla\mathbf{i}$, Stationary exists as Pointy-Spinning $\rightarrow \mathbf{F_G} \equiv \frac{n\pi\sqrt{3}}{16(1+\sqrt{5})}\mathbf{v^4} = \frac{n\pi\sqrt{3}}{(1+\sqrt{5})}(\frac{v}{2})^4$,and in the light-velocity moving *Rolling-Heap*, as the Travel-Spinning $\rightarrow\bar{\mathbf{c}}\mathbf{F_G} \equiv \frac{c.n\pi\sqrt{3}}{16(1+\sqrt{5})}\mathbf{v^4} = \frac{c.n\pi\sqrt{3}}{(1+\sqrt{5})}(\frac{v}{2})^4$, *and according to* [C.], The condition of the two Systems, *either Stationary or in Motion*, to react continuously either *Internal or External* and their *State of motion* either the *Internal Energy-State* or their *External Energy-State,* which tends to change between them, *is to be connected by a Path Permeable to a Common-motion.* Which is the Path and where this drives ??

This *Path is the Black-hole*, driving to the Common-motion *to the Rest Gravity Energy-Field*- [MFMF] In-where exist the, Pointy Stationary-Gravity-force $\nabla\mathbf{i}$, the Moving-Gravity-force $[\bar{\mathbf{c}}.\nabla i]$, and that of All the others $\{[\nabla i].[\pm\bar{\mathbf{v}}.s^2]\}$.

All stars are under the pressure of Gravity. This force is created from the continuous internal acceleration $a = v^2/r$ of Material-points $[\oplus s^2\circlearrowright\circlearrowleft\ominus s^2]$in MFMF Gravity-field .The continuous pressure between them reach a point that they cannot be compressed any further , and the electrons degenerated pressure on a Neutron Star breaks-down under the force of Gravity and then, *Black holes are created* . In this way a NEW System *just the opposite* to [STPL] is generated and all {Regular Matter and Antimatter, Dark Matter, Energy, Degenerate matter, Stationary and travelling Gravity-force} are annihilated following *The Permeable Resonance - Path of Gravity-Material-Point* from the eternal motion of opposites.

D. Following Kepler laws then, *On any moving Particle when is Tangentially-colliding* or *under any angle* φ *with a Material-Point executing Circular motion*, then *the Total Energy* E *is Negative*, and the Particle follows *constant* Elliptical-Energy-Orbits on the same semi major axis as , $k = 1/c = \mathbf{f_n}^2.a^3$, and of the same constant Energy . Semi major axis, a, is related to energy as $\rightarrow a = GMm / 2E$, i.e. for very large Energies semi major axis tents to a Negative-Energy-Point, which is the beginning of the Black hole in microcosm and macrocosm.

For axis $a \rightarrow 0$, *then* $\mathbf{f_n} \rightarrow \infty$, i.e. *for very small semi major axis a, frequency becomes infinite and Infinite-Negative-Energy also*, which is the Black-hole.

Resonance-Path happens as the Force, *EM-Radiation in Two directions*, can travel in any closed *System* through Cauchy-stress-tensor where the two Conveyers $E \perp B \perp r \equiv \boldsymbol{\sigma_1}\perp\boldsymbol{\sigma_2}\perp\boldsymbol{\sigma_3}$, can carry the *Energy Storage* r, in *System*, and change the Inner-Structure of System to another *Primary-Energy-System*.

From Inner-velocity equation $\rightarrow v = wr = (2\pi/T)r = 2\pi.\mathbf{f_1}\, r$, wavelength $\lambda = cT = c / \mathbf{f_1}$, cave $r = n.[\lambda/2]$ and $\rightarrow r = n.(c/2\mathbf{f_1})$ also $v = 2\pi.\mathbf{f_1}\,[n.c/2\mathbf{f_1}] = n.\pi.c$ *or* $\rightarrow v = n.\pi.c\leftarrow$ and thus showing, velocities in lobes are, $n.\pi$, times that of light, and for $n = 1$ then $v = \pi$.ci.e. more than 3 times the light velocity.

