THE HOW ENERGY FROM CHAOS BECOMES ,THE SPIN OF MONADS ,THEIR ENERGY – STORES , AND PHOTONS

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Abstract:-

Present article allowed me to elucidate, the Essence, of what is said for Geometry and Physics. In geometry Point P , is nothing and is possessing Zero-magnitude and Infinite directions. In Material-Geometry , Point is the minimum-cave , r, in space possessing cave`s , r , magnitude  which is eternally existing from the internal-rotation = motion , of any two Opposites [+ , - ] .  Because of this, Material-point is a Quaternion measuring so much the cave`s ,r, magnitude as well as the internal eternal-motion which is motion in , n , lobes .

In geometry, two Points A, B consist the line-Segment, possessing the |AB| magnitude and AB direction.   Euclidean-vector → |AB|, carries Point A to point B, possessing the |AB| magnitude and the two opposite directions → AB , BA ← respectively .

Material-Quaternion or, monad |AB| = z = a + bi, carries motion from Material-point A , to Material point B , where this motion called Work ≡ Spin is never annihilated .

The non-annihilation of Work ≡ motion, is due to the fact that this happens in the finite –space, r , which is a Stationary-Wave pattern , and thus is the way of Transporting-Energy.

In E-Geometry Three Points A , B , P, consist the Plane ABP , i.e. the line AB and point P , not on AB and triangle ABP , which is the Basic-Ideal-Stable-Plane Shape in all states of universe, and for Material triangle is the Regular Hexagon containing all properties of E-Geometry-triangle multiplied by two . In E-Geometry Four Points A , B , C , P, consist the Space ABCP , i.e. the Basic-Ideal-Stable and Solid-Shape which is the Tetrahedron , and is the Basic-Element for all structures as Compound-primary particles , Atoms , Molecules , Crystals , etc. N - Points A , B ,,, P,,, P_N , consist the Regular-N-Edges shape , $ABPP_N$, i.e. The Regular N - Edges - Polyhedrons , where points , P , P_N , do not coincide with the others and consist all Solid Structures.

It is proved that, any cave, r, containing Opposites is a Material - Point, and into this cave exists an Eternal- rotation of the Positive to the Negative. This motion produces an angular-velocity-vector w, and an angular-momentum vector $\overline{B}$, and the total work produced is equal to $2W = \overline{w}.\overline{B}$.

Caves r , follow the Euclidean-Geometry *Quantization of two points* from nothing ≡ zero to infinite and in aterial-Geometry the Energy-Wave-Space-Principle .[68]

The eternal-rotation of Positive to Negative is proved to be the eternal-motion ≡ *Energy from Chaos*. **The Spin** is proved to be the rotation on great or on Small circles, and is *Angular-momentum-vector* $\overline{\mathbf{B}}$.

Energy-storages is proved to be the **n**, integer-energy-lobes in cave, r , which is a Stationary-wave . **Photon** is proved to be one of The *Moving - Storages,* [Stationary-energy-storage-waves] .

Preliminaries:

From Mechanics in case that , in an Axisymmetric Rotating Body , with constant Angular-Velocity , w , *the moment of Inertia ,* $\mathbf{J_x} = \mathbf{J_y}$, *is equal about the two of the three Principal axis ,* **then** ,

1.. The Angular – velocity - vector , $\overline{w}$ **,** describes the Ellipsoid of Angular Velocity and its nib describes a Cone of which Plane-Base is Fixed , **and Simultaneously** ,

2.. The Angular-Momentum , $\overline{B}$ **,** describes the Ellipsoid of Angular-Momentum and its nib describes a Cone also of which Plane-Base is also Fixed .

3.. The Nib of Angular – velocity - vector , $\overline{w}$, describes on the Tangential-Plane of the Angular-Momentum-Ellipsoid , **the Herpolhode** , while ,

4.. The Nib of Angular-Momentum , $\overline{B}$, describes on the Tangential-Plane , of the Angular-Velocity-Ellipsoid , **the Polhode** .

5.. The Fixed-Tangential-Planes on , $\overline{w}$ **, and ,** $\overline{B}$ **, nib** are alternately Perpendicular to , $\overline{B}$, and , $\overline{w}$, central axes of rotation .

6.. The Kinetic Rotational – Energy of monad , which is the Work in monad **, is the Scalar** quantity **, L ,** *The Vector Angular Momentum quantity* is **,** $\overline{B}$ **,** and the *Vector Angular - Velocity quantity* is **,** $\overline{w}$ **,** *which Three monads are related as* $\overline{B} \cdot \overline{w} = 2L = J \cdot w^2$ where J = The moment of inertia around the axis of rotation.

All above happen in , Material-Point *, where the Positive* $\oplus$ *constituent , is Eternally self rolling on the Negative* $\ominus$ *constituent ,* with Angular-Velocity , w *, in Infinite Spherical traces , either at Great-circles* [+or -] *, or Small-circles ,* [+] where is the Clockwise Left direction , and [-] where is the Anti-Clockwise Right direction *, or any other close Spherical-curve , and by Applying all laws of Mechanics into this Energy - Chaos , is thus created the* → **First–Discrete – Energy–monad** *, the Material Point i.e. ,*

The Quantum of Physics and , of all Energy-Space-Universe . Article [65] is the completion of prior [64M].

The Energy E dissipated per cycle is equal to the Work $W_d \rightarrow E = h.f = \dfrac{h(1+\sqrt{5})}{4\pi} \cdot [\frac{\sigma}{r}] = 8.k\zeta(\pi r^2$) , and

Stored in monad , which is a Stationary Wave , in ,n, loops as , $\mathbf{W_n = [\dfrac{4\pi r^2}{3}].f_n = [\dfrac{4\pi r^2}{3}].nf_1 = n\dfrac{(1+\sqrt{5})\sigma r}{3}}$

Geometry has the Monad , *the discrete continuity* **AB** length becoming from the *Zero-Point ≡ 0 ,* and **Mechanics - Physics** the Recent-Acquisition of the Material - Geometry , where Zero-point $0 = \Box = \{\oplus+\ominus$ } = The Material-point = *The Quantum* = Positive Space and Negative Anti-Space . [58] **Monad in Geometry → Linearly** is , through mould of Parallel Theorem [44-45] *,which are the equal distances between points of parallel and line* → **In Plane** is through mould of Squaring the circle [46-47] *, where the two equal and perpendicular monads consist a Plane acquiring the common Plane- meter ,π,* → **In Space** (volume) is through mould of the Duplication of the Cube [44-46] *, where any two Unequal perpendicular monads acquire the common Space-meter,³√2, to be twice each other .* **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 , 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, which is their cause of external motion *as outward waves* .[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 Breakages { [$s^2 = \pm (\overline{w}.r)^2$] = 2(wr)²]

of [MFMF] mechanism under $\overline{v} = \overline{c}$ thrust } , and through it are becoming ,

of [MFMF] mechanism under ... ...thrust, *and through it are becoming,*

The Fermions → [±v̄.s²] and ***The Bosons*** → [v̄.∇i = [v̄.2(w̄.r)²] = [v̄.2s²] , [35]

It was shown [33-36] that Un-clashed Fragments through center , O , consist the Medium-Field Material-Fragment → [± s²] = [MFMF] = ***The Chaos*** , as base for all motions , and Gravity as force [∇i] , while the clashed with the constant velocity ,c̄, consist the Dark matter [±.c̄.s] and the Dark energy [c̄.∇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 → Breakages

[± s² = ± (wr)²] and [∇i = 2(wr)²] , where then become Waves { *Distance* ds = |AA_E| *is the Work embedded in monads and it is what is vibrated* } with the Vibrating equations of motion , become ,

      A   →   Particles , with Inherent Vibration ,
      B   →   Gravity-Field-Energy , without Vibration
      C   →   Dark-matter-Energy constituents   and as below ,

A.. [±v̄.s²] →   Fermions and → [v̄.∇i] → Bosons ,
B.. [± s²]   →   [MFMF] Field ≡ ***The Energy - Chaos*** , and the binder Field is [∇i] → Gravity force ,
C.. [±c̄.s²] →   Dark matter , and the binder Gravity force [∇i] , [c̄.∇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 ,v̄, exists in the Discrete monads ,± v̄.s² and ± c̄.s².
B , case , → is the transportation of Energy , from Chaos to Material points either

      Linearly , STRING , [⊕s² ↔ ⊖s²] ***or Rotationally*** , SPIN , [⊕s² ∪∪ ⊖s²] .
      The How Energy from Chaos becomes the Monad of particles in → (Page 42)

It was shown in [25] that → Quaternion $\overline{AB}$ ≡ monad [AB] ≡ s + v̄ ∇i)¹ , where , s = the Scalar part , v̄ = [v1 + v2 + v3] , and the Imaginary part ≡ v̄ ∇i .   The Wave-nature of Spaces , Anti-spaces is as ,

→ **z^w** = (s + v̄ ∇i)^w = [z_o. (cos φ + i sin φ)]^w = |z_o|^w.(cos w φ + ε. sin wφ)=|z_o|^w.e^{i.wφ}, *where*

→ |z_o| = $\sqrt{s^2 + v1^2 + v2^2 + v3^{\,2}}$, ε = [v1.i + v2.j + v3.k] / [$\sqrt{v1^2 + v2^2 + v3^{\,2}}$],cos φ = $\frac{s}{|z_o|}$ s   *and*

→ z^{1/w} = (s + v̄ ∇i)^{1/w} = |z_o|^{-w}.[cos (φ + 2kπ)/w + i. sin(φ + 2kπ /w)] = |z_o|^{-w}.e^{i.(φ+2kπ)/w}

where   z^w = The Space , and z^{1/w} = The Anti-space of → Monad [AB] ≡ Quaternion $\overline{AB}$ ≡ s + v̄ ∇i)
The **w**, Spaces and ,**1/w** = **w^{-1}**, Sub-spaces are monads in **w**, power and **w^{-1}**, the root which represent the Regular Circumscribed and the Regular Inscribed Polygons in monad $\overline{AB}$. Granulation of Points occurs through the equilibrium Space-caves which follow the rotational opposite Torsions . [26-29]

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

In Engineering and Physics :

Mechanics and classical Physics , ***are the Bases describing reality*** ,without any interest to the *Essence* of Euclidean-geometry elements beginning from Point which is , *Position and Magnitude* .All Physical laws and those of nature , *it is the objective reality* , are explained by the ***Classical - mechanics*** which describes the motions of , macroscopic objects, *either as Particle or as Wave*, from atoms to molecules and to Astronomical objects , considering Space **as a Continuum** .

Relativistic - mechanics , describe events , the Position and the Magnitude of Atoms and Subatomic as Continuous called ***Spacetime being deterministic*** , meaning that every cause matches up to a specific .

   It considers also Spacetime a dynamic and an elastic entity without defining of what is this entity ,   and mass and energy without defining the essence of mass and energy . The fabric of Spacetime is   called *speed of time* , and are the undoubtedly boundaries of Space , and the beginning of Big bang   in order to justify Black holes something accepted as axiom .

  Quantum - mechanics , describe Atoms and Subatomic Particles with the , *Wave-mechanical model* ,   separating the Position and the Magnitude as , **a Continuum or the Quantized** = compact = *periodic* ,   and accordingly to , if it is a Point or infinite . Is also dealing with the behavior of matter and light on   the atomic and subatomic scale and the interactions with one another , and both the called matter and   light , with Electromagnetic radiation .

  Material – Geometry , or ***Granular -Geometry*** ,describes the Essence of elements in Geometry which   are the Magnitude and the Position of Euclidean Points, giving their nature and equations, *so much of*   **The *Lattice–Energy -***

Space, { These *are the Stationary* Primary and compound Particles , *are all the Moving* Primary and compound Particles , and *are all the Stationary and the Moving* Energy-Stores **}**

  The ***Continuous - Energy - Space*** , { This is the Granular-Gravity-field and the Gravity - Force **}** **,**

   The ***In - Continuous - Absolute - Vacuum*** , { This is the in-between the Gravity field Energy-caves **}**   The ***Out - Continuous - Granular - Vacuum*** , { This is the Granular Travelling-Gravity-field}. The ***Out - Continuous - Absolute - Vacuum*** , { This is the MFMF field *so match* the Under-Granular Stationary-Gravity-field , *as* for the Under-Granular-Travelling-Gravity-field }.

  In Article are explained , without any staggering implications , ***The where the laws of nature are coming from*** **,** ***The where this cosmos is built ,*** surely not on Uncertainty and not fundamentally deterministic , ***without every event linked definitively to a cause*** and this because of maxima.

  Photon is a vibration , *Rotational vibration* **[** K $\equiv \ominus$s² ↻↺ K$_1 \equiv \oplus$s²**]** , **In a tank r** , that typically Radiates and follows Breakage principle *, which is consisted of the Inner Energy tank with **n**, Energy lobes in wavelength ,**λ** ,* as an ***Electromagnetic Standing Wave*** $\equiv$ [E²+H²] /2 = 2rc.sin.2φ , and which follows *the Conservation law of Energy* where then *, and because of the Skin-effect which happens in medium of different density ,* becomes an ***Outward-***

$$f_N = n \frac{(1+\sqrt{5})\sigma\, r}{3} = \frac{\lambda_N}{c}$$

Electromagnetic-Wave with different frequencies as , Radiating through an also Radiated-medium which is *the Electric - field ,* **E** *, and the transverse Magnetic - field ,* **H** *, as the composition of opposites* , and because follows above Principle then is such tobe as Particle , $\lambda \equiv 2r$, and as Wave **f$_n$** .

Mass of Photon : It was proved that Energy of wave is , E = m.ẏ² / 2 = (m/2).(-wA$_o$)² and mass in cave m =

$$\frac{E}{2r^2.w^2} = \frac{\bar{B}}{2r^2.w^2} = \frac{W}{2r^2.w^2} = \frac{(1+\sqrt{5})\,4r^2\sigma}{6r\sigma^2\,(1+\sqrt{5})^2} = \frac{2\,r}{3\sigma\,(1+\sqrt{5}]} = [\frac{4\pi r^2}{3}].f_1$$ *which is the reaction to the change of motion ,*

and for light velocity v = c = 2πr.f *is* $\rightarrow$ $f = \frac{v}{2\pi.r}$ $= \frac{3.10^8}{2\pi.3,5610^{-14}} = 1,34.10^{21}$ Hz . and

Photon mass $\rightarrow$ 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$_{Ph}$** = 1,34.10²¹ Hz *and mass* **m$_{Ph}$** = 4,868.10⁻³³ Kg .

  An effort for the Theoretical - Base of future technologies already started with article [68] and will be continued with Packet $\rightarrow$ **[70] + Plus** $\leftarrow$ for all future articles , from Quantum Physics to theoretical Physics advancing to Astrophysics based on the present.

The Work **W** *, produced from the Wave-Energy-Pattern with wavelengths* **λ$_n$** *, 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 2λ= r = h/p $\equiv$[f$_1$,f2, f$_n$$\equiv$ n lobes] follows the *Stationary-Wave-Nodes-Principle ,i.e.* ***The Glue-Bond-Stress Rotation of opposites on Small - circles creates the*** **Integer number of lobes ,** *which is the Wave-Nodes-Principle of the moving-energy-stores ,* one of which is the Photon.

CONTENT

A : NEWTON – FORCES

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 , $a = \dfrac{v^2}{r}$ and force , F, acted is

$F = m.a = m\dfrac{v^2}{r}$, which is the Centripetal force F_p .

From Newton`s Third-Law , *All forces in the universe occur in equal but opposite directed pairs* , then For any Centripetal force F_p , there is a force of equal magnitude but of opposite direction , the Centrifugal force , F_f , which acts back on the object , *without specifying the nature , or origin of the forces* . In Material-point , [⊕⊖] , ***both forces exist***

apriori , as the Glue-Bond between the two opposites which is the main Stress $\sigma = \pm \dfrac{2.v}{(1+\sqrt{5})}$, and since $v = w.r = 2\pi r/$

$T = (2\pi.r) \cdot f$, where $r =$ the radius of the Energy cave (*the Chaos*) $f =$ the frequency of this rotation , *then* $\sigma = \pm \dfrac{4\pi r}{(1+\sqrt{5})} \cdot f$ or $\rightarrow f = \dfrac{\sigma(1+\sqrt{5})}{4\pi r}$.

i.e. a relation between the Glue-Bond , σ , and the frequency , f , of the rotation , or , In *Chaos* where $r = r \rightarrow 0$ between the $\oplus$, $\ominus$, Opposites , exists a Stress , σ , The Centripetal F_p , and Centrifugal force , F_f , which nature is only the frequency in a complete rotation , and

from Planck's equation $E = h.f = \dfrac{h(1+\sqrt{5}).\sigma}{4\pi r} = \dfrac{h(1+\sqrt{5})}{4\pi} \cdot \left[\dfrac{\sigma}{r}\right]$, then *from Chaos* $r = r \rightarrow 0$, *becomes the Monad* , $[\oplus\ominus]$, which is *the Neutral – Material – Point* . A wide analysis in [59] .