The answer to the question < Why is the speed of light constant and magnitude c ? *and not* , it just does > is because as prior referred ,the Centrifugal velocity, $\bar{\mathbf{v}} = \bar{\mathbf{w}}.r$, is always a constant $\bar{\mathbf{c}}$, and this because acceleration $[d\bar{\mathbf{v}}/ dt = d(\bar{\mathbf{w}}r/dt)=0]$ is zero since $\bar{\mathbf{w}}$ is constant .[39]

X. Epilogus

The origin of Space[S] *becomes, through the Principle of Virtual Displacements* $W = \int_A^B \boldsymbol{P}.\boldsymbol{ds} = 0$, *from Primary Point* A, *which is the Space, to point* B *which is the Anti-space as the Inner distance of Space and Anti-Space in all Layers becoming as shown from STPL Mechanism.*

The origin of Energy becomes , through the same Principle because are co-related and is the Work, motion, executed by the displacement, ds, and *is conserved between points,* A *and* B, *and which never vanishes.*

This means that Universe is Energy-Space and nothing else, which follows the Glue-Bond – Principle in all Positions and Layers starting from The First Eternal< Self – Moving – Energy - Dipole > ≡ *The Quantum, of this*

cosmos and transformed in every Energy Space level as the Golden ratio frequency. The Torsional oscillation of Caves (cleft, slit), w, *is transformed as inner Wave-frequencies which in turn, to monads and moving Particles transforming Inward-Spin to the Outward-Spin and motion. All above are produced in and from STPL.*

Energy produced by Reference System $\{\mathbf{D_A}\text{- }\mathbf{P_A}\} \equiv$ [R] (x', y', z', t') *moves with velocity*, $\bar{\mathbf{v}}$, *parallel*, to x-x', *axis with respect to the fixed and Absolute System* $\{\mathbf{D_A}\text{- O}\} \equiv$ [S](x,y,z, t) and is conserved.

Energy of the whole universe is defined as a whole, all at once, and not the Energy of different pieces. It was referred that Energy in Gravitational-Field is Torsional and Negative and always attractive. [27]

In General-Relativity is referred that Space time is giving energy to matter or absorbed it from matter, and thus the Total energy is not conserved. Here are not clarified the three Basic Quantities, Energy, Matter and Time. It was proved that the Basic Quantity is only the Energy → motion, while Matter is the Space where Energy is stored, and Time is the meter of changes in Energy.

The Argument < Energy is not conserved but it changes because Spacetime does >is the greatest –confusion for these magnitudes. In [31-36] and [39] was clarified that →

1) Because of Zero acceleration of rotational velocity $\bar{\mathbf{w}}$ in a cave, velocity $\bar{\mathbf{v}}$=wr is also constant , so thus GR failed *to explain the WHY speed of light is constant*, considering constancy of light as an axiom from which derived the rest of its theory.
2) For the reality of discrete monads, GR failed *to explain the WHY → Wave nature, is the Intrinsic Electromagnetic Wave of Particles* (Maxwell`s Displacement current) and speed of light is constant in a Stress-Strain System with (where Red-shift happens as low f and-Blue-shift, as high f) Photon to be as Particle and Wave also as above, but considering constancy of light as an axiom deriving theory. Here is referred that, Since the mass is equal to $m = \frac{\mathbf{2}}{\mathbf{c^2}}(wr)^3 = \frac{\mathbf{h.w}}{\mathbf{2\pi.c^2}}$, *analogous to Energy* w, → then *mass is a factor measuring energy magnitude only*,
3) GR, by Appealing space-time a Priori is *accepting the two elements, Space and Time, as the fundamental elements of universe* without any proof for it, and so anybody can say that this *Stay on air*. It has been proofed [22-26] that any space AB is composed of points A, B which are nothing and equilibrium by the opposite forces $\mathbf{P_{\bar{A}}} = \text{-}\mathbf{P_{\bar{B}}}$ following *Principle of Virtual Displacement*.
4) GR , by Presenting Time as element of universe *could not perceive that, Time (t) is the conversion factor between the conventional units (second) and length units (meter), and by considering the moving monads (particles etc. in space) at the speed of light pass also through Time ,this is an widely agreeable illusion*. *It was proved that Time is a meter, A simple number, measuring the alterations of Space concerning velocity and direction*.
5) GR by Presenting Space-Time universe *Becoming from Big Bang* is accepting Infinite priors. Euler-Savary equation of couple-curves is related to the Tangential and angular velocity from (Space, *Path*, Anti-space, *Evolute*) and is, *The Rolling-Glue-Bond of Space , Anti-space*, and which happens on the instaneous center of curvature by STPL line. [58]
6) The Energy - Space Genesis Mechanism:

Everything in this cosmos, is Done or Becomes, from a Mould where,
In Geometry Mould is the Monad, the discrete continuity AB from points,
In Mechanics-Physics Mould is the Recent Acquisition of Material - Geometry where,
Material-point = The discrete continuity $|\oplus+\ominus|$ = The Quantum = Energy distance,
In Plane Mould is number ,π, becoming from the Squaring of the circle as extrema case, In the Space, volume, Mould is the number $\sqrt[3]{2}$ becoming from the Duplication of the Cube [STPL] Geometrical Mechanism, is itself the Mould which produces and composite all opposite Spaces and Anti spaces Points, to Rest-Material-points which are the three Breakages $\{[s^2 = \pm (\bar{\mathbf{w}}.r)^2 , [\nabla i] = 2(wr)^2]$ of [MFMF] Gravity, under thrust $\bar{\mathbf{v}} = \bar{\mathbf{c}}\}$, where become Fermions → $[\pm \bar{\mathbf{v}}.s^2]$ and Bosons → $[\bar{\mathbf{v}}.\nabla i = [\bar{\mathbf{v}}.2(\bar{\mathbf{w}}.r)^2] = [\bar{\mathbf{v}}.2s^2]$.

Big Bang and GR *was the temporary solution to the weakness of what men-kind had to answer*. Nature cannot be described through infinite concepts, as this can happen in Algebra and values, because are devoid of any meaning in our Objective - Reality, or the Physical World, or the Nature , or the Cosmos. Solutions of geometric classification problems with moduli Spaces, and Algebraic geometry by giving a universal space of parameters for the problems, must follow the classical and dialectic logic of Geometry which exists in Objective reality.

And which is this logic ? This way of thinking is nothing else than the Dialectic way of thinking and which is able to solve the Geometrical problems and that of Mechanics.

Material Geometry is the Science and the Quantization-Quality of this Cosmos which joints the, infinite dimensionless and the meaningless Points, *which have only Position*, with those of Nature which are *Qualitative the, Positive - Negative - Zero Points and which have, Positions, infinite Directions and Magnitudes with infinite meanings*, which through the Physical laws are the language of them in itself.

One of the most important concept in geometry is, *distance*, which is the Quanta in geometry, while in Material-Geometry the composition of opposite, *the Material-point*, which is the Quanta in Chemistry and Physics. A wide analysis in Book [58]. The Work, *as Energy*, is the Essence of this deep connection of Material-Points, *The Space*, and through the Conservation-laws is making the

Material-Geometry from STPL mechanism. Extension of the Material - Geometry to the chemical-sector gives the possibility for new materials in a drained way of thinking. In summary, my personal confidence is that nature is produced from Euclidean Geometry moulds, *as Space only* from the two existing, *Energy opposites*, *by following the Principle of Virtual work*, and not any other logical starting point.

The essential difference between Euclidean and the non-Euclidean geometries has been attentive in the very specially written article [32] for the nature of the parallel lines, a unique Postulate directly connected to the physical world. [STPL] line (doubled cylinder in spatial CS) is the creation Mould for Particles, *Quanta*, which are created between all Space-Levels and which Spaces are directly connected. [58]

Particles and Forces consist the monads *i.e.*

The Vibrations caused by the varying lever arms, *the varying lengths between Cycloid and Anti –cycloid of inner structures of monads*, and which cause the *Inner Electromagnetic waves and Spin* of Energy caves create motion. This motion is conserved and transferred everywhere and in all levels. Vibrations are caused from the first Material point becoming from the eternal rolling of the |⊕| Space on⊖ Space producing the physical angular velocity, w, and dissipation under conditions of cyclic oscillations in monads. The Work produced by this eternal rotation in r cave is stored in the n, lobes of cave r, and is outward the *Golden ratio frequency* → $\mathbf{f_n} = (\frac{\mathbf{n\sigma}}{\mathbf{8\,r^2}}).\bar{\mathbf{B}} = \frac{\mathbf{n\sigma}}{\mathbf{8}r}[1+\sqrt{\mathbf{5}}]$ of electromagnetic wave. Inner, Spin and EM wave, is transformed to the Outer Electromagnetic Wave of Particles as this is in Photon. Their Inner Electric and Magnetic forces are related to gravity`s forces, thus unify all physics. According to the Second law of Thermodynamics by considering the Material-point as a closed system this tends to equilibrium State, *on the contrary*, *Spin is the available energy to do Work* , i.e. *In Material point the second law of Thermodynamics is Violated*.

Moreover, the articles concerning the Ancient and Special unsolved till yesterday Greek problems of E-geometry argue , and defense on all the above referred. [44-49]-[52]

7) The How Enerrgy from Chaos becomes the First-Discrete-Material-Point:

Material-point was proved to be a System which has an Inner–Rotation - constrained, Due to the velocity vector, $\bar{\mathbf{v}} = \frac{\mathbf{d\psi}}{\mathbf{dt}}$ and Angular velocity, $\bar{\mathbf{w}}$, becoming from Stress, σ, of the two Opposite Constituents [⊕↔⊖], and which is the Force applied on lever-arm ,$\bar{\mathbf{r}}$, in space , on where External Forces and Moments are not existing.

The inner forces of this system, are the two equilibrium → Centripetal and Centrifugal Forces ← due to the Eternal, ± σ, Stresses of Opposites.

As in Algebra Zero ,0, is the *Master-key* number for all Positive and Negative numbers and this because their sum and multiplication becomes zero, *and the same* on any coordinate-system where ± axes pass from zero, *Exists also Apriori in Geometry the Material-Point* in where the Rolling of the Positive ⊕, constituent on the Negative ⊖, constituent, creates the Neutral Material point which Equilibrium , and consists the *First–Discrete - Energy-monad* which occupies, *Discrete Value and Direction*, in contradiction to the point which is, nothing, *Dimensionless* and *without any Direction*.

Material-point was proved to be the *First Energy monad* because occupies a Space, a cave, in where exists an Eternal intrinsic rotation with a constant Angular-velocity $\bar{\mathbf{w}}$andan Angular-momentum $\bar{\mathbf{B}}$.

This Angular - momentum is identical with Spin, which is trapped in caves`s loops and which are in Phase with each other. The amplitude of Oscillation varies from Zero at Nodes to maxima at Antinodes.

8) The How and Where , Energy from Chaos Becomes Discrete – monads and Spin:

In Planck`s cave [61A–64] is proved and shown,

The Angular-momentum Vector $\bar{\mathbf{B}}$ is identical to the Spin, S, and analogous to the Magnetic moment $\bar{\boldsymbol{\mu}} = \frac{\mathbf{4r.L}}{(\mathbf{1+\sqrt{5}}]).\boldsymbol{\sigma}}$and vector $\bar{\mathbf{B}} = \frac{\boldsymbol{\pi}\mathbf{r^3}\boldsymbol{\sigma}}{\mathbf{8}}[1+\sqrt{\mathbf{5}}]$, both depended on Glue bond σ . The *Angular -Velocity Vector* $\bar{\mathbf{w}}$ is identical to The current-loop Torque and analogous to the charge $\bar{\mathbf{q}} = (\frac{\mathbf{m.\bar{w}.\bar{\mu}}}{\mathbf{Lg_s}}) =$ [r σ (1+√5)] a *Golden-ratio-charge* relation .

In Under-Planck cave [64] is proved and shown,

The Angular - momentum Vector$\bar{\mathbf{B}}$ is identical to Spin $\equiv \frac{\mathbf{E}}{\mathbf{w}} = \frac{\mathbf{h_m}}{\mathbf{2\pi}} = \bar{\mathbf{B}} = [\mathbf{r.\sigma.(1+\sqrt{5})}]$ and analogous to *the Golden-ratio* of cave, r, and Glue-bond ± σ. The *Angular -Velocity Vector* $\bar{\mathbf{w}}$is analogous to the Principal Stress σ, as $|w| = \frac{\sigma}{\mathbf{2r}}[1+\sqrt{\mathbf{5}}]$ and is a *Golden-ratio-angular velocity vector* relation causing the mass of monads, which is the meter of, *the reaction to the change of velocity vector*.[72]'

9) The Where Energy, produced through a Circular Removal of Space, is Stored:

In article [62] was shown the Geometrical construction of all the - Regular - Polygons in a circle and, for Odd, between the two sequent Even Polygons. Any two chords at the Ends of any diameter consist *the Space* and *Anti* -

Space monads which are Perpendicular each other and do not produce Work.

In case of a Removal from these two chords the *Work Produced* between them *is equal to the Central triangle* Surface, and consists the Quantization of the Work –Produced in Geometry- Monads,

Work, Either – in, Odd - Regular - Polygons and with their Angle, OR - in, Any - Shape of Area equal to the Space triangle, and are equal also to the, In Area of the Anti - Space triangle.