Figure .1. In (1) The Glue-Bond pair of opposites $[\ominus \oplus]$, *Creates Rotation* with angular velocity $w = v/r$, and velocity $v = w.r = \dfrac{2\pi r}{T} = 2\pi r \cdot f = \left[\dfrac{\sigma}{2}\right].(1+\sqrt{5})$, and or frequency $f = \dfrac{(1+\sqrt{5}) \cdot \sigma}{4\pi r}$, with Period $T = \dfrac{4\pi r}{\sigma(1+\sqrt{5})}$ where $\pm\sigma$, are the two equal and opposite , Centripetal F_p and Centrifugal F_f Glue-bond forces .
In (2) Mass , m , of an object rotating with velocity , $\bar{v}$, in a cave of radius , r , creates a pair of equal and opposite forces the Centripetal F_p and Centrifugal F_f .
In (3) The two Forces Newton's Inertia Force $\rightarrow m \cdot a = m\ddot{x}$ and Glue-Bond Force of opposites $F_p = F_f \rightarrow m.v^2/R = \sigma = m.c^2 / r$ and $m = [\sigma r] / c^2$ or , Force $F = m.v^2/R = \nabla(\sigma^2.r^2) / (c^4 r) = \nabla[\frac{\sigma}{c^2}]^2 \cdot r$ and the analogous force for gravity Gravitational Force $\rightarrow$ constant.$\nabla(m_1.m_2)/(x_1-x_2) = g.\nabla[\frac{\sigma}{c^2}]^2 \cdot r$

B : the spin of monads
 1.. *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 **, $\bar{B}$,** 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 [$\ominus$] constituent .   Motion of the [$\oplus$] constituent on each Semi-spherical of the [$\ominus$] 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 $L = (B/2).w$
The Geometrical construction of the Particle's Spin is shown in Figure.2.

[+] SPIN [$\overline{B}=1/2$] Is because Angular Velocity $\overline{w}$ is Positive (+) , *Clockwise*, in Small-Circle
[-] SPIN [$\overline{B}=1/2$] Is because Angular Velocity $\overline{w}$ is Negative (-) , *Anti-clockwise*, in Small-Circle
[+/-] SPIN [$\overline{B}=1$] Is because Angular Velocity $\overline{w}$ is (+) or (-) , and *Rectilinear* , in Great-Circle

Figure .2.. In (1) The Glue-Bond pair of opposites [$\ominus$ $\oplus$] of the *Rectilinear motion in Great circles* , creates 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 $\pm\sigma$, are the two equal and opposite Centripetal ,F_p , Centrifugal ,F_f forces . Energy is $\rightarrow E = h.f = \frac{(1+\sqrt{5}).\sigma h}{4\pi r}$ in *Zero Wave-note.*

In (1) The Glue-Bond pair of opposites [$\ominus$ $\oplus$] 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 $\pm \sigma$ are the two equal and opposite Centripetal,F_p, Centrifugal,F_f forces . Energy is $\rightarrow E = h.f = \frac{(1+\sqrt{5}).\sigma h}{8\pi r}$ in *One Wave-note.*

In (1) The Glue-Bond pair of opposites [$\ominus$ $\oplus$] 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 $\pm\sigma$ are the two equal and opposite Centripetal,F_p, Centrifugal,F_f forces . Energy is $\rightarrow E = h.f = \frac{(1+\sqrt{5}).\sigma h}{8\pi r}$ in *One Wave-note.*

In analysis *The Torsional Momentum is a Vector noted as* $\overline{B}$, *and is the Spin of monads* $\rightarrow$ (Page-68)   )

1. Introduction .
Zeno`s Paradox and The nature of Points .
Word , *quantization* , has to do with the discrete continuity, which describes the Physical reality through the Euclidean conceptual , for Points Straight lines, Planes , the Monads in Universe and the Dual Nature of Spaces as *discrete* and *continuous* . Euclidean Geometry is proved to be the *Model of Spaces* and Material Geometry the *Model of Physical Reality* since it is Quantized as the Complex numbers , which are such.

The proposed Euclidean solution.
Points :
Euclidean geometry definition for Points is as < *that which has no part* > meaning that a point cannot be defined in terms of previously defined objects , but from axioms only as that of , any length , area , volume or any other dimensional attribute (a unique location) . This consideration of points was devised by Zeno of Elea to answer , the how Granulation of points may become a segment.

Euclid`s - Markos :
Point is nothing , has not any Position and Dimension , and may be anywhere in Space if exists , *therefore* , the Primary point A , *being nothing also , in no Space* , is the only point and no-where *i.e. Primary point is the only Space and from this all the others*) . [6] **Straight line :**

Straight line AB is continuous in Points between A and B [i.e. all points between line segment AB *are the elements which fill , AB* , *and which Points are also Nothing* , or Everything else and are Anywhere as in above and for a Runner in order to run the 100 m , has to pass the infinite points between point A and point B [1.1] . A point ,T, is on line AB only when exists equation TA + TB = AB (*or the whole* AB is equal to the parts TA , TB , *as it is the logic of equality and the logic for equations*). Since in nature exists the Principle of Equality and Un-equality consequently any Comparison is including the following three cases .
1.. In case TA + TB > AB then point , T , is not on line AB , **it is OUT**, and then issues the Property of *nequality* and it is the triangle ABT lying in ABT Plane .

This is the main difference between the Euclidean and the Non-Euclidean geometries . On this is based the Philosophy of Parallel fifth Postulate which is proofed to be a Theorem , and also all the Ancient unsolved and now solved roblems . [44-47]

In Euclidean Geometry points A , B , T consist the Plane ABT , while for Others is a curve in Plane ABT .

The Definition 2 (*a line AB is breathless length*) is altered as → *for any point* T *on line* AB   *exists* TA + TB = AB , i.e. it is the equation which is also and equality . [9-10]

Since points have not any dimension and since only AB has dimension (the length |AB| and for any $\overline{A\overline{\overline{T}}}$ the length AT) , and since also on $\overline{A\overline{\overline{B}}}$ exist infinite line segments AT < → AB , which become the quantized material - lengths and have *infinite Spaces , Anti-Spaces and Sub - Spaces* , then (1.1) is impossible in--bringing Achilles to the Tortoise´s starting point B , and also for Tortoise´s to 110 m , because issues as follows **,**

  Straight line AB *is not continuous unless* a Common Dimensional Unit AT > 0 *or*

  AT = ds → AB *is accepted , and thus in this way exists ,*   **a ..** Straight line AB is continuous with points as filling (*Infinitively divisible*)

  b.. Straight line AB is discontinuous (*discrete*) with dimensional Units , ds , as filling (that is made   up of finite indivisible parts the Monads , where ds ≠ 0 , as in Material geometry) and so defining the   Space Anti-space at A , B points and Sub-space as [ds ≠ AB /n , where n =1 , 2 , → ∞] .

  c.. Straight line AB is continuous in ,ds, with ds = 0 as points of filling , and also discontinuous   (*discrete*) with the dimensional Units , ds ≠ 0 , defining the Space , Anti-space at A,B points and   Sub-space , where , *ds = quantum* = AB / n , **{** where n = 1,2,3 → ∞ = [a+b.i] / n = complex number   *and Infinitively divisible which is keeping the conservation of Properties at End Points A , B* **}** as   filling , *and continuous with points as filling ,* [*for n = ∞ then ds = 0 i.e. the ∞ Positions of   points in ds*] , i.e.

Monads ds = 0 → ∞ are simultaneously (*actual infinity*) and also (potential infinity) in Complex number form , and this defines that , infinity exists between all points which are not coinciding , and because ,ds, comprises any two edge points with imaginary part , then this property differs between all the infinite points .

This is the Vector relation of Monads , ds , (or , as Complex Numbers in their general form $\overline{w}$ = a + b . i) , which

is the , *Dual Nature of lines* (*discrete as* $\overline{|a^2+b^2|}$ $\underset{\overline{w}}{}$ *and continuous as points* (.) *and in recent Material-Geometry the Work ≡ Energy ≡ Monads ≡ Imaginary part ,i,*) . [57-58-63M]

2.. In case TA + TB = AB then point T is **ON** straight line AB , where then issues the Property of Equality. On *Monad* AB which maybe equal to , 0 ↔ AB ↔ ± ∞ , exists < *a bounded State of energy for each of the Infinite Spaces and Anti-Spaces* called **Energy monad** in Space moulds > and this [*Dipole AB = Matter = The meter of the reaction to Energy-change*] is the communicator of Impulse [*Force P*] of Primary Space .

This Energy-monad is modified as the Quanta of Energy , *the monad* , and is represented as the above Dipole i.e. This motion is Continuous and occurs on Dimensional Units , ds , *which is the Maxwell`s Monads - Displacement-Electromagnetic-current* [E+$\overline{v}$xP] , and not on Points which are dimensionless, upon these Bounded States of [PNS] , *the Spaces and Anti-Spaces, and because of the different Impulses* P$_A$, P$_B$, *of edge points A , B , and that of Impulses ,* P$_{iA}$, P$_{iB}$ of Sub-Spaces *, they are* either on straight lines AB or on tracks of the Spaces , Anti-Spaces and Sub-Spaces of AB .The range of *Relative velocities* , is bounded according to the single slices of spaces (*ds*). [14 -15] ,[39-40]

3.. In case TA + TB < AB then point ,T, is **IN** straight line AB , *where then is* NOT *issuing the   Property of Equality or Un-equality* .

It is issuing a ***New Paradox in Geometry which is the recently new Material - Geometry***, The Granular Geometry as in articles [55-56] which connects , ***Geometry – Mechanics – Chemistry – Physics .***   From D. Hilbert`s → 4. Problem of the straight line as the shortest distance between two points A and B   become the following :

Lobachevsky : (Hyperbolic Geometry) is excluding the axiom of parallels or assume it as not satisfied . ***Rieman`s***   : (Elliptic Geometry) is excluding the axiom of parallels which assumes that one and only   one Point lies between the other two.

Hilbert`s***    : (Non-Archimedian Geometry) is excluding the axiom of parallels , assuming that          Infinitive Points on Parallels lie between the other two and straight line is the shortest          distance between the two points . ***Euclid`s - Markos :

Straight line is from any Point to Positive , Negative ± ∞ points , *and since is composed of infinite points which are filling the line* , then nature of line is that of Point *(the all is one for Lines and for Points).* ***Euclid`s-Markos*** : (Geometry - Material Geometry) ,The Definition 2 , *(a line AB is breathless length*) is altered as , *for any point , T , on line AB exists* the Equality TA + TB = AB .

The critic of all above is in my articles , and because of the inattention in the establishment in these Definitions , allowed the creation of Non-euclid Geometries which acted Negatively to the Right - Orientation of sciences . The deep concept of Material-Geometry is the , ***distance*** , from the Opposites

    The Space as cave [⊖⊕] ≡ r becomes the ***First Self – Rotating – Monad*** in M-Geometry , **Plane :**

Is Positive , Negative , ± Neutral and ± Complex points and since is composed of infinite Straight lines which are filling Plane , then , *nature of Plane is that of Lines and that of Points* (*the all is one for Planes , Lines and Points*) .

Space :

Space is Positive , Negative , ± Neutral and ± Complex points , and since is composed
of infinite Planes which are filling Space , then , *nature of Space is that of Plane* and
that of Points (the all is one for Spaces , Planes , Lines and Points) .

The Planck Length :

The Planck length L_p , *The distance ≡ Granular Space* , can be defined from the fundamental Physical
constants , The speed of light , The Planck constant and The Gravitational constant as the formula ,

$$L_p = \sqrt{\frac{hG}{2\pi c^3}} = 1,616229.10^{-35} \text{ m} = \textit{which agrees with the Energy - caves } L_p = e^{i.\left(\frac{\pi}{2}+2k\pi\right).b} = e^{-i.\left(5\frac{\pi}{2}\right).b}$$

$$= e^{i.\left(-5\frac{\pi}{2}\right).10} = e^{-.(78,5398).} = \mathbf{8,906}.10^{-35} \text{ m} = \{\sqrt{3}.\pi.\ \mathbf{1,616199}.10^{-35} \text{ m} \} .$$

1.1. Achilles and the Tortoise :

The Problem :

(0m) →   (100 m)   (110 m)
A ------------------T---------------- B → - - - - -
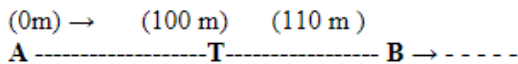
< *In a race , the Quickest runner , Achilles , can never overtake the Slowest , Tortoise , since the
Pursuer must first reach the Point whence the Pursued started , so that the Slower must always
hold a lead* >

This problem was devised by Zeno of Elea to support Parmenides´s doctrine that < *all is one in
Euclidean Absolute Space* > , contrary to the evidence of our senses for plurality and change and to others
arguing the opposite . Zeno´s arguments are as proof by contradiction or (*reduction ad absurdum*)
which is a philosophical dialectic method . Achilles at point ,A, allows the Tortoise at point ,T, a head
start 100 m , and each racer starts running at some constant speed , *one very fast and one very slow* , the
Tortoise say has further 10 m at point ,B , .
Since Straight line AB is continuous with points as filling , *The Quickest* ,
has to pass *Infinitive* points to reach point T , so since the steps are the points ($\frac{AB}{\infty} = 0$) ,
The Quickest will never reach point T .
The same also for *The Slower* with step , ($\frac{TB}{\infty} = 0$) will never reach point B .

1.2. The Arrow Paradox (*Arrow*) :   The Problem :
< *If everything when it occupies an equal Space is at rest , [PNS] , and if that which is in locomotion   is always
occupying such a Space at any moment , the flying Arrow is Therefore motionless* > | (10 m) |
(10m) **ds = a+b.i = v.dt** (10 m)
A ----------------------- > B
A ------- C - D -------- > B
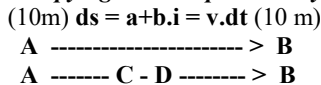
The Arrow Paradox is not only a simple mathematical problem , because is referred also to , *motion in Absolute Euclidean
Space ,* i.e. in a Space where *issues Geometry* , *with all the unsolved till recently problems as ,The Parallel Postulate
the Squaring of circle etc.* and also the *Physical* where Space [PNS] is not moving and because of its
Duality (*discrete and continuous as Complex numbers are*) , shows that
Time is not existing as any essence but only a measure for measurements , i.e. a number .

This Paradox *is not* in metaphysical sphere of mind since is was proved in [15] that , Complex numbers and Quantum
Mechanics Spring out of *the Quantized Euclidean Geometry* .
As before Straight line AB is discontinuous (*discrete*) with dimensional Units , **ds = CD** as filling
and *continuous with points* as filling (The Complex Numbers in the general form w = a+b. i) , *which is the Dual
Nature of lines* (line = *discrete with , Line-Segments , and continuous with points*). It has been shown that PNS Primary
Neutral Space is not moving and Time is not existing , *so Points* , in Primary Space cannot move to where they are
because are already there and motion is impossible. Since any *Points C , D* of the Primary Neutral Space , PNS , are
motionless (v = 0) this is at any Time (the composed instants are dt = 0) , and so then motion is impossible , i.e.
issues [ds = a + b. i = v.dt] where , *for*   a = 0 then ds = b.i = v.dt *and for*   b ≠ 0 and dt = 0 then
ds = Constant = v . 0 →   i.e. **v = ∞** , *for*   b = 0 then ds = a = v.dt *and for* dt = 0 then → ds = a = Constant
= v . 0 →   i.e. again , **v = ∞** ,

Therefore in PNS, $v = \infty$, $T = 0$, *meaning infinite velocity and Time not existing, so,*
Since Arrow is moving from point A to point B, then exists the Numerical order
$A \rightarrow B$ *which is not valid for Temporal order (dt). In case that dt = 0 then motion from Point*
A *to point B has not any concept,* and the distance CD, and anywhere exist the Equal CD ,
is unmovable , **i.e.**

Motion of points C, D of PNS is not existing because time (dt = 0) and infinite velocity (v = ∞)
exists, while motion of the same points C, D exists in PNS out of a moving Sub-Space of AB
(arrow CD is one of the ∞ roots of AB) where , (ds = CD = The Monad in PNS) . [15] .
It has been shown that Primary Neutral Space [PNS] is not moving and Time is not existing , *so*
Points , in Primary Space cannot move , *to where they are,* because are already there and motion is
impossible . Since *Points T, C,,,* of Primary Neutral Space , PNS , are motionless (v = 0) at any Time
(the composed instants are dt = 0) , then motion ($s = v.dt$) is impossible . i.e.
In PNS *velocity v = ∞ and Time = 0 , meaning infinite velocity ,v, and Time is not existing , so since any*
Arrow (a vector) moving from point A to point B, then exists a Numerical order A $\rightarrow$ B , which is
not valid for Temporal order (dt) . In case dt = 0 then motion from Point A to point B has not
any concept , and distance , CD magnitude , and anywhere exist the Equal CD which is unmovable (s=v),
  i.e. *The Motion of points C, D, T..... of PNS is not existing because time (d t = 0) and for ds =*
  Any constant exists with infinite velocity (v = ∞) while motion of the same points C, D, T exists in
  PNS *out of a moving Sub- Space of AB (Included Arrow CD is one of the ∞ roots of this line*
  segment AB).
Monads ds =CD= 0 $\rightarrow \infty$ are Simultaneously, *actual infinity (because for n = ∞ then*
$ds = [AB / (n = \infty)] = 0$ *i.e. a point) and , potential infinity , (because for n = 0 then*

$ds = [AB / (n = 0)] = \infty$ *i.e. the straight line through sector AB .*

Infinity exists between all points which are not coinciding, and because Monads ,ds, comprises
any two edge points with Imaginary part , then this property differs between the ,i, infinite points
or as dš = $\lambda i + \nabla i$, which ($\lambda \equiv$ Space, i$\equiv$ Energy) , is the Quaternion .