It was also proved that, By Scanning Any Space-Monad KK_1 *to a Space –Monad* KK_2 *of the circle, The Work produced is conserved in a Space - triangle in the circle, and in one of equal area out of the circle, which is the Anti-Space triangle, meaning that,*

The above relation of this Plane Work, is the Quantization in Geometry – Shapes, and becomes into the Plane – Stores of Anti-Space and, consists the Unification of Geometry – monads with those of the Energy monads, which Energy - monads is the Work in caves stored as Angular momentum and Angular velocity Ellipsoids, and which were analyzed and have all been fully described.

For Orbit or, Negative-Energy-Rim, which is the Stable and Stationary Granular-lattice-Energy-Disk, which is kept in the Plane-Orbit of motion, In the Ellipse area, πab, existing in Gravity-field, and in a way Opposite to that which follows the Central motion.

It was shown in [58] that the free rotation is so happening because of the eternal rotation of the ⊕ constituent on the ⊖ constituent in the two x, z, axis of rotation. Considering the distance of rotation be, the diameter of the cave, $l = 2r$, then velocities as angular velocity, w, and velocity, v, under the condition $y(2r,0) = 0$, then leads to the Energy-equation $\sin\frac{2rw}{v} = 0$, or $w_n \cdot \frac{2r}{v} = \frac{4\pi r}{\lambda} = n.\pi = \frac{4\pi r f}{v}$, where $n = 1,2,3$, and $\lambda = \frac{c}{f}$ is the wavelength and, f, is the frequency of oscillation, *i.e.* Each, n, represents → *a Normal mode vibration* with natural frequency determined by the *Golden-ratio* equation →

$$f_n = \frac{n.v}{4r} = \frac{n\sigma}{8r}[1+\sqrt{5}] \qquad \text{.. (n)}$$

i.e. Normal mode vibration is an Energy - cave (the ∞ modes of f_n) in where, Energy ≡ Spin is stored. Above relation (n) denotes the Energy-Storages in Material -point or Oscillations or and monads which are the Quantization of frequencies as the harmonics f_1 , f_2,… ,f_n of cave, $r = l$, depended on, σ, only.

The rotating axis, $l = 2r = KK_1$ *in Material – point, creates the* Linear vibration of string*, l, which is* K≡ [⊖] ↔ K_1≡ [⊕] *and the Natural - frequency* f_n*, in points,* K , K_1 *, or the* Rotational vibration of string *which is* [K≡⊖ s^2 ↻↺ K_1≡ ⊕s^2].

In cave of radius, r, the correlation of → *Natural frequency*f_n*, becoming from the Linear vibration of string,* and → *Spin equal to the Angular - momentum Vector* $\overline{B}$*, becoming from the Rotational vibration of string*, Spin ≡ $\frac{E}{w} = \overline{B} = [r.\sigma.(1+\sqrt{5})]$ and Natural-Frequency $f_n = \frac{n.v}{4r} = \frac{n\sigma}{8r}[1+\sqrt{5}]$ is,

Spin $\equiv \overline{B} = [r.\sigma(1+\sqrt{5})] = (\frac{8r^2}{n}).f_n$ and ,$\frac{\overline{B}}{f_n} = (\frac{8r^2}{n\sigma})$ = *Constant golden-ratio* for each cave ,and Frequency ≡ $f_n = (\frac{n\sigma}{8r^2}).\overline{B}$ → i.e. Energy-caves are Stationary Wave-Fringes.

In Material point*, and because of the Eternal rotation of the* [⊕] *constituent around* [⊖] *constituent*, *the Stretched - String Energy*$\overline{B}$ *is not transmitted, but trapped in the,* N loops *, where loops are all in Phase with each other, and the amplitude of oscillation varies from zero, at the* N *nodes, to maxima at the antinodes. By considering rotation as a grating having* N *lines per,* r, *then maximum values of,* n, *is* $n < \frac{1}{N\lambda}$ *, i.e. the biggest whole number less than* $\frac{1}{N\lambda}$ *which is always integer .*

This is the Why Spin is , $\frac{l}{2}, \frac{l}{3}, \frac{l}{4}, \frac{l}{5}, \ldots\ldots.\frac{l}{N}$, *i.e.*

One, Half, Third …$\frac{1}{N}$. - Lengths →$[\frac{l}{2},\frac{l}{2}]$,$[\frac{l}{3},\frac{l}{3},\frac{l}{3}]$, , ,$[\frac{l}{N},\frac{l}{N}]$, with One, Two, Three ,,, N- *Wave-nodes.* Above is the, *Stationary - Wave - Nodes Principle* , in Material – point, and in all monads.

In article was proved that,*in Material Point* , the Eternal - Rotation of (+) Opposite around (-) Opposite , due to Centifugal and Centrifugal Glue-Bond Principal-stresses, ± σ , *creates in Primary and in caves which are Standing waves as Resonance phenomenon*, the Angular – Momentum being Identical to the Spin of Particles , and which is trapped in caves`s loops always being in Phase with each other.

Their amplitude of Oscillation varies from Zero at Nodes to maxima at Antinodes.

The N *loops are*, the N, *Sub - Stores* created in the *Main-Store*, r, and this because Energy Momentum vector ,$\overline{B}$, follows the Stationary-Wave -Nodes Principle in Material – point only. From Inner-velocity equation $v = wr = (2\pi/T)r = 2\pi.f_1.r$, wavelength $\lambda = cT = c/f_1$, cave $r = n.[\lambda/2]$, then $r = n.(c/2f_1)$ and $v = 2\pi.f_1[n.c/2f_1] = n.\pi.c$ or $v = n.\pi.c$ …(4) showing that velocities in lobes are, n.π, times that of light , i.e. in Material-points exist velocities multi-times that of light. .

It has been confirmed that, when Matter and Antimatter annihilate at rest or when Anti-space comes in contact with its regular Space counterpart, they mutually destroy each other and all of their Energy is converted to the *Three Breakages* → s^2 , $-|\bar{\mathbf{v}}|^2$, $[2\bar{\mathbf{w}}].|s|\ |r|.\nabla i \leftarrow$ where for, $\bar{\mathbf{v}} = s \equiv$ the cave,

[s^2] → is the Real part, *Matter*, of the new monad, and is *a Positive Scalar magnitude*.

-[s^2] → is the always Negative part, *Anti-matter*, which is always *a Negative Scalar magnitude*.

2 $s^2.\nabla i$ → is the double Angular-Velocity Term, *The Energy Term*, which is *a Vector magnitude,*
And since *Energy is motion* and, *Total – Energy of Elementary - Particle* is equal to the → *Intrinsic Rotational + Kinetic Energy from velocity*, *then* according to the conservation law of Energy, *This Energy is stored into Neutral caves as Stationary Loops*, and thus producing the *Space and the Anti - Space Particles with velocity vector the remaining of Energy Term*.

This is *The Breakage-Principle, which is the way of Energy conservation*, *where Energy never annihilates and which is always reverted into* → the *two Opposites* (± w) *and an Neutral Part* 2∇i← or as, *Matter* (+ w), as *Antimatter* (- w) *and as Energy part*, 2L, *and always to its constituents, either to all or separate* following → Total Energy as L = (B/2).w. Because Motion is obtained either by Pushing or Attracting, so both cases presuppose NOT the Continuity of points which points are nothing, But Discontinuity, *Discrete*, with the dimensional Units as filling as this was shown in Zenon Paradox (1), *i.e. through Granular Material-Space*. Advancing from Primary to compound elements as are Atoms, *Discrete Energy - monads*, *then by following above logic for, Primary Particles or Atoms, is formulated a Geometrical formula of all Moulds* [Space –Anti space - Energy] ≡[⊕↔⊖]-[$\bar{\mathbf{v}}.\nabla i$], *without any Assumptions, or Axioms, or Exclusion Principles, or any other Starting Points.*

In a few words Energy ≡ Motion ≡ Quantized constant-Quantity in Energy-lobes as the loops, and Exists because of Opposition or Charge. Is trapped in Energy - caves in case of Circular-motion ≡ {Stationary Waves ≡ The monads}, Is getting Out the cave in case of the Skin-effect ≡ { Formulated in the three Moulds of →[Space – Anti space - Kinetic Energy]}, Never vanishes, But continuously changes to above three Moulds, formulating the Primary and Compound elements of this cosmos.