Since Primary point ,A, is the only Space then on this exists the Principle of Virtual Displacements W =
$\int_A^B$ P. ds = 0 or [ds.(P_A+P_B) = 0] , i.e. for any monad ds > 0 Impulse P = (P_A+P_B) = 0 and [ds. (P_A+P_B) =
0] , Therefore , Each Unit AB = ds > 0, exists by this Inner Impulse (P) where P_A+P_B= 0 , $\rightarrow$ i.e.

The Position and Dimension of all Points which are connected across the Universe and that of Spaces exists,
because of this equilibrium Static Inner Impulse , on the contrary should be one point only (Primary Point A
$\equiv$ Black Hole $\rightarrow$ ds=0 and P = ∞) . [17,22] . Monad AB is dipole [{A(P_A) $\leftarrow 0 \rightarrow$(P_B)B}] and it is the
symbolism of the two opposite forces (P_A) , (P_B) which are created at points A , B . This Symbolism of
primary point (*zero 0 is nothing*) shows the creation of Opposites , A and B , points from this zero point
which is the Non-existence. [13] .

    All points may exist with force P = 0 $\rightarrow$ { PNS the Primary Neutral Space} and also with P $\neq$ 0 ,
(P_A+P_B= 0) , { PS is the Primary Space} for all points in Spaces and Anti $-$ Spaces , therefore [PNS] is
self-created , and because at each point may exist also with P $\neq$ 0 , then [PNS] is a (perfectly Homogenous ,
Isotropic and Elastic Medium) Field with infinite points (i) which have a $\pm$ Charge with force Pi = 0 $\rightarrow$
P = $\Lambda \rightarrow \infty$ and containing rotational energy Λ in cave $\lambda/2$.

Since points A ,B of [PNS] coincide with the infinite Points , of the infinite Spaces , Anti-Spaces and Sub-Spaces of
[PNS] and exists there rotational energy $\pm \Lambda$ and since Motion may occur at all Bounded Sub–Spaces ($\pm \Lambda$, λ), then this
Relative motion is happening between all points belonging to [PNS] and to those points belonging to the other Sub-Spaces
(A$\equiv$B) . The Infinite points in [PNS] form infinite Units
(The monads = segments) AiBi = ds , which equilibrium by the Primary Anti-Space by an Inner Impulse
(P) at edges A , B where P_{iA}+$P_{iB} \neq$ 0 , and distance ds = 0 $\rightarrow$ N $\rightarrow \infty$.
Monad , the *discrete* Unit ds = Quaternion ($\overleftrightarrow{AB}$) is the ENTITY and [AB – P_A , P_B] is the LAW , therefore Entities
are embodied with the Laws . Entity is quaternion $\overleftrightarrow{AB}$, and law |AB| = Energy length (*the energy quanta*) of points
|A,B| or the wavelength where then AB=0 and imaginary part are the equal forces P_A , P_B as the fields , *the medium* , in
monads , (***This is distinctly seen for Actions at a distance*** , *where there the continuity of all intermediate points being
also nothing , **is succeeded on a quantized , tiny energy volume which consists the material point** i.e. it is a field , the
medium , or by the Exchange of energy in the Inner-monads field*) . [39-40].
Pythagoras definition for a **Unit** is $\rightarrow$ *it is a Point without position , while in Material-geometry* **a Point is $\rightarrow$ *Linearly***
[$\oplus$ s² $\leftrightarrow \ominus$ s²] *or Rotationally* [$\oplus$s² $\cup\cup \ominus$ s²] , *is a Unit having position.*

1.3. The dichotomy Paradox (*Dichotomy*) :

The Problem :

< *That which is in locomotion must arrive at the half-way stage before it arrives at the goal* >

(0m)   →   → (50 m)   (100 m)
A ---------D----------- C-------------------- B
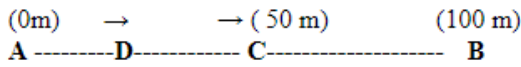
As before , Straight line AB is not continuous unless a Common Dimensional Unit AC > 0 or , as the problem , $ds = 0 \rightarrow AB/2 \rightarrow AB$ is accepted and this because point C is on line AB , where then issues $CA + CB = AB$ and since $CA = CB$ then $CD < CB$ therefore point D on (AD) will pass through C on (AC) before it arrives at the goal B on (AB) .

1.4. The Algebraic Numbers :

From priors , *Monad* $\equiv AB = 0 \leftrightarrow |AB| \leftrightarrow \pm\infty$, *a wave in* AB *Cycloidal or circular cave with wavelength* $\lambda = 2.AB$, **which represents** the Spaces , A , the Anti-Spaces , B , the Sub-Spaces of AB which are **the Infinite Regular Polygons** , on circle with AB as Side , and on circle with AB as the diameter , and it is what is said , *monad in monad* . According to De Moivre's formula the n-th roots on the unit circle AB are represented by the vertices of these Regular , n-sided Polygon inscribed in the circle which are Complex numbers in the general form as ,
$w = a + b.i = r.e^{(i\varphi)}$, and , a and b = Real Numbers ,
$r = \sqrt{a^2 + b^2}$, $(\pm) i$ = Imaginary Unit.
We will show that since Complex Numbers are as **the Monads AB** (*A Monad is any two points non coinciding*) and it is the only manifold , for the Physical reality , *and in the same way the Euclidean Geometry is also Quantized* .
This geometrically is as follows,
a. Since Exists $\sqrt[2]{1} = \pm 1$ or square roots of monad are $[-1 \leftrightarrow +1]$, therefore **xx** (axis) coordinate system represents the one-dimensional Space (+1) and the Anti-Space (-1) which is (the Straight line) , $1.1 = 1$, $(-1).(-1) = 1$ and $[+i]$.
b. Since Exists $\sqrt[2]{-1} = \pm i$ *or both directionally* [↕] , therefore **yy** (axis) coordinate system represents $[-i]$ a perpendicular axis on $(-i).(-i) = +i^2 = +(-1) = -1$, $(+i).(+i) = +i^2 = -1$
c. Since Exists $\sqrt[3]{1}$ = the three roots $[1 , -\frac{1}{2} + (\sqrt{3}.i)/2 , -\frac{1}{2} - (\sqrt{3}.i)/2]$ therefore **xx-yy** coordinate system represents the two - dimensional $\pm$ Spaces and the $\pm$ Complex numbers , (the Plane)
$1.1.1 = 1$, $[-\frac{1}{2} +(\sqrt{3}.i)/2]^3 = 1$, $[-\frac{1}{2} -(\sqrt{3}.i)/2]^3 = 1 + i$

d. Since Exists $\sqrt[4]{1} = \sqrt[2]{}\sqrt[2]{1} = \sqrt[2]{}\pm 1 = [+1 , -1] , [\sqrt[2]{-1} = +i , -i]$ or on the two perpendicular axis - $1 \leftrightarrow +1$, ↕ therefore coordinate systems **xx - yy** represent all these Spaces , - i , i.e. ($\pm$ Real and $\pm$ Complex numbers) , where Monad = 1 = (*that which is one*) , and represents the three-dimensional Space and Anti-Space (the Sphere) which is , $[\pm 1]^4 = [\pm i]^4 = 1$.

The fourth root of **1** *are the vertices of Square in circle* with **1** as diameter and this because the Geometrical Visualization of Complex numbers , is the formula $\sqrt[4]{1} = \pm 1 , \pm i$ …(d) and also since ± 1 is the one-dimensional *real Space* (*the straight line*) , the vertical axis is the other one-dimensional *Imaginary Space* $\pm i$.
Since for dimension , *discrete* , are needed N+1 points , then (d) is representing the Space with three dimensions (dx ,dy ,dz) which are Natural , the Real and Complex . Monads (or the Entities = AB) and are the Harmonic repetition of their roots , and since roots are the combinations of the purely real and purely Imaginary numbers , *which is a similarity with Complex numbers (Real and Image)* , then , **Monads are composed of Real and Imaginary parts as Complex Numbers are** , i.e.
Objective reality contains both aspects (Real and Imaginary , discrete , AB , and the Continuous Impulses P_A , P_B , etc.) meaning that , *Euclidean - Geometry is such Quantized , and becomes the Energy – Space - Reality* . [15]

i.e. The Position and Dimension of all Points which are connected across the Universe and that of Spaces exists ,

i.e. The Position and Dimension of all Points which are connected across the Universe and that of Spaces exists , because of this Static Inner Impulse P , on the contrary should be one point only (Primary Point ≡ Black Hole → ds = 0). [43 - 45]
Impulse is ∞ and may be , Vacuum , Momentum , or Potential , or Induced Potential.

Change (motion) and plurality are impossible in Absolute Space [PNS] and since is composed only of Points that consist an Unmovable Space , then neither Motion nor Time exists i.e. a constant distance AB = **ds** = monad anywhere existing is motionless . The discrete magnitude **ds = [AB /n] > 0** = *the quantum* , and for infinite continuous **n** , **then ds** convergence to **0** . Even the smallest particle (say a photon) has mass , *the reaction to velocity change ,* [15] and any Bounded Space of ds > 0 is not a mass- less particle and occupies a small Momentum , which is the Rotational motion . It is proved that this Rotational momentum , vector $\bar{B}$, is the Spin of monads .

The Physical world is scale-variant and infinitely divisible , consisted of the finite indivisible entities ds = AB → 0 called monads (under Planck`s level) and of infinite points (ds = 0) in monads , i.e. The Euclidean and the Material Geometry.
All entities are Continuous with points and Discontinuous , *discrete* , with the monads → ds > 0 .

In PNS dt = 0 , *which is the meter of velocity changes ,* so motion cannot exist at all and , *ds ≡ v* .

Since any points A , B of PNS coincide with the infinite Points , of the infinite Spaces , Anti - Spaces and Sub-Spaces **of PNS** , and since Motion may occur at all Bounded Sub-Spaces then this **Relative motion** is happening on the, e_{xx}^{yy} or ,e, dimensional to **xx** Space and ↔ Anti-Space (the Straight line) between all points belonging to PNS and all those belonging to other Spaces . *Time exists in Relative Motion and it is the numerical order of material changes in the PNS - Space , and is not a fundamental Entity as is said in Relativity .??*

On *Monad* AB , in any Space - level , and which is = 0 ↔ AB ↔ ± ∞ exists *< a bounded State of energy for each one between the Infinite Spaces and Anti-Spaces >* and the

[Dipole AB = Matter = monad] is the communicator of Impulses [P] *of the Primary Space.*

This Energy monad is modified as the Quanta of Energy and is represented as the Dipole of Energy-monads in any Space-level , and is proved that it is the Material-point .

Synopsis 1 :

Primary point , *which is nothing and* **has not any Position** *may be anywhere in Space , if there is any Space , therefore , the unique Primary point , A , being nothing also* **in no Space** *, is the only* **Point** *and no-where , i.e. Primary Point is the only Space and from this all the others which have Position , and because it is the only Space thus to exist point A , at a second point B somewhere else , point A must move towards point B , where then A ≡ B . Point B is the Primary Anti-Space which Equilibrium point A , and it is the Primary-Neutral-Space → [PNS] = [A ≡ B] . The position of points in [PNS] creates the infinite dipole AB and all the quantum quantities which acquire Potential difference and an Intrinsic momentum (± Λ) in the three Spatial dimensions (x , y , z) and on the infinite points of the (i) Layers at these points , which exist from the other Layers of Primary Space , Anti-Space and Sub-Space , and this is because , Spaces ≡ monads ≡ quaternion . Since Primary point , A , is the only Space then on this point exists the Principle of Virtual Displacements , Work* $W = \int_A^B P \cdot ds = 0$ *or* $[ds \cdot (P_A + P_B) = 0]$ *, i.e. for any ds = vector > 0 Impulse* $P = (P_A + P_B) = 0$ *and* $[ds \cdot (P_A + P_B) = 0]$ *, Therefore , Each Unit AB = ds > 0 , exists by this Inner Impulse (P) where* $(P_A + P_B) = 0$ *. This Monad , discrete , (Unit ds = Quaternion)* $\overrightarrow{AB}$ *is the* ENTITY *and* $[AB - P_A , P_B]$ *is the* LAW *≡ the Content , therefore Entities are embodied with the Laws .*
Entity is quaternion $\overrightarrow{AB} \equiv a + b \cdot i = r \cdot e^{(i\varphi)}$ *, and Form |AB| = Energy length (the energy-quanta) of points |A ,B| or the wavelength , and imaginary part are the equal forces* P_A , P_B *as fields , or the medium , in monads . Line segment AB is not continuous unless a* **Common Dimensional Unit** *AT > 0 or AT = ds → AB is accepted and thus in this way exists TA+TB= AB and then point T is ON straight line AB , i.e. the whole AB is equal to the parts , TA , TB , where then issues the Property of Equality and the relation between the Whole and the Parts . This property in Geometry issues in all Physical levels .*
Primary Segment *is of the* **Form** $\overrightarrow{AB}$ *, where* **Form** *|AB| ,* **Finite** *AB and* **Infinite** *, ∞ , to the zero Point* $L_v = e^{i(\frac{N\pi}{2})} b = 10^{-N} = -\infty$ *, and for N = ∞ → 0 , where exists , The* **Content is Atraction** $P_A \leftrightarrow P_B$ *and the* **Repulsion** $P_A \rightarrow \leftarrow P_B$ *, and Quantity in Real part is length* $AB \equiv L_v$ *, and the Imaginary part is Quality* $(P_A + P_B) = 0$ *, and when this* **Quality** $(P_A + P_B) \neq 0$ *then is a differentiation , and so on .*
Since also **Imaginary Part** *is always* $(P_A + P_B) = 0$ *then* **Form and Content** *are absolutely inseparable and pass from zero for all Opposites , so all Entities are embodied with the Laws , and since also valid* $(P_A + P_B) \neq 0$ *then , the Zero equality is the* **Critical-Energy-Quantity** *{CEQ} for any transition in different Quality , a kind of Catalyst which is not changing the composition of Primary Segment , it is the unity of opposites , and since also Work ≡ Energy involved in all levels , then Generally → is holding that ,*
In Primary Segment $\overleftrightarrow{AB} \equiv a + b \cdot i = r \cdot e^{(i\varphi)}$ **exists the Contratiction and Identity** *, an Extrema-state of Unstable-equilibrium on the edge of nothing , or the opposites interpenetrate in Unity , or Similar charges Repel each other whereas opposite kinds attract , or a Tiny - Energy - Space , Anti-space containing Work ≡ Energy ≡ Eternal Self-Motion as Wave , forming the Material world ,* **Apriori** *.*

It Was proved that **The Eternal - Rotation** *of (+) Opposite around (-) Opposite , due to Centifugal and Centrifugal Glue-Bond , ± σ ,* **creates in caves which are Standing waves as Resonance phenomenon** *the Identical Angular- momentum and* **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 .*

The Ideal is nothing else than this **Material-world** *reflected by the human mind and translated into forms of thoughts . Since Monads are quaternion as* $w = a + b \cdot i = r \cdot e^{(i\varphi)}$ *, composed of Real (a) and Imaginary part (bi) as Complex Numbers are , so Work , Energy , is the Monad`s most characteristic - existence .*
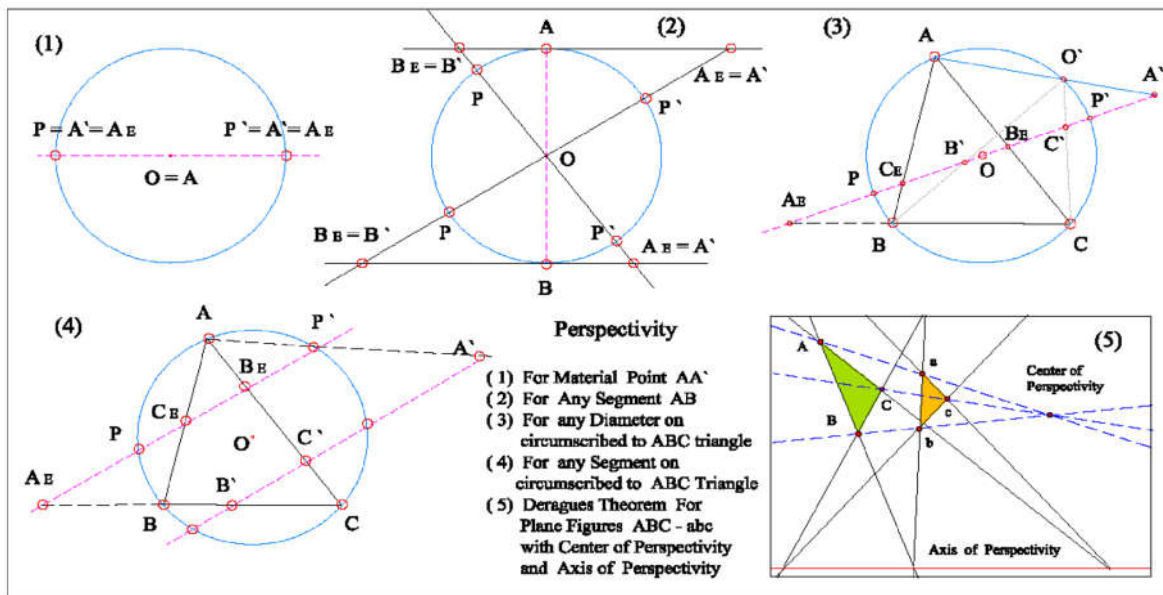
Figure.3... Pole and Axis of Perspectivity for Points , Sectors , Planes , Volumes.

2.1. Perspectivity :

Projective in geometry has to do with Points , Lines , Planes and Spaces embedded in Euclidean geometry as in Fig.3.

In (1) Perspective Points P , P` lie on line PP` which is monad AA` , and where O is their middle point of this material point AA`.

In (2) Perspective Points P , P` lie on the circumference of the circumscribed sphere of Plane ABO through AB axis , where O is the common circumcenter of Segment AB.

In (3) Perspective Points P , P` lie on the Diameter of the circumscribed circle in Plane ABC , where O is the circumcenter of triangle   ABC and O` is the concurrent point on circle .

In (4) Perspective Points P , P` lie on any segment of circumscribed circle in ABC Plane , with O as center and parallel to conjugate A`B`.

In (5) Perspective Points P , P` lie on the Axis of Perspectivity of the Planes of circumscribed circles of Planes ABC , abc being centrally perspective.

*Projective geometry , (**Desargues` theorem**) , declares that , two triangles ABC , abc are in perspective axially , if and only if they are in perspective centrally .*

We will show that , **Perspective and Projective Geometry** is embedded and it is an **Extrema** in Euclidean geometry.

Proof :

a.. In F3-(4) , Two points P , P′ on circumcircle of triangle ABC , form **Extrema** on line PP′. Symmetrical axis for the two points is the mid-perpendicular of PP′ which passes through the center O of the circle, *therefore* the Properties of axis PP′ are transferred on the Symmetrical axis in rapport with the center O (central symmetry), *i.e.* the *three points of intersection* A_E , C_E *are Symmetrically placed as the other three points A′ , B′ , C′ on this Parallel axis* .

b.. In F3-(3) points P , P' **are on any diameter** of the circumcircle , and then line PP' coincides with the parallel axis , the points A' , B' , C' are Symmetric in rapport with center O and *the Perspective lines AA' , BB' , CC' are concurrent in a point O' situated on the circle* .
When in F3-(5) , a pair of lines of the two triangles (ABC , abc,) are parallel , then extrema case is when their point of intersection recedes to infinity ,and axis PP' passes through the circumcenters of the two triangles , (Maxima) and is not needed " to complete " the Euclidean plane to a projective plane .i.e.

> *Perspective lines of two Symmetric triangles in a circle are concurrent in a point , on the diameters and through the vertices of the corresponding triangles .*

c.. *When all pairs of lines of two triangles are parallel , the equal triangles ,then points of intersection recede to infinity , and axis PP' passes through the circumcenters of the two triangles (The Extrema case).*

d.. *When the second triangle is a point **P** then axis PP' passes through the circumcenter of the triangle .*

From above is shown that *Perspectivity* exists between any triangle ABC , a line PP' and a center O , where then exists Extrema for each Point , Line , Plane , Space etc. i.e.

Perspectivity on a Plane is transferred on lines and from lines to Points . This is the compact logic into Euclidean geometry , which holds in Extrema Points , and thus Projective and Perspective - Geometry is an Extrema in Euclidean–Geometry in all levels without controversy or contradiction .

Mathematical interpretation and all the relative Philosophical reflections based on the Non - Euclid geometry theories , must be properly revised and resettled in the truth one.
For conceiving alterations from Point to sectors *discrete* , lines , plane and volume is needed Extrema knowledge where there happen the inner transformations on geometry and the external transformations of Physical world .
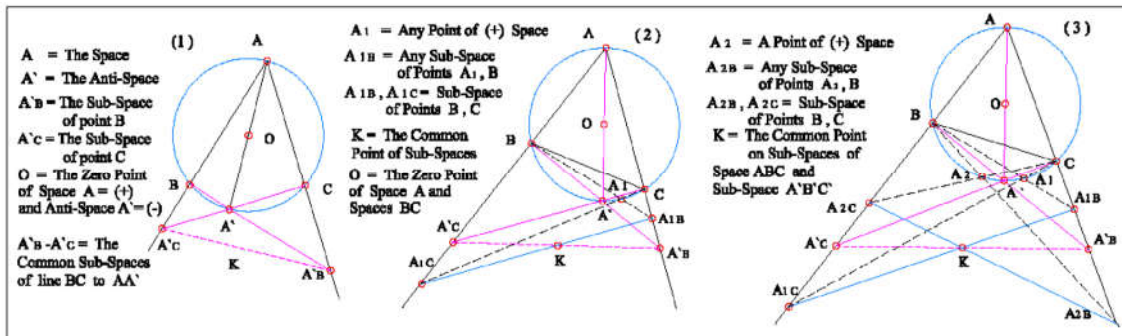
Figure.4.. The Coexistance of Space ABC and Anti-space A` , B` , C` in a Plane .
The Spaces , Anti-Spaces of One Point is A↔A` , of Two Points B,C ↔ A`B,A`C , of Three Points ABC , *the Plane* , is ABC ↔ A ` , A`B , A`C ,and are the Extrema points on any circumcircle in triangle ABC .
Discrete , on Geometry happens in all levels and Primary in STPL as shown below.

2.2. The Extrema Euclidean Geometry :
1.. In Figure .4. Extrema of a point A is point A` on Straight line AA` and the middle point of segment AA` is point O with equal distance OA = OA` . From point O is drawn the only one circle (O,OA=OB) on which exist infinite points forming any triangle ABC in the circle of this diameter AA' .

Point A represents the Space and point A` the Opposite Anti-space .
In E-geometry the two points *equilibrium because of equal distances* **OA , OA`** from midpoint O while in Material-Geometry *equilibrium because of equal Forces* $P_A$ , $P_{A`}$ at end points A , A` , from midpoint O . i.e. it is Dipole =[⊕⊖]=∅=AB .

Is shown also the relation between point A` which is the Anti-space , with the three points A,B,C representing the Space-Plane .

Lines CA′ , BA′ produced , intersect lines AB , AC at points $A`_C$ , $A`_B$ respectively .
Points $A`_C$ , $A`_B$ represent the Sub-space of , Space , Anti space A↔A` .
A1 is any point on the circle between the points B , A′.
CA1 , BA1 produced intersect lines AB , AC at points A_{1C} , A_{1B} respectively.
Show that lines A_{1C} , A_{1B} are concurrent at the circumcenter K of the triangles $CA_{1C} A_{1B}$, $BA`_B A`_C$.

Proof :
Since angle < $ACA`_C$ = 90° so angle < $A`CA`_B$ = 90° also , therefore the circumcenter of triangle $CA`_C A`_B$ is point K , the middle point of diameter $A`_C A`_B$. Fig.4 -(2)
Considering angle < $A`_C CA`_B$ = 90° as constant then all circles passing through points C , $A`_C$ , $A`_B$ have common radius KC .
Considering angle < $A`_C BA`_B$ = 90° as constant then all circles passing through points B , $A`_C$ , $A`_B$ have their center on $A`_C A`_B$ line .
Considering both angles < $A`_C BA`_B$ = $A`_C CA`_B$ = 90° then lines $BA`_C$ , $CA`_B$ produced meet lines $AA`_C$ , $AA`_B$ at points A_{1C} , A_{1B} such that line $A_{1C} A_{1B}$ passes through point K which is (*the common to* $A_{1C} A_{1B}$, $A`_C A`_B$ *segments*) and when angle < BAC = 0 as extrema case then point K , coincides with Anti-space point A` which are both on the circle , *i.e. From all contrary cases ,*
In an angle < BAC of triangle , ABC , exists a constant point K , such that all lines passing through this point intersect sides AB , AC at points A_{1C} , A_{1B} so that internal lines A_{1C} A_{1B} concurrence on the circumcircle of triangle ABC and in Extrema case , angle < BAC = 0 , this point becomes the Anti-point A` ≡ A_E where then lies on line AK becoming the AK_A sector . The case of an angle < A equal to 180° is next examined in Fig.3 , as the general extrema cases in a Plane triangle .
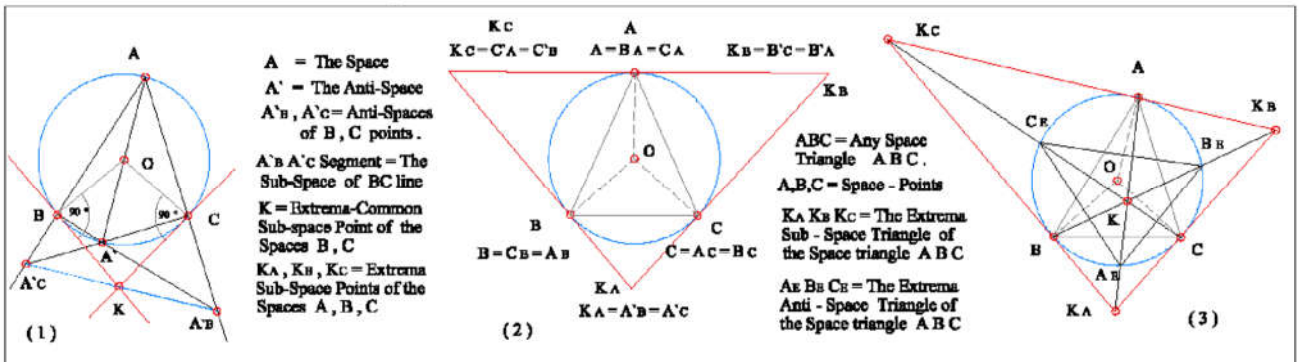
Figure.5.. In (1) Concurrency points in and out of any circumcircle of triangle ABC .
      In (2) The Extrema Concurrency points of vertices of any triangle ABC .   In (3) The Extrema Sub-Space and Anti-Space of any Space Plane-triangle ABC.

2.. In Figure .5. Extrema of the circumcircle triangle ABC on its vertices :
In (1) , When any point A_1 coincides with point B (Superposition of points A_1 , B) , then line $B A_1$ is the tangent at point B , *extrema* , where then angle < OBK = 90° . When any point A_1 coincides with point C , (Superposition of points A_1 , C) then line CA_1 becomes the tangent at point C , where then angle < OCK = 90° .
 Following the above logic for the three angles BAC⌢ , ABC⌢ , ACB⌢ , then , K_AB , K_AC are tangents at points B nd C and angles < OBK_A = OCK_A = 90 °.
K_BC , K_BA are tangents at points C and A and angle < OCK_B = OAK_B = 90° .
K_CA , K_CB are tangents at points A and B and angle < OAK_C = OBK_C = 90° . F.3-(2)
Since at points A , B , C of the circumcircle exists only one tangent then ,
The sum of angles OCK_A + OCK_B = 180° therefore points K_A , C , K_B are on line K_AK_B .
The sum of angles OAK_B + OAK_C = 180° therefore points K_B , A , K_C are on line K_BK_C . The sum of angles OBK_C + OBK_A = 180° therefore points K_C , B , K_A are on line K_AK_C i.e.
The circle (O , OA = OB = OC) is the inscribed in triangle $K_AK_BK_C$ and the circumscribed on triangle ABC .

In all Plane levels of Euclidean Geometry , the Space points A , B , C , the Anti-Space points [A` , B` , C`] ≡ [A$_E$, B$_E$, C$_E$] , and Sub-Space points K$_A$, K$_B$, K$_C$ lie on the Circumscribed circle and Circumscribed to ABC triangle and it is the Extrema of it , to its vertices .

This coexistence of the three Spaces in One , is the main property of Spaces , and the Stabilizer into this Mechanism , is the Work ≡ Energy as Glue-Bond between them . [58]

Theorem : *On any triangle **ABC** and the circumcircle exists one inscribed triangle A$_E$B$_E$C$_E$ and another one circumscribed **Extrema** triangle K$_A$K$_B$K$_C$ such that the **Six** points of intersection of the six pairs of **triple lines** are collinear → (6+6+6) = 18 . Fig.5 –(3)*

The six-triple points-line [STPL] is line → of Points D$_A$,D$_B$,D$_C$ - P$_A$,P$_B$,P$_C$ where ,
Triangle **ABC**   → is the Space Triangle ,   Triangle **A$_E$B$_E$C$_E$** → is the Anti-Space Triangle ,   Triangle **K$_A$K$_B$K$_C$** → is the Sub-Space Plane Triangle .

   Proof : Fig.4 - Fig.5. (3) - Fig.6.

Let   ABC be any triangle (The Space) , the K$_A$, K$_B$, K$_C$ are the points of intersection of tangents   at A,B,C points of circumcircle (The Sub-Space) , A$_E$, B$_E$, C$_E$ be the points of intersection of lines AK$_A$, BK$_B$,CK$_C$ and the circumcircle (The Anti-space) respectively .

1.. When points   A $_1$, A coincide , then internal lines CB $_1$, BC $_1$ coincide with sides CA , BA ,   so line K$_A$A is constant . Since point A$_E$ is on Extrema line AK$_A$ then lines C$_E$B , B$_E$C   concurrent on line AK$_A$. The same for tangent lines   K$_A$K$_B$, K$_A$K$_C$ of angle < K$_B$K$_A$K$_C$.

2.. When points   A $_1$, B coincide , then internal lines CA $_1$, AC $_1$ coincide with sides CB , AB ,   so line K$_B$B is constant . Since point B$_E$ is on Extrema line BK$_B$ then lines A$_E$C , C$_E$A   concurrent on line BK$_B$. The same for tangent lines K$_B$K$_C$, K$_B$K$_A$ of angle < K$_C$ K$_B$ K$_A$.   **3..** When points A $_1$, C coincide , then internal lines AA $_1$, BA $_1$ coincide with sides CA , CB ,   so line K $_C$C is constant . Since point C$_E$ is on Extrema line CK$_C$ then lines B$_E$A , A$_E$B   concurrent on line CK$_C$. The same for tangent lines K$_C$ K$_A$, K$_C$ K$_B$ of angle < K$_A$ K$_C$ K$_B$, i.e.   ***Triangles*** **ABC , A$_E$B$_E$C$_E$, K$_A$K$_B$K$_C$ are Perspective between them ,   and consequently between the Spaces.**

 Since Triangles ABC , A$_E$B$_E$C$_E$ are Perspective between them , therefore the pairs of Perspective lines
[AA$_E$, BC$_E$,CB$_E$] , [BB$_E$, CA$_E$, AC$_E$] , [CC$_E$, AB$_E$, BA$_E$] are concurrent in points P$_A$, P$_B$, P$_C$, respectively .
Since Triangles ABC , K$_A$ K$_B$ K$_C$ are Perspective between them , therefore the pairs of Perspective lines [K$_B$A , CB , C$_E$B$_E$] , [K$_A$B , AC , A$_E$C$_E$] , [K$_B$C , BA , B$_E$A$_E$] , are concurrent in points D$_A$,D$_B$, D$_C$ respectively .
Since lines (K$_A$K$_B$, K$_B$ K$_C$, K$_C$K$_A$) are Extrema (tangents to circumcircle) for both triangles
ABC and A$_E$B$_E$C$_E$, of sides (BC , B$_E$C$_E$) , (AB , A$_E$B$_E$) , (AC , A$_E$C$_E$) , then , the points of intersection of these lines lie on the same line . i.e.