10. The Where Energy, *produced through a Removal of Space*, is Stored:

It was shown the Ellipse-Orbits, $1=c.\mathbf{f_n}^2.r^3$, with their content is The Spin-Field-vectors $\bar{\mathbf{B}}$ in all area πab of MFMF field. *During orbiting* centripetal-acceleration, $\bar{\mathbf{a}}_\mathbf{P} = \sigma = \pm\frac{4\pi r}{(1+\sqrt{5})}.\mathbf{f}$ and Because the *Orbit is subject to a Mechanical-stress* σ, becoming from the Centripetal-acceleration$\bar{\mathbf{a}}_\mathbf{P}$,*then is appearing the* Piezoelectric-effect with Positive-charge *at the Nucleus* and Negative-charge *at the Planet* ≡ Material point. The two faces at N, P are connected by the *In-between Gravity-field*[∇i]=[± s^2] in [MFMF] Field *so flows Current which is the Resonance on Orbit,* the Gravity Force, g. For the *Inverse* Piezoelectric-effect on Orbit, *when a voltage is applied across its opposite* faces at N, P becoming from the[⊕↔⊖] stretching ,then Orbit becomes mechanically stressed, *Deformed in Shape by the Resonance at* N *and* P. Motion is Kept, *is quantized,* as work → W =1= k ≡ [∇i].[±s^2] ≡ MFMF Field ← *in the Orbit-area* ,πab upon the Spin $\bar{\mathbf{B}}$ *Orientation of the Pointy-Material-points* [±s^2]. This Orientation of Spin becomes from the Energy in sinusoidal gravity-fields of orbit, created by the motion of oscillation of the M-P[⊕↻↺⊖] *Any Interaction* between this *Oriented-Energy Disk-Rim* and a *Body-Planet* creates disturbances in Disk and *Reorientation of Spin*$\bar{\mathbf{B}}$≡ Motion ≡ Work ≡ k = constant = quanta and transformed as ,*The Gravity Force in Disk-Rim* ,and this Energy is equal to the Gravity acceleration g, because *g = force* as g = F/m. Bodies produce *Work* ≡ *Gravity* g, on Dipole M-P≡[∇i] ≡± s^2,equal to the Change of *Spin-direction.* Motion with velocity vector v, may be *Linear or Rotational* for all displacements r, and thus exists as constant-work

$$W = k = \bar{v}x\bar{v}.\bar{r} = v^2.r.\ \bar{n} = v^2.\ r = (wr)^2.r = [\tfrac{2\pi}{T}r]^2.r = \tfrac{4\pi^2\,r^2}{T^2}.\ r = \tfrac{4\pi^2\,r^3}{T^2} = 4\pi^2.\tfrac{r^3}{T^2} = 4\pi^2.r^3.f^2{}_p$$

Because Gravity-Force F_G becomes from the in-storages acceleration a = v^2/r of the MFMF material points and force [∇i] is Stationary, and this because from the pointy-rotated-dipole [-s^2↻↺+s^2], then for Planck length *Gravity force* $[\nabla i] \equiv F_G \equiv m_G g = g\nabla[\frac{\sigma}{c^2}]^2.r = m_G\frac{v^2}{r} = Jw^2.g_G = [\frac{\pi r^4}{2}]\ w^2\frac{v^2}{r} = \frac{v^2}{r}[\frac{\pi r^4}{2}]\frac{v^2}{r^2} = [\frac{\pi r v^4}{2}]$

For Gravity-Acceleration in Black-holes is $g_G = s[\frac{\pi r v^4}{2}] = [\frac{3{,}1415926\left([\sqrt{5}+1].\sqrt[4]{2}.10^{-35}\right).(299793458)^4}{2}].e^3 =$ 6,044981.10^{-35}.80,776078.10^{32}.20,085536 = g_G = → 9, 8076941 ← the theoretical g, number which is near to that of measurements = g_m = → 9, 8082382$\frac{s^2}{m^3} = \frac{N}{Kg}$ markos 10/10/18.

Photon is the Quantum of lightened and is a *Wave-Packet, and* may lose its Conveyer which is the Outer Electromagnetic part or its E&M Radiation ,but conserve its Body which is the stationary wave in a cave r, with the bound energy-frequencies [$B_P \equiv f_{1=n}, f_2, f_3, f_{R=}w^2$]. Photons eradicate themselves by losing E&M vectors, but they can still exist with their Body ,$B_P \equiv f_{1=n}, f_2, f_3, f_{R=}w^2$, which can develop NEW E&M vectors and continue to travel. All comments are left to the Readers and for more, *Black-holes* [74].

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