This compact logic of the points [A , B , C] , [A$_E$, B$_E$, C$_E$] , [K$_A$, K$_B$, K$_C$] when is applied on the three lines (K$_A$K$_B$, K$_B$ K$_C$, K$_C$K$_A$) then the SIX pairs of the corresponding lines which extended are concurrent at points P$_A$, P$_B$, P$_C$ ***for the triple pairs of lines (Pascal`s Perspectivity of points in Euclidean geometry) , [AA$_E$, BB$_E$, CC$_E$] , [BB$_E$, CA$_E$, AC$_E$] , [CC$_E$, AB$_E$, BA$_E$] and at Points*** D$_A$, D$_B$, D$_C$ ***for the triple pairs of lines***   [K$_B$ K$_C$, BC , B$_E$C$_E$] , [K$_A$K$_C$, AC, A$_E$C$_E$] **and**   [K$_A$K$_B$, AB , A$_E$B$_E$] , (***Desargues`s Perspectivity of points in Euclidean geometry) and all the   18 common points lie on a straight line the → STPL Mechanism .***

As proved **,** Straight line AA$_E$ is continuous in ,ds, with ds = 0 as points of filling , and also discontinuous
(*discrete*) with the dimensional Units , ds ≠ 0 , defining the Space , Anti-space at A ,A$_E$ points and Sub-space at K$_A$, where , *ds = quantum = AA$_E$/ n , (where n = 1,2,3 → ∞ , = [a+b.i] /n = complex number and Infinitively divisible which is keeping the conservation of Properties at End Points* A , A$_E$) as filling , ***and continuous with points as filling*** (and for n = ∞ then ds = 0 i.e. the ∞ Positions of points in ds) . On line AA$_E$ exists Euler-Savary mechanism for Couple-Curves.

2.3. Remarks on The Physical meaning   of the Geometrical Properties.   The [STPL] ≡ Six Triple Points Line Mechanism .   The Geometrical mould on Physical world :

1.. [STPL] is a ***Geometrical Mechanism*** that produces and composite all opposite Space Points from   Spaces (The three characteristic points A-B-C forming a Plane) , Anti-Spaces (The corresponding   points A$_E$B$_E$C$_E$ of opposite direction through the Zero space) and the Sub-Spaces (The Zero Plane   points K$_A$, K$_B$, K$_C$ is similar to Positive axis which passes from Zero in order to pass to the opposite   Negative axis) in a Common Circle , *Sub-Space* , line or a cylinder .

2.. Points A,B,C and lines AB , AC, BC of ***Space , communicate with*** the Extrema corresponding
   A$_E$B$_E$, A$_E$C$_E$, B$_E$C$_E$, of ***Anti-Space*** , separately or together with bands of three lines at points   P$_A$, P$_B$, P$_C$, and with bands of four lines at points D$_A$, D$_B$, D$_C$ *,   **on common circumscribed circle** (O , OA) , **consisting the Sub-Space**.* [17]

3.. If any monad AB (*quaternion or Vector*) , [s , v̄.□i] , *all or parts of it* , somewhere exists at points   A,B,C or at segments AA$_E$, BB$_E$,CC$_E$ then [STPL] line or lines , is the Geometrical expression of   the Action of the External triangle , K$_A$ K$_B$ K$_C$, *the tangents as extrema is the Subspace* , on the two   Extreme triangles ABC and A$_E$, B$_E$, C$_E$ (*of Space Anti-Space*) creating 1,3,5, spin , *the minimum*

Energy - Quanta .(This is the How Opposites combine and produce the Material-Neutral-Points) . [29]   When the **monad** (quaternion with real part = s = 2r and Imaginary part $\bar{v} = \square i = \bar{\Lambda} = \Omega$ = m.v.r) is in   the recovery equilibrium (*a surface of a cylinder with 2r diameter*) , and because velocity vector is on the   circumference , then the two quaternion elements identify with points A,B,C (of the extreme triangles

  ABC of Space ABC) and Imaginary part with points A_E , B_E , C_E (of the extreme triangles $A_E B_E C_E$ (of   Anti-Space) , on the same circumference of the prior formulation and are rotated with the same angular   velocity vector $\bar{w} = 2\pi f$.

The inversely directionally is the rotated Energy $\pm \bar{\Lambda}$ and equilibrium into the common circle , so Spaces and Anti-Spaces meet in this circle which is the common Sub-space . Extreme Spaces (the Extreme triangles ABC) meet Anti-Spaces (the Extreme tangential triangles $A_E B_E C_E$) , through the only Gateway which is the center O of the Plane Geometrical Formulation Mechanism (mould) of the [STPL] line . [43]

Since the origin of Space [S] becomes, through the Principle of Virtual Displacements as , $W = \int_A^B Pds$ *= 0 from Primary Point* A *which is the Space , to* A_E *which is the Anti-space as the Inner distance ,ds, of Space and Anti-Space in all Layers then , Distance* ds = AA_E *is the Work embedded in monads and it is the what is eternally moving and eternally stationary , and because of the Principal stresses* $\pm \sigma$ *, is vibrated .*
Since also Work of the Inner Impulse distance of Space and Anti-Space is embedded in all material points of universe , stationary points *, a Torsional Oscillation* $\bar{\Lambda}$ *in STPL mechanism happens and thus a Natural Wave-Frequency* **f_m** = **w/2π** *is embedded in Material-Geometry , from which exist the Euler-Savary equations with the rotating and Rolling curves , and thus become the figures of Conchoide to Spirals and all the others .* [58]
Point, which is nothing and has not any Position may be anywhere in Space , therefore , the Primary point A , being nothing also in no Space , is the only Point and nowhere , i.e. Primary Point is the only Space and from this all the others which have Position , therefore it is the only Space and so to exist point A at a second point B somewhere else , point A must move towards point B , where then A ≡ B.
Point B is the Primary Anti-Space which Equilibrium point A , [PNS] = [A ≡ B] . The position of points in [PNS] creates the infinite dipole and all quantum quantities which acquire Potential difference and an Intrinsic moment $\pm \Lambda$ in the three Spatial dimensions (x , y , z) and on the infinite points of the (i) Layers at these points , which exist from the other Layers of Primary Space , Anti-Space and Sub-Space , and this is because Spaces = monads = quaternion [9] .
Again , since Primary point A , is the only Space then on this point exists the Principle of

Virtual Displacements as $W = \int_A^B P.ds =$ 0 or [ds .($P_A + P_B$)= 0] , All points may exist with
P = 0 → (PNS) and also with P ≠ 0 → (Spaces) because , ($P_A + P_B$=0) for all points in Spaces and Anti –Spaces , therefore [PNS] is self -created , and because at each point may exist also   with force   P ≠ 0 , then [PNS] is a (perfectly Homogenous , Isotropic and Elastic Medium ,   in spatial and Temporal domain) Field with infinite points which have a ± Charge with force
P = 0 → P = Λ → ∞ .
Work (W) is quantized on material-points as EM wave and spin $\pm(\bar{p})$ and from this , equilibrium and quantized angular momentum $\bar{\Lambda}$ which is independently of time and is capable of forming the   Wave nature of Spaces , following the Boolean logic and distorting momentum $\bar{p} = \bar{\Lambda}$, as energy , on the intrinsic orientation position of points , on all points of the microscopic and the macroscopic homogeneity.
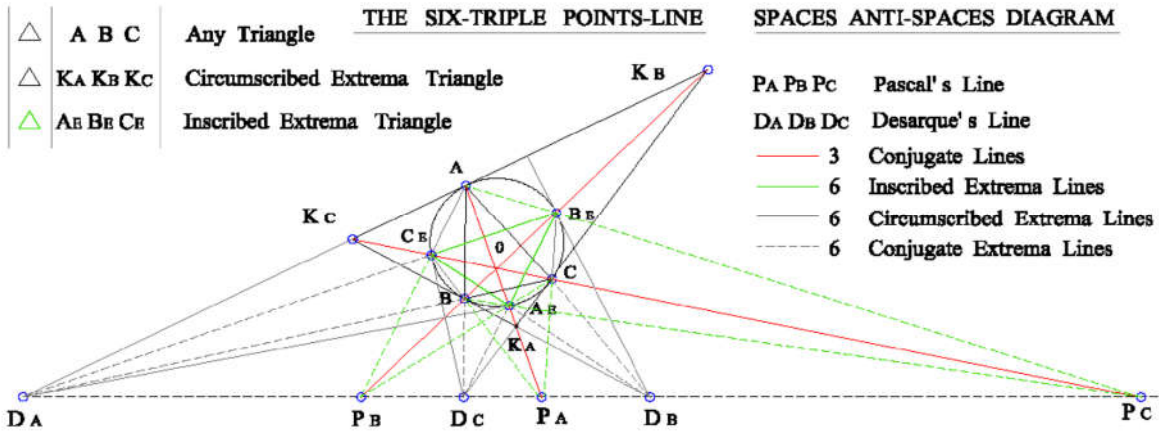Since also in common circle rotational velocity ,$\bar{w}$, and momentum , $\bar{\Lambda}$, are constants , and because of these the constant velocity ,c, is created , so thus it consist a Pure quaternion which is the cause of their Inner motion , (This is the Electromagnetic wave which produces Spin) and of their Outer Spin (This is the screw helically Kinetic Energy wave Motion conjugation) .
Conjugation equation of the two constituents $\bar{w}$ and Λ , gives ,
$(\partial/\partial t , \bar{w}) \copyright (0 , \Lambda) = (- \Lambda , wx\Lambda) = (-\bar{H}x\bar{\bar{P}}, \square x\bar{\Lambda}) =$

$[\lambda , \square$ x $\bar{\Lambda}] = E = $ h. $f_n = \dfrac{h(1+\sqrt{5})}{4\pi} . [\dfrac{\sigma}{r}] = (\dfrac{n\sigma}{8\,r^2}) . \bar{\mathbf{B}}$ [13-15] .

3.. The Material Geometry and Properties .
  All above Geometric logic is simultaneously presented on Space , Anti-space and on the deep relation of the Material-Geometry and Physics , because by Considering → point A as the positive Space = $\oplus$, point A_E as the negative Anti-Space = $\ominus$, and point K_A as the Neutral = $\square$ Space then , in Fig.7 ,

△	A B C	Any Triangle
△	K_A K_B K_C	Circumscribed Extrema Triangle
△	A_E B_E C_E	Inscribed Extrema Triangle

THE SIX-TRIPLE POINTS-LINE

SPACES ANTI-SPACES DIAGRAM

P_A P_B P_C	Pascal's Line
D_A D_B D_C	Desarque's Line
—— 3	Conjugate Lines
—— 6	Inscribed Extrema Lines
—— 6	Circumscribed Extrema Lines
- - - 6	Conjugate Extrema Lines

Figure.6.. *The Six , Triple Concurrency Points , Line .* [STPL] → D_A , D_B , D_C - P_A , P_B , P_C [ABC ≡ The Space] , [A_E, B_E, C_E ≡ The Anti-Space] , [K_A, K_B , K_C ≡ The Sub-Space]
The Space ABC , The Anti-Space A_E, B_E, C_E coincide in The Sub-Space K_A, K_B , K_C .
This Property of links ,constitutes the Instaneous rotation of , Plane Space , Anti-space , [For point A is the Rotation of Triangles OAD_A , OAA_E with velocity , $\bar{v}$, on the circumference of circle (O,OA)] with Instaneous centers of rotation D_A , P_A on STPL Line , where then equilibrium happens on AK_A straight line . Simultaneously Euler - Savary equation relates three directed quantities lying on the path normal AK_A and reduces to having K_AA_E , K_AP_A always laid off in the same sense along the line AK_A, and also the converse of Positions since inflection circle (O,OA) is the location of couples points whose curves have an infinite radius of curvature as in Figure 7. where angle < AOA_E = 180˚. Euler-Savary equation gives the radius and the center of curvature of this coupler curve between the Instaneous Rotation of , Space and Anti-space .

In Figure. 7-8-9 , *is shown the Lorentz factor* γ ≡ sec.φ *, becoming from* **STPL mechanism and** *related to All known Particles , following the Conchoide of Nicomedes to* **COSC .** [58]
     Gravity force is exerted on breakages [± ($\bar{w}$.r)² = Material points = Dipole of the two ± quantized energy-spaces ($\bar{w}$.r)² as velocity vector , $\bar{c}$, which is then decomposed into two reverse velocities following the cycloidal motion , and consisting the intrinsic Stationary Electro-magnetic Wave of gravity, and which is binding points of this Homogenous-Isotropic, Rest and mass-less nature Field.
The total dispersion Rotating energy of dipoles is [± $\bar{\Lambda}$]² = [p.c]² +[m_o.c²]², which is the known relativistic energy-momentum equation of Lorentz transformation equations.
It has been shown [16] that Projective and Perspective geometry are Extrema in Euclidean geometry into
[STPL] line , their boundaries becoming from common Space and Anti-space. Energy , *Motion*, follows this Euclidean moulds, because this Proposition , *Principl*e, belongs to geometry, and not to Energy which is only motion. That is why in Planck`s length light travels at the same speed , no matter how fast any other.
In [33-36] The Un-clashed Fragments through center O, consist the Medium-Field , and
Material-Fragment → [± s²] = [MFMF] is the Base for all motions, and Gravity as force [□i] , while the clashed with the constant velocity ,$\bar{c}$, consist the Dark matter [± $\bar{c}$.s] and the Dark energy [$\bar{c}$.□i] , or from → Breakages [± s² = ± (wr)²] and [□i = 2(wr)²] where then become Waves { *Distance* ds=AA_E is the Work embedded in monads and it is what is vibrated } with Vibrating equations of motion becoming as

A   → Particles, with Inherent Vibration ,
B   → Gravity-Field-Energy, without Vibration
C   → Dark-Matter-Energy constituents as ,

A.. [±$\bar{v}$.s²] → Fermions and [$\bar{v}$.□i] → Bosons,

B.. [± s²] → [MFMF] Field , and the binder Field , which is $[\nabla i] = g.\nabla[\frac{\sigma}{c^2}]^2$. r → the Gravity force ,
C.. [±$\bar{c}$.s²] → Dark matter , and the binder Gravity force [□i] , [$\bar{c}$.□i] → The Expanding Dark Energy.

From above is seen that in , A , and , C , case Energy as velocity , $\bar{v}$, exists in the Discrete monads , ±$\bar{v}$.s² and ±$\bar{c}$.s² .
Case , C , declares that → Antimatter-Galaxies and Antimatter – Asteroids can exist only as Dark-matter or and Dark-Energy and not as Antimatter light , - **c** . And because of above , →   Dark Energy travelling with the light velocity is actually causing the universe to grow .

B *case , is the transportation of Energy   from Chaos [PNS] , to the Material points being   Linearly in String [+s²*
↔ - s²] , [⊕s² ↔ ⊖   s²] or Rotationally as Spin [⊕   s² ∪∪ ⊖   s²] as shown .

 Figure.7.. ABC is any triangle (The Space) , $K_A K_B K_C$ triangle is the (The Sub-Space) , $A_E B_E C_E$ triangle is (The Anti-space) respectively . The Instaneous Pole **P** ≡ A_E of rotation is off the   circle on AA_E axis .Inscribed to ABC circle is Common circle of STPL-{D_A-P_A} mechanism   *The Reference System* {D_A- P_A}≡[R] (x',y',z', t') *moves with velocity ,v̄, parallel to ,* x-x', *axis   with respect to the fixed and Absolute System* {D_A- O} ≡ [S](x,y,z, t) **.**

    The Space point , A , moving on (p) curve , and Anti-Space point A_E moving on (ε) curve   are rolling on the same Sub-space circle (O,OA) ≡ (O,OA_E) which is the common cave-circles   of Material Geometry in STPL - {D_A-P_A} mechanism .

3.1. The Instaneous Pole P ≡ A_E of rotation , on the Inflection-circle of Plane $AD_A A_E$ of STPL
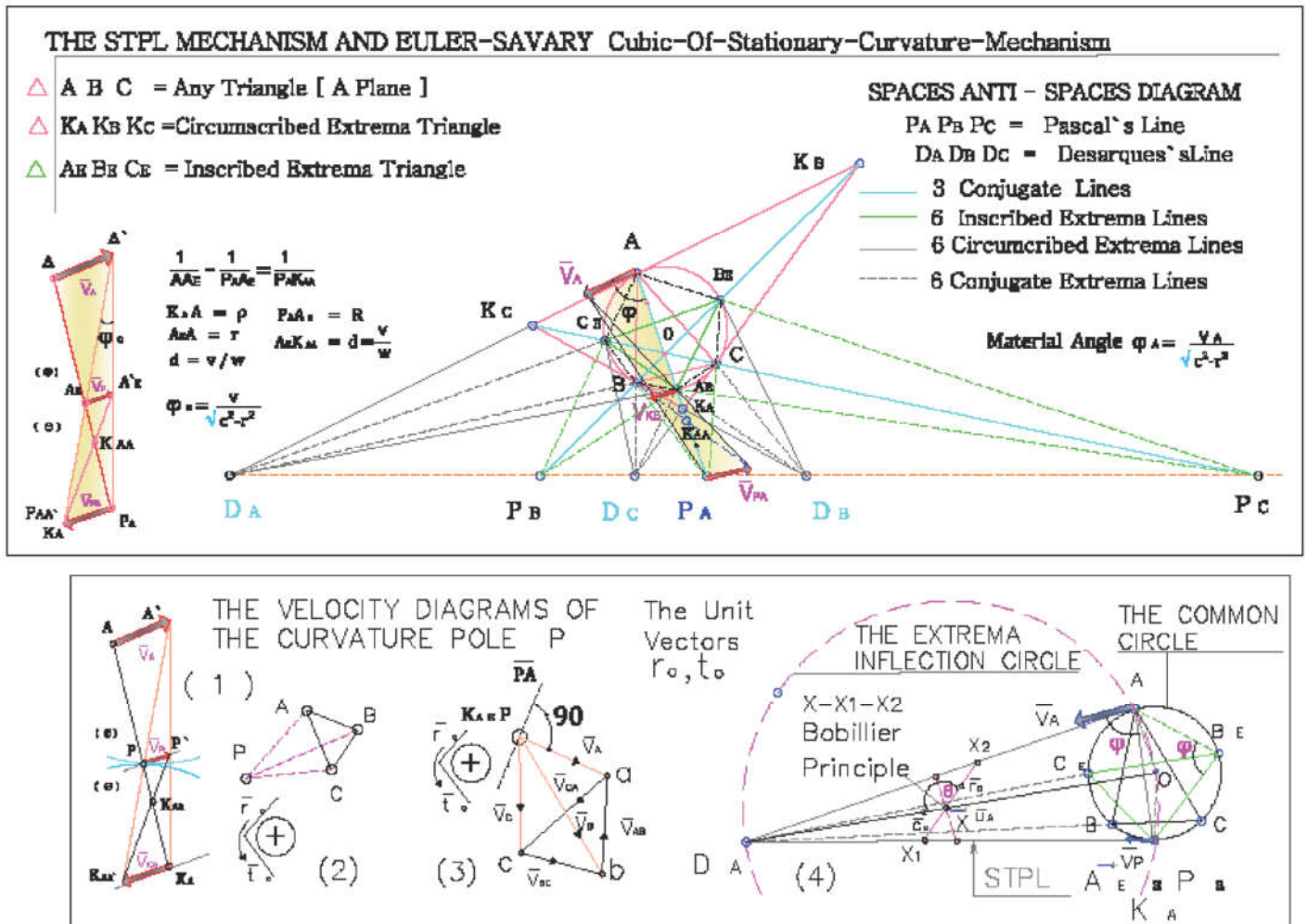
Figure.8.. ABC ,is any triangle (The Space) , $K_A K_B K_C$ triangle is the (Sub-Space) , $A_E B_E C_E$ triangle   is the(Anti-space) respectively. The Instaneous Pole **P** of rotation coincides with the   Anti-space point A_E on the circumscribed to ABC circle .

   The Velocity diagrams for the Instaneous Pole **P** of rotation in STPL≡ [O,ABC]-{ D_A-P_A}   mechanism , on the inflection circle of the Plane points A , B , C .

   In (1) point K_{AA} is the velocity instaneous center for point A , in S_o system .
   In (2) point P is the Pole of rotation for points A , B , C .
   In (3) Figure is the Velocity Diagram P – a ,b, c for points A , B , C   In (4) When STPL is Tangential to (O,OA) circle then the two circles , *The common-circle   and Inflection circle* , cut on AP chord which is common to Velocities , and the Accelerations   of points A , P , coincide with D_A , P_A Desargues and Pascal`s points .   On triangle $AD_A A_E$, Material lines $X_1 X X_2$, formulate all referred curves .
   Any rotation in three dimensions can be represented as a combination of a vector **v̄$_A$** and of a

Scalar angle ,φ, on AA_E≡AP axis which is the *Euler rotation theorem-axis* . [58]

The rotation of Space point **A (+)** *and Anti - Space-point* **K_A (-)** *through Instaneous Pole* **P** , *defines Velocity* $\bar{v}_A$,and *Angular momentum* $\bar{B}$, *so the Position of Spaces* , *the point A and Anti-space-point* K_A , *and Momentum are simultaneously determined* .

3.2. The Angular Momentum of any Material point in STPL mechanism .

From Physics momentum $p = m.v = m\,\dfrac{ds}{dt}$ …………(1) where →

mass = the reaction to the change of velocity → |v| = the instant velocity equal to ds/dt which is the change of displacement ds , where ds = l , and which is the Dipole =‖[⊕⊖]‖=□=l=AB . [40] Angular Momentum   **L = l x p** = |l|.|p|.sin φ ……..(2) where → angle φ = Angle subtended between direction of l and p , as in [41] and l = a position vector .

Differentiating (2) then is , $\dfrac{dL}{dt} = \dfrac{d\,l}{dt}\,x\,p + l\,x\,\dfrac{dp}{dt}$ = vxp + l x F = $\dfrac{pxp}{m}$ + l x F = 0 / m + l x F = l x F = J . $\bar{a}$ ……....(3) , where J = moment of Inertia , $\bar{a}$ = acceleration.

Since **p = m** x **v** , and which is a Torque acting on the particle about its axis through l , or $\dfrac{dL}{dt}$ = l x F → is a Torque also , i.e. *It is the Linear momentum .*

Remark : $\dfrac{dL}{dt}$ = l x F = Torque → which suggests that , equation (3) *is the Extrema case between , the Linear and Angular Momentum* , where then for instaneous velocity v = w.r , then L = m(w.r).l i.e. Angular momentum is equal to the followings →

1.. To the reaction ,m, of the change of position vector ,l, through material point axis AB .
2.. To the Intrinsic angular velocity ,w, of the material Point as a cave of radius , r .
3.. To circular orbit of radius ,r, of material point.
4.. The length |l| of the position vector which is the wavelength λ = 4π.r of the material point . Since any Monad , (Unit) $\overrightarrow{AB}$ = L , is the ENTITY and [A,B – P_A , P_B] is the LAW , so Entities are embodied with the Laws.

Since Entity is quaternion $\overrightarrow{AB}$, and law |AB| = length = the Real part which is the Space of points A , B then imaginary part (i) are the forces P_A,P_B or the fields in AB .

By definition i =√-m.1 and(-m1)² = -1m i.e.

[Energy]² = - [Space] = Anti-space , and since also exists Λ x Λ = - (- m.1) ² = ± Λ.□i , the basic equation of quaternion becomes [-(ΛxΛ)/m ± Λx□i] = [λ , ± Λx□i]

i.e. wavelength λ = - (ΛxΛ)/m where m = a constnant depending on the reactions to the present or other conditions .
Applying this in energy cavities then wavelength , λ , becomes ,

$\lambda = e^{-i[(\frac{\pi}{2})b]^2} = e^{-i[(\frac{2\pi}{2}).b]} = e^{-i[(\pi).b]}$ → i.e.

The Massive mechanism Diffraction and the Energy mechanism Diffraction , *The Quanta* , are
Interchangable as , $e^{-i.(1,78.10-7)^2} = e^{-i.(3,56.10^-14)}$ and for Relativity massive Energy

(ΛxΛ) = (- m.i) x (- m.i) = m (i)² = - m .($\bar{v}$)² = - m..$\bar{v}$², where imaginary part , i = $\bar{v}$, i.e.
The Space aquires Energy as Velocity and becomes an Energy-monad .

Applying quaternion equation [-□Λ ,□xΛ] = 0 for point ,O, and constant velocity , $\bar{c}$, then [-□c ,□xc] = 0 where [-□c] □ [□xc] meaning that it is a mechanism that instantly transports breakage masses in two directions dynamically and perpendicularly to all Inertial frames Layers . From Velocity-Energy vector are produced the three breakages [±s²=± (wr)²] and [□i =2(wr)²] and from them Fermion and Bosons . [26]

3.3. The Absolute and Relative Motion .
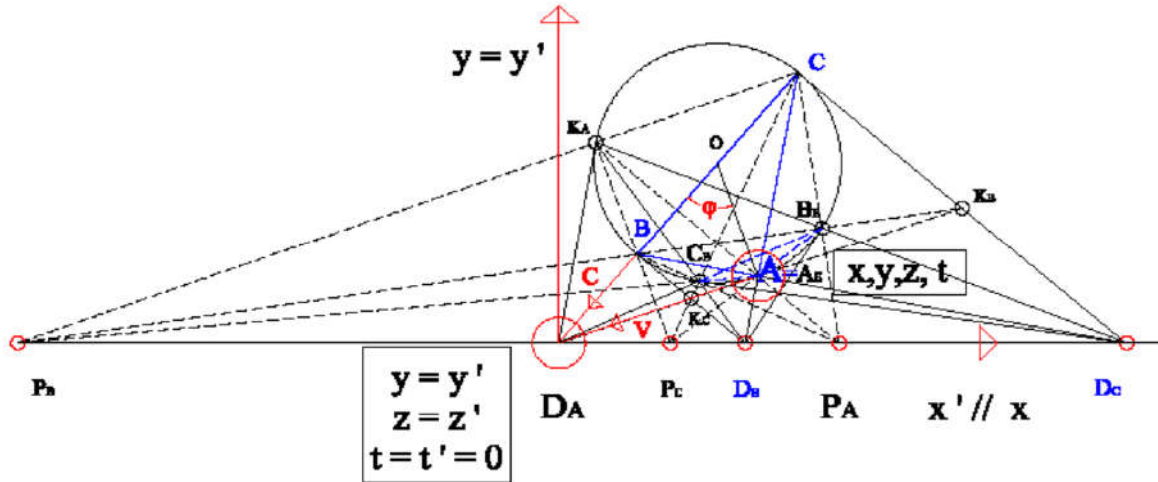
Figure.9.. ABC is any Right-angled triangle at A (The Space) ,$K_AK_BK_C$ triangle is the (Sub-Space), $A_EB_EC_E$ triangle is the(Anti-space) respectively. The Instaneous Pole **P** of rotation is off the   Circle of diameter BC . The Poles of rotation lie on $\{D_A- P_A\}$ Reference system.

   Reference System $\{D_A- P_A\} \equiv [R]$ (x',y',z', t') moves with velocity ,$\bar{v}$, parallel to , x-x', axis   with respect to the fixed and Absolute System $\{D_A- O\} \equiv [S](x,y,z, t)$.
   The Geometrical expression of Lorentz factor ,γ, is as $\sec \varphi = \gamma = OD_A: AD_A =$
   $\pm 1 / [\sqrt{1 – (v/c)^2}]$ and which is the Conchoide of Nicomedes , $\{ s = a + b. \sec \varphi \}$,   and which acquires the

material Angle $\varphi = \dfrac{v}{\sqrt{c^2-r^2}}$

The Relative Motion.
Because Properties In and On [STPL] line , are relative to the only one Equilibrium and Absolute system $\pm \Lambda = r.m\bar{v} = r.m.\bar{w}.r = mr^2.\bar{w}$, so exists that what is called Relativity .
As Absolute System let it be $[S] \equiv \{D_A-O\} \equiv$ STPL mechanism , and as the Relative (Reference, Affine) System, $[R] \equiv \{D_A-P_A\}$. Fig - 9
The Relative motion $[S] \equiv \{D_A-O\}$, $[R] \equiv \{D_A-P_A\}$ of the two above Systems :
It was shown , that in $\{D_A-O\}$,(x,y,z, t) , System $\bar{c},\bar{v}$, vectors are isochrones i.e. period $T = L/V = 2\pi R/V$
$= 2\pi/[c/r_c] = 2\pi/[v/r_c] \to c/r_c= v/r_v \to c.r_v= v. r_c$,where r_v, r_c are the radius of their intrinsic rolling circles . In F-7 , this relation is Geometrically expressed as $\to$
   $\sec \varphi = O D_A : A D_A = \gamma = \pm 1/ [\sqrt{1–(v/c)^2}] = c / [\sqrt{c^2 – v^2}]$, and it is   a geometrical Cycloid property equal to Lorentz`s ,$\gamma$, factor. Newton`s laws
   are true into Reference System $[R] \equiv \{D_A-P_A\}$ by ,
Considering $\{D_A-O\}$,(x,y,z, t) , as the fixed frame $[S]$ of the coordinate system in the Gravity cave   (d=2r) , and point A(x,y,z) is fixed on circle (O,OA) which is rotating with a velocity $\bar{v}= \bar{w}r$, and of angular velocity $\bar{w} =2\pi/T = 2\pi f$, where period of rotation ,T, then is also constant .

Since acceleration ,a, for a quaternion $z = (s + \bar{v}.\square i)$ is $a = [d^2z/dt^2] = (ds/dt.\bar{v}.\square i) + s.d(\bar{v}.\square i)/dt = 0 +$
$s.d(wr)/dt = 0 + 0$, *and this because $\bar{w} = constant$ for both* , therefore , velocity $\bar{v} = $ constant also **, i.e. $\to$**
Centrifugal velocity of Absolute system [S] is any constant , $\bar{c}$, and this because angular velocity ,$\bar{w}$, is constant also and thus , is not needed to accept apriori this constancy of velocity $\bar{c} = 0 \to \bar{v} \to \infty$ on circle (O,OA) to exist in frame , so
automatically *is defined the conversion factor $t = $ time* , between the conventional time units (second) and length units (meter = $A.D_A$) or as $\bar{c}. r_v = \bar{v}. r_c$, $\to \bar{c} (v)(T/2\pi) = \bar{v}(c)(T/2\pi) \to \bar{c}(v)/w = \bar{v}(c)/w$ which is happening with the same ,w, without any restrictions , in contradiction to General Relativity which is an axiom apriori.
This is the why conversion factor , t = time , has not any essence in all universe , but it is a meter of changes only in all Systems .
Because [STPL] line of the fixed frame is becoming from this system [S] , then this relative frame [R} is common to the fixed one (common D_A) and let it be $[R](x',y',z', t')$.
From figure Fig-7 , $\sin\varphi = (\bar{v}/\bar{c})$ meaning that the Relative system , [R](x',y',z', t') , (the Affine Frame) is   the projection of Absolute Frame [S] $\equiv \{D_A-O\}$ - (x,y,z, t) where exists as Simultaneity for all motions , i.e.
$[R]$ $\equiv \{D_A-A\} \equiv [(x',y',z', t')]$,
$[S]$ $\equiv \{D_A-O\} \equiv (x,y,z, t) = [R] .\gamma \equiv (x',y',z', t')$

Considering point D_A as the common center and [STPL] as the x-x axis of the two systems , then becomes D_A (x ,y=y ', z = z', t) and for all linear systems D_A (x', y'= y, z '= z , t') respectively .

This specific state of constancy , i.e., the Centrifugal velocity of Absolute system [S] to be a constant ,$\bar{c}$, and the rectilinear motion with respect to one another , defines the natural Inertial frames , and because of uniformity of Space and motion , therefore occupy the same meter of their changes , (i.e. the Time) .

Since also points O,A remove to point D_A isochrones by their intrinsic property motion , which is $\rightarrow$ their wavelengths are a Stationary wave in cycloid $\leftarrow$ following Lorentz`s factor ,$\gamma$, then this following , happens also to all frames which make this motion , and so issues $\{D_A\text{-O}\} = \gamma.\{D_A\text{-A}\}$ …....(2-0) On this Relative system $D_A$( x', y'=y, z' = z , t`) are conveyed , the Breakages [$\pm$ (wr)², 2(wr)²] of (O,OA) circle after the colliding with the rotating velocity $\bar{v} = \bar{w}.r$ of the [S] system , and are the fundamental particles , Fermions and Bosons, or by escaping consisting the Rest Field and Gravity , or Dark matter and Dark Energy , as analytically is shown . [39] Remarks :

a.. Material point $A \equiv \pm |(\bar{w}.r)²|$ of the Fixed System $\{D_A\text{-O}\}$ travels with velocity $\bar{v}$ at point D_A , so geometrical distance $A.D_A$ in the Relative System $[R] \equiv \{D_A\text{-} P_A\}$ is $A.D_A = x' + \bar{v}t'$, and because of the isochrones motion in the Fixed System $[S] \equiv \{D_A\text{-O}\}$, it is holding ,

$x = (x' + \bar{v}.t').\gamma$ or $x = (x' + \bar{v}.t')\gamma = [x' + \bar{v}.t'] / [\sqrt{1-(v/c)²}]$ …. (2a)
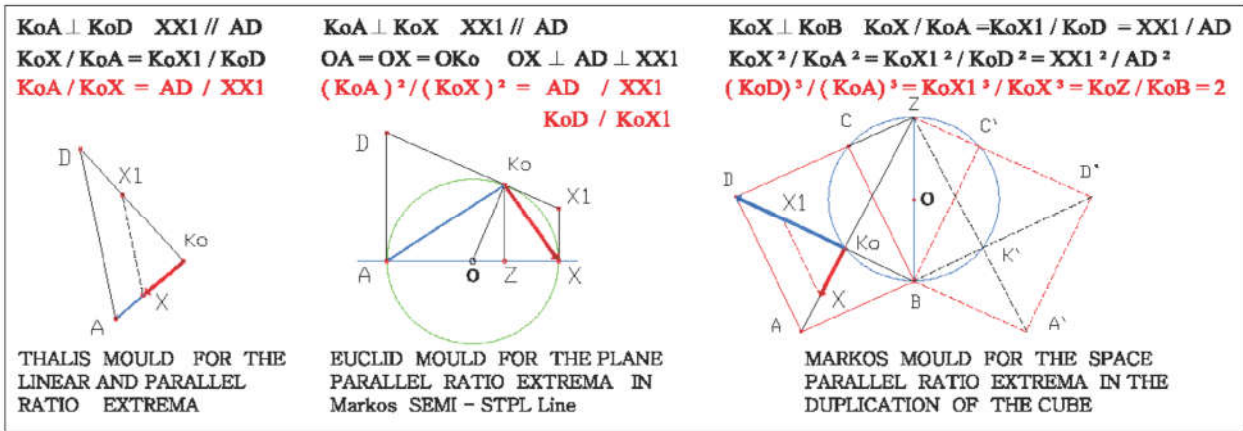
Inversely, by using (2a) , where $[S] \equiv \{D_A\text{-A}\} \equiv \{D_A\text{-O}\}/\gamma$, then if Material point A of the Fixed System $\{D_A\text{-O}\}$ travels with velocity $\bar{v}$ at point D_A , the geometrical distance AD_A in the Fixed System $[S] \equiv \{D_A\text{- O}\}$ is $\rightarrow A.D_A = x - \bar{v}.t$ and in the Relative System , $[R] \equiv \{ D_A\text{-} P_A\}$ it is $\rightarrow x' = (x-vt).\gamma = [x-vt] : [\sqrt{1-(v/c)²}]$ …...(2b)

3.4. The *Quantization of E-Geometry and its moulds* .

It was shown in [58] that common-circle of radius , r_c , is the common source of vibration excitation for the Space , Anti-space , considered as rotating with constant angular velocity $\bar{w}$. The same also on all lines joining the Space , with Anti-space points , and the STPL line , and Particles acquire an Inherent Vibration , f , becoming from the material`s point property .

This vibration , the frequency *,f, is the configuration of Conchoide of Nicomedes which is connecting the Glue-bond , ±σ , of the Spaces ,* of this circular rotation , *and Generally the changes on axis , $\bar{B}$ =2L , from the Instaneous circle of rotation of the Plane Space , and Anti-space AA_E through , K_A , Neutral point* of the STPL mechanism.

3.4.1 The Quantization Meter – Moulds

$K_oA \perp K_oD$ $XX1 // AD$
$K_oX / K_oA = K_oX1 / K_oD$
$K_oA / K_oX = AD / XX1$

$K_oA \perp K_oX$ $XX1 // AD$
$OA = OX = OK_o$ $OX \perp AD \perp XX1$
$(K_oA)² / (K_oX)² = AD / XX1$
K_oD / K_oX1

$K_oX \perp K_oB$ $K_oX / K_oA = K_oX1 / K_oD = XX1 / AD$
$K_oX² / K_oA² = K_oX1² / K_oD² = XX1² / AD²$
$(K_oD)³ / (K_oA)³ = K_oX1³ / K_oX³ = K_oZ / K_oB = 2$

THALIS MOULD FOR THE LINEAR AND PARALLEL RATIO EXTREMA

EUCLID MOULD FOR THE PLANE PARALLEL RATIO EXTREMA IN Markos SEMI – STPL Line

MARKOS MOULD FOR THE SPACE PARALLEL RATIO EXTREMA IN THE DUPLICATION OF THE CUBE

(1)   (2)   (3)

Figure.10.. The *Thales , Euclid , Markos Mould , for the Linear – Plane - Space , Extrema Ratio , Meters .*

In (1) is the **Linear - Ratio** where , length K_oA *analogous* to monad K_oX is equal to AD / XX_1 following the Euclid`s parallels .

In (2) is the **Squared - Ratio** where , length K_oA *squared* to monad K_oX squared is equal to linear ratio AD / XX_1 following the Euclid`s parallels .

In (3) is the **Cube - Ratio** where , length K_oA *cub* to monad K_oX cube is equal to linear ratio K_oZ / K_oB following the Euclid`s parallels .

Quantization of E-geometry is the way of Points to become , *discrete* , as $\rightarrow$ (Segments , Anti-segments = Monads , Anti-monads) , (Segments ,Parallel-segments = Equal monads) , (Equal Segments and Perpendicular-segments $\equiv$ The Plane Vectors) , (The Un-equal Segments twice-Perpendicular-segments $\equiv$ The Space Vectors = Quaternion) . [15]

Monads and Segments being quaternion occupy Massive and Energy magnitudes called Meters . Since points A , B , C (of the extreme triangles ABC which denote the Space ABC) are in the recovery equilibrium with points A_E , B_E , C_E , (of the extreme triangles $A_E B_E C_E$ which denote the Anti-Space) and meet also in the same common circle which is the Common Sub-space , therefore Energy between the two Spaces passes through Sub-space from Extreme Spaces (Extreme triangles ABC and Extrema Anti-triangle $A_E B_E C_E$ in the Sub-triangle $K_A K_B K_C$ meet in this circle which is

the common to all spaces . i.e. common-circle of radius , r_c , is the common source of vibration excitation for the Space , Anti-space , considered as rotating with constant angular velocity **,w**, becoming from **, ± σ ..**
Since Space , Anti-space are on the same circle then their relative motion is the , Rolling of Space ABC on
Anti-space A_E B_E C_E and since also this relative motion is applied on STPL line , then D_A , P_A , points are the corresponding linear links of vibrations and Poles of rotation . [58]
Anti-segments = Monads , Anti-monads) , (Segments ,Parallel-segments = Equal monads) , (Equal Segments and Perpendicular-segments ≡ The Plane Vectors) , (The Un-equal Segments twice-Perpendicular-segments ≡ The Space Vectors = Quaternion) . [1]
STPL is the Generator of Space – Energy as Material Point , Energy monads , and Spin

In [62B] was proved that , *By Scanning* Any Space-Monad K K_1 to a Space – Monad K K_2 of the points K , K_1 , K_2 on circle , the Work produced is conserved in a *Space - triangle* in the circle , and in one of equal area outside the circle , which is the *Anti-Space triangle* , meaning that , ***The above relation of this Plane Work ,*** it is *The Quantization of Geometry – Shapes into the Plane – Stores of Anti-Space* **, consists the Unification of the** *Geometry – monads* **with those of** *Energy monads* **, and consist the Granular-Geometry which was analyzed and fully described .**

3.5. The Deduction of *Projective- Geometry* And *Perspectivity* in E-Geometry and further in *Material-Geometry*
Perspectivity and Projection of Points :
   A.. For One point A perspective point A`, lie on the straight line AA` which Coincides to axis PP` of Perspectivity . Since any Anti-point $A_E$ on Line PP` lies also on the circle of radius AA` , and since points P , P` lie on the same circle therefore points A` , P` , A_E coincide with PP` Axis of Perspectivity as this in Fig3-(1).
   B.. For Two points A,B perspective points A`,B`, lie on the straight line A`B` which is Parallel to axis PP` of Perspectivity . On Line PP` lie the Anti-points A_E ,B_E which is the diameter *AOB of the circle ,* and whose points P , P` lie on the circle . The Infinite Axis PP` of Perspectivity are Coinciding to Perspective lines of points A`,B` and are also Symmetrical to the center O as in Fig3-(3).
   C.. For Three points A,B,C not coinciding , perspective points A`,B`,C` lie on the straight line A`B`C` which is Parallel to axis PP` of Perspectivity . On Line PP` lie the Anti-points A_E B,$_E$,C_E , which line PP` is *Symmetrical to center O of the circumscribed to ABC triangle circle ,* and whose points P , P` lie on the circle . The Infinite Axis PP` of Perspectivity are Parallel to Perspective lines of points A`,B`,C` and also Symmetrical to center O as in Fig3-(3).
From above is seen that both Perspectivity and Projective - geometry are incorporated in Euclidean geometry and this because of the Anti-points of Material geometry .
Because the New logic , of Material Geometry responds to Physical reality , the consistent Systems of the Non - Euclidean geometries - have to decide the direction of the existing mathematical logic . This is the why conversion factor , t = time, has not any essence in all universe , but it is a meter of changes only in all moving Systems.
Since Time in Theory of Relativity is the main substance of Space - Time , then must be a quantity which has magnitude and direction and must follow the vector addition $\vec{a}+\vec{b}=\overrightarrow{ab}$. Unlike, the time intervals follow the Algebraic addition for scalar quantities a + b = t .
Proper time is measured between two events in GR Space-time and it is the Lorentz scalar ,where there time , t , exists as a measure of changes in the velocity and distance vectors of an isochronous Vectors-racing .
3.6. Waves and the exponential form of Monads
Angular velocity $\overline{w}$, and rotational momentum , Λ, in a cave conjugate, and are represented as ,
$$(\partial/\partial t , \overline{w}) \,©\, (0 , \Lambda) = (- \Lambda , w \times \Lambda) = (-\overline{H}x\overline{\overline{P}}, \square x\Lambda\overline{)} =$$
$$[\lambda , \square \times \Lambda\overline{}] = E = h. f_n = \frac{h(1+\sqrt{5})}{4\pi}. \left[\frac{\sigma}{r}\right] = \left(\frac{n\sigma}{8\,r^{\,2}} \right). \overline{\mathbf{B}} \qquad [13\text{-}15] .$$
Since points A , B of [PNS] coincide with the infinite Points , of the infinite Spaces , Anti-Spaces and
Sub-Spaces of [PNS] and exists rotational energy ± Λ and since Motion may occur at all Bounded Sub - Spaces (± Λ , λ) , then this Relative motion is happening between all points belonging to [PNS] and to those points belonging to the other Sub-Spaces (A ≡ B) . The Infinite points in [PNS] form infinite Units (monads) A_iB_i = d$\overline{s}$, which equilibrium by the Primary Anti-Space by an Inner Impulse (P) at edges A , B where exists

$P_iA + \overline{P}iB \neq 0$, and it is → ds = 0 → N → ∞.

Monad , (Unit) $\overline{A}B$, Quaternion is the ENTITY and [A , B – $\overline{P}_A$, $\overline{P}_B$] ≡ Dipole = [⊕⊖] = □ = AB the LAW , the Material-point , so Entities are embodied with the Laws. Entity is quaternion $\overline{A}B$, and law |AB| = length = The Scalar and Real part which is the Space of points A,B and maybe any point A with its Pole B of rotation , and this since Space-curves are rolling on Anti-space curves , and Imaginary part the forces , $\overline{P}_A$, $\overline{P}_B$ or the Electromagnetic fields of AB . [58]
3.7. Cycloid → The Inner Isochronous motion of monads .
Isochronous motion of a point A , on cycloid happens in all Material-points , where the **,y,** axis reach **x-x** axis at the same time , regardless of the height from which they begin. This property is used for breakages on Common-circle *Before* these reach STPL line isochrones. [31]
In quantum systems , the rotated energy **Λ = Ω** can be isolated as frequency

(*in carbon monoxide molecule as integer multiples of* 115 GHz = 115.(10^9Hz) = 1,15 .10^{11} *Hz = cycles / second and* $\lambda = 1,128.10^{-10}$ m) and then by using the formula for angular frequency related to Planck constant , h , then → Work
≡ W_d = (π/4). C_o .w. λ^2 = (π/4).1,6939.10^{34}.(2π)
.1,15.10^{11}.1,4943.10^{-20} = **1,249 .10^{26} J** / 1,602.10^{-19} = **7,796. 10^{45} (eVs²/m²)** . The Rotating Energy , Λ , is bounded (*flowing*) in the three Energy States say, k1 , k2 = the Plank Scale , and k3 as below ,
W=Λ.d$\overline{s}$1= k2= Λ . 10^{-35} m = ET= □ [m.v.$\overline{E}^2$]² +[Λ.v.B +Λxv.$\overline{B}$]² = (π/4).C.w.λ^2 = (h/λ).λ= h = ET =
Λ. 10^{35} m = k3 = Λ.d$\overline{s}$3 = W = Work

i.e. The Work is embodied in the three regions k1 , k2 , k3 as the *rotating Energy* Λ .$\overline{s}$ On dipoles $\overline{A}$B = d$\overline{s}$1, d$\overline{s}$2 , d$\overline{s}$3 in the Configuration of co variants **Λ , ds** □ , with constant **C_o** = 4.Λd$\overline{s}$/πwλ^2) and d$\overline{s}$ =10^{-35} m *to exist so simultaneously the Equation of Quaternion =* Space d$\overline{s}$ = 10^{-35} m = $\overline{z}$ = [s ± $\overline{n}$.□i] = [s ± $\overline{n}$.i] = Work = Total Energy
= ET = [Λ□ +Λ x □] =
[Λ.M +Λ x M] = □ [m.v$\overline{E}$.²]² + [Λ.vB + Λx v$\overline{B}$]² = □ [m.v$\overline{E}$.²]²+S ² =
□[m.v$\overline{E}^2$] +|$\sqrt{}$p1.vB1 |²+|$\sqrt{}$p2.vB2 |²+|$\sqrt{}$p3.vB3|² = ($\overline{z}_o$)^w = (λ , Λ.□i)^w = |$\overline{z}_o$|^w . e^ [$\overline{v}$wθ] =
|$\overline{z}_o$|^w. e^ {[$\overline{Λ}$ ∇i / √ Λ'$\overline{Λ}$]. [ArcCos (w|λ|/2 |. $\sqrt{}\overline{z}_o$ `.$\overline{Z}_o$]] } *is therefore of Wave motion and*
w = 4.Wd / (π.C.λ²) *with velocity* $\overline{v}$ of the Energy Ellipsoid in the two perpendicular curled fields **E = □. Λ** and **B =** □ x Λ . Both curled fields consist the quantized energy as the new monad , the curled fields .
The Quantized Energy **ET ,** in the three quantized Regions **k1 , k2 , k3** as Monads ℧℧ with the length , **h** , boundaries are , **k1** = [$\overline{A}$B] = Work = Energy = [PNS] , $\overline{z}_o$[**λ 1 , Λ**] with λ1 = 0 → 3,969.10^{-62} m 8,906 . 10^{-35} m and → k1→k2 = Co.$\lambda 2^2$wπ/4 = (h/2π)w = h.f = < 8,906. 10^{-35} m .
k2 = [$\overline{A}$B] = Work = Energy = [PNS] ,
[λ2 , Λ] = λ Λ = Rotational Energy = λ.($\overline{r}$.M.w.|r|) = Spin = Ω ≡ 8,906 . 10^{-35} m < λ < Planck Scale 1,78118. 10^{-7} m .
k3 = [$\overline{A}$B] = Work = Energy = [PNS] , **[λ3 , Λ]** with λ3 >= 1,78118. 10^{-7} m < ∞ .
3.8. The Flow Plan of the Space - Energy Universe .
(1). It was shown in [9 -18] what is Primary Neutral Space as well as Infinity [15] and rotational energy , Λ , in [22] , so
[PNS] → [A ,B – P $\overline{A}$, P $\overline{B}$] ≡ Work W = |ET | = [|Λ|.□ + Λ x□] → W = ∫ P.ds = 0 →

SPIN is The Energy in Material Point & Loops in Lobes are the Energy Stores

and **Time T= 0 is the Cause** , because Primary **Point A** is nothing and *is Quantized as* →
Point B (where then is following the *Principle of Virtual Displacements as W = ∫P.ds = 0*) =
Force **x** Displacement = Energy **x** Space , *and according to the ancient Greek Philosopher* Anaximander → [**The non-existent (i.e Point A) , Exist when is Done , it occurs as (Point B)** = [Το μή Ον , Ον γίγνεσθαι] = [Τό τίποτα υπάρχει Όταν αυτό γίνεται] . [21] The relative Range is Displacement |AB|
(2) → Space -Anti-space , **0 → k → Infinity .**
[PNS] → [|Λ|.□ + Λ x□] ≡ $\overline{z}$ ≡
[λ , ± Λ x□] ≡ |$\overline{z}_o$| ^{w}. e^ { [$\overline{Λ}$□I / √ΛΛ'_] . [Arc.Cos (w|λ|/2|. $\sqrt{}\overline{z}_o$ `. $\overline{z}_o$]] } , which is the Beyond Gravity Forced- Field . [25]
(3) → No change of ds → **Time T = 0**
Cause is the moment Lever of Primary Forces and is Quantised as → Spin ≡
< is The Spin modelling of the microscopic description > . [19]
The relative Range is of Infinite Points in the Displacement |AB| , **Infinity .**
(4) [PNS] → [λ , ± Λ x□] = zo = Λ = nRT/V(λ = C) → It is the Gas equation where →
No change of ds → **Time T = 0 .**
Cause is the Heat causing vibration on molecules and is Quantised as →
Intensity (Pressure) and the relative Range is of Infinite Points in Displacement |AB| = λ .
(5) → For region **k1** z = |$\overline{z}_o$|. e$^{- i. (9.\pi /2).10}$ = Energy Under Planck length , *The Tank Cavity of Gravity , where* $\overline{v}$
E = 0 and Total Energy ET = Λ.vB.+ Λ x v$\overline{B}$ and is the *accelerating removing , rotating energy* Λ to v $\overline{B}$.
For $\overline{v}$m = 0 and ET = Λ.vB.+ Λ x v$\overline{B}$, it is the *linearly removing , energy* Λ , towards , v $\overline{B}$, where there is No change of ds i.e. → **Time T = 0** and , **Cause is the High Heat** Conservational Balanced Tank of gravity and is Quantised as →
The Fundamental particles (Bosons and Fermions). [29]
The relative Range is of Infinite Points in Displacement |AB| , i.e. Infinity .
(6). ↑↓ → **k2** z = |zo|.e$^{- i. (5.\pi /2).10}$ = Energy in Planck length to → ∞ .
The changes of ds presupposes →
Time T = t . The Cause are the Infinite changes of Space and is Quantised as , → Matter , Energy and Existent .
The relative Range is the **Planck`s - length .**
(7). → **k3** $\overline{z}$ = |Λ|. e$^{- i. (\pi /2).10}$ = In Black Holes Temperature Balanced Tank Energy length is as , PV = n.R.T and
(PA = W_d = σ.T ^{4})
→ No change of ds → and **Time T = Constant**

Cause is the **Very high Heat** causing Vibration on molecules and *is Quantized as* → **Intensity** ≡ (*Pressure* = Fd = C.ẋ = ± C_o.w.[√ A² - x²]) i.e. *Cause* → (*Constant Co*) → *Quantized as New monad* .
The relative Range is **Infinity . i.e.** *The meter of Space-Energy changes* (*The time* = T) *exists in* **k2** *quantized Region only* .

(8). → *Quaternion and Regular Polygons* :
De Moivre´s formula for the nth roots of a quaternion, where q = k.[cos.φ+ [□i].sin.φ] is for w = 1/n , q□ = k □ .[cos.wφ + ε .sin.wφ] where q = z = ± (x+y.i), decomposed into its scalar (x) and vector part (y.i) and this because all the inscribed Regular-Polygons in the unit circle have this first vertex at points 1, or at -1 (for real part φ = 0, φ = 2π) and all others at imaginary part where , k = Tz = Tensor (the length) of vector ,z, in Euclidean coordinates and which is k = Tz = □ x²+y1²+y2²+ yn² .
For imaginary unit vector ā(a1,a2,a3,a.n.w), the unit vector ε of imaginary part is → ε = (y.i/Ty) = [y.□ i] / [Ty] = ±(y1.a1+y2.a2+) / (□+y1²+y2²+yn²) the rotation angle
0 < = φ < 2π, φ = ± sin⁻¹ (Ty/Tz), cosφ = x/Tz, which follow Pythagoras theorem for them and for all their reciprocal quaternions ā' (ā. ā' = 1).
Since also the directional derivative of the scalar field y(y1, y2, yn.) in the direction ,i, is→ i (y1, y2, yn.) = i1.y1+ i2.y2.+ i n.yn and defined as i.Grad y = i1.(□y/□1) + i2.(□y/□2) +…. = [i.□].y, which gives the change of field ,y, in the direction → i , and [i.□] is the single coherent unit , so coexistence between Spaces Anti-spaces and Sub-Spaces of any monad z̄ = x+y.i = ĀB is happening through a general equation , *Identical with the Plane stores in Anti-Space and to those of Energy monads* . [33]

Figure.11.. *The Cycloidal motion in , Material Point* ≡The monad is Dipole ≡ [⊕⊖]= □ =AA` *where* → A≡ [⊕]
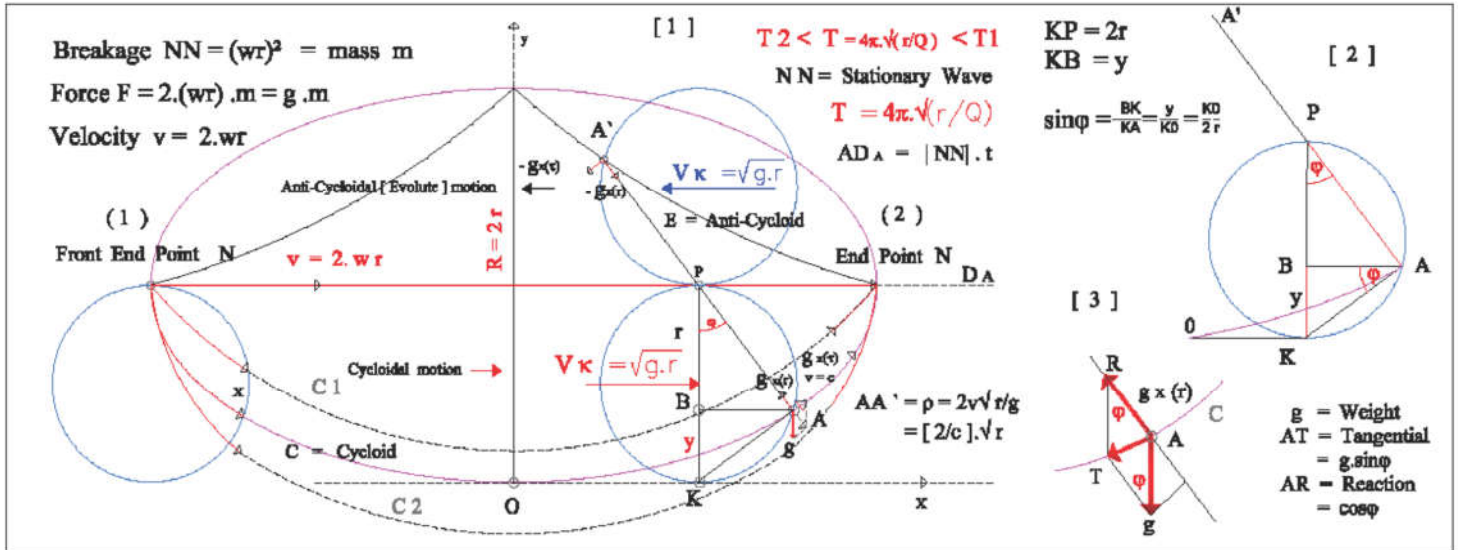
→A`≡ [⊖ ] → |AA`|≡ □ ≡*The Brachistochrone Curve* C ≡ N1→N2 .
Motion on Curve C1 acquires a period T1 > 4π√ r/g , while on C2 T2 < 4π√r/g which is not Isochronous .

Monad (1) –(2) = NN=Energy-Quanta is The Electromagnetic Wave in NN , *and is the Energy Distance* . Motion of point A on cycloid [C] , equilibrium from the opposite motion of point A`. on Evolute {Anti-cycloid } . Vibration happens on AA` where the Mechanical motion (*the velocity ,v*) is transformed to Electricity (*the Electromagnetic wave* E⊥P). [52-60] .
Because of above Force F = mẍ ,on AA`≡ Stress-common-curve , so happens the 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 , *Outward* , λ ,*as The-Outer Electromagnetic-Wave* and allows all → *The - Energy -Wave - Storages to Propagate any Distance in Vacuum without dissipation . Inner-motion ≡ Work* **W** , *from the Wave-Energy-Pattern and with Wavelengths* $λ_n$, *created from all Points of the Periodic Oscillation in any Cave ,* **r** = (1)-(2) , *Is Stored into the , n , Integer and Energy - Lobes of cave* **r** . Photon in Galaxies in [68] .

Space point A on cycloid [C] , is rolling on Anti-space point A` of Evolute curve as the
Instaneous-Curvature Pole. [58] STPL line is the circular Rolling motion of , Space , Anti-space , is the cause of Vibration on the Instaneous Radius (diameter) of curvature centre of rotation through Sub-space , and or , on every couple of lines between Spaces and Anti-spaces .

Extrema case of , *Pascal`s line-rolling of any two circles* , is Euler-Savary mechanism where Instaneous -circle and Common-circle acquire the common Space , Anti-space Chord on where , *Rolling motion of the two curves is transformed to Vibration curves* .
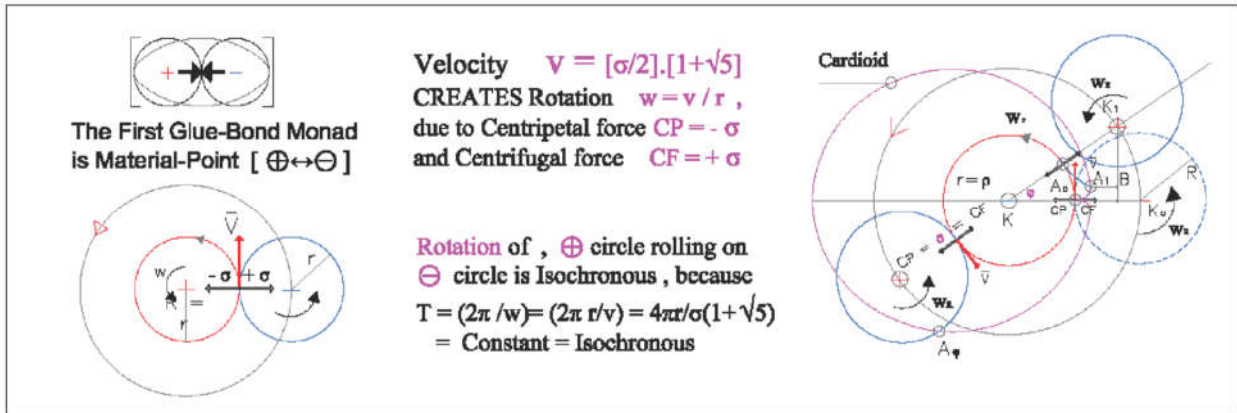
Figure.12. *The Isochronous Rolling of* circles[⊕⊖] (*in Material Point , due to Glue-Bond {+σ-σ })* , happens

because the period $T = \dfrac{4\pi r}{\sigma(1+\sqrt{5})}$ = Constant , therefore and Isochronous .

Properties (Fig.11) :

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 $\dfrac{dy}{dx} = \dfrac{KB}{KA} = \dfrac{BA}{BP} = \dfrac{BA}{2r-y}$ and $(BA)^2 = (BP).(BK) = (2r-y).y$ and by squaring → ($\dfrac{dy}{dx})^2 = \dfrac{y}{2r-y}$ …….(a) which is the differential equation of cycloid , and or as → ($\dfrac{dx}{dy})^2 + 1 = \dfrac{2r}{y}$

For any element on trace ,ds , issues (a) and Pythagoras theorem as ,

$(ds)^2 = (dx)^2 + (dy)^2 = (\dfrac{2r}{y} - 1).(dy)^2 + (dy)^2 = (\dfrac{2r}{y}).(dy)^2$ and $ds = \sqrt{2r}.y^{-1/2}.dy$, and by integrating ,

$\int ds/dy = s = \sqrt{2r}.\int_0^y y^{-1/2} = \sqrt{2r}.\dfrac{y^{+1/2}}{-1/2} = 2.\sqrt{2ry}$ + C and since in axis for y=0 *exists* s=0 and C= 0, so **s**

$= 2\sqrt{KP.KB} = 2.\sqrt{KA^2}$ = 2.KA = 4r.sin φ ………(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 cycloid.* The area between the curve and the straight line is A=3πr² 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. sin φ , and since from (b) , $\sin φ = \dfrac{s}{4r}$ then AT= g. $\dfrac{s}{4r}$.

Since acceleration $= \dfrac{d^2s}{dt^2} = \dfrac{dv}{dt} = \dfrac{d}{dt}(\dfrac{ds}{dt}) = - g.\dfrac{s}{4r}$ then $\dfrac{d^2s}{dt^2} = -g.\dfrac{s}{4r}$ *or* $\{\ddot{x} = -w^2\dot{x}\}$ *where* w $= \dfrac{2\pi}{T}$ ...(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= $\dfrac{2\pi}{w} = 2\pi.\sqrt{\dfrac{4r}{g}} = 4\pi.\sqrt{\dfrac{r}{g}}$ ……(d) *and this since* $w^2 = \dfrac{g}{4r}$. In Material-point $w^2 = \dfrac{g}{4r} = \dfrac{\sigma}{4r}$ = constant 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= 4π√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 is the balancing cycloid, and called Anti-cycloid.

The *Tangential component of Acceleration* is $AT = g. \sin \varphi = \frac{g}{4r}$. 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

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

i.e. The *Centrifugal component of Acceleration is proportional to curvature radius* ,**ρ**, *with the same proportionality ratio* g /4r *meaning that any motion on cycloid is outward directed, or and ,* **acceleration** $\ddot{x} = - w^2 \dot{x}$ *produces the Skin - effect ,* *during the cycloidal motion of Space and Anti-space .* [5] **The Electromagnetic Wave** produced from the , *Driving force ≡* **B̄ ,** travels with the light - speed velocity.

The velocity $v = \sqrt{g/4r}$. ρ 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 v̄=w̄.r̄, and since →linear

momentum p̄= [Breakage x Velocity] = $|\overline{w}.r|. \sqrt{g/4r}$. ρ =

$\overline{w}. \sqrt{gr}. \rho = \sqrt{gr}.\rho.|\overline{w}|$, then follows a Cycloid`s trajectory with , a Total time period $T = 4\pi \sqrt{(r/)g} = = \frac{r}{2v} . \sqrt{\frac{r}{g}}$

which is dependent on angular velocity w̄ = v̄/r = c̄/r only and it is the Spin of particle |AA|. **Remarks :**

a.. [Breakage **x** Velocity] $= \sqrt{gr}.\rho.|\overline{w}|$, and force $F = [(\overline{w}.r)^2.(\overline{w}.r)] = 2(mg/\overline{c}). \overline{w} = 2mg.(\frac{\overline{w}}{\overline{c}})$, This property is used to show that the wavelength of norm |v̄|, of vectors ,v̄, is a Stationary wave, with the two edges as Energy material nodes , Cycloidally carried on wavelength |λ| = 2|A1-A2| twice the norm.

In Fig.11, KA= 2.r.sin φ and KA.sin φ = y so sin² φ = y/2r and cos² φ = 1-y/2r = $\frac{2r-y}{2r}$ and by division becomes $\frac{v}{\cos \varphi} = \sqrt{4gr}$, which means that any Weight , *Force* , falling , or rolling on Cycloid from upper point A , ratio $\frac{\overline{v}}{\cos \varphi}$

remains constant, and for the center of PK $v_K = v. \frac{r}{PA} = \frac{1}{2}.\frac{v}{\cos \varphi} = \sqrt{gr}$, i.e. the rolling circle has a constant *velocity* and with an area of moving circle $A = \pi.r^2 = \pi.(2r. \cos \varphi)^2 = \pi R^2.\cos^2 \varphi$.

b.. Thrust is the velocity vector v̄=w̄.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 □ | is the static equilibrium position vector of amplitude, ds, of dipole |AB| =|v̄| =ds and in terms of the static deflection, ds, then T =1/f= 2π/w , where ds = z = v̄ = A.$e^{i.wt}$= v̄.cos wt + i.v̄.sin 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(T1) > c > c2(T2). Any material point [Medium - Field Material - Fragment] →[± s²]=|w̄xr̄|² →[MFMF] Field following trajectory ,in=(c1), or ,out=(c2) , Cycloid=(c)=|A1-A2| needs more or less time T(2) < T = 4π √(r/g) <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, v̄ = w̄.r , and period ,T, of monads.

Breakage quantity 2.(wr)² under the tangential action v̄ = 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 A_E,B_E , C_E of Anti-Space . Because all velocity vectors AA,BB,CC carry material points A,B,C at points D_A ,D_B , D_C ,in time ,t, isochrones , then material points follow a cycloid with period the norm of wavelength of velocities |AA|,|BB|,|CC|. Fig.5 This Simultaneity is succeeded by Lorentz factor where transformations between Inertial frames that preserve the velocity of light will not preserve simultaneously.

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.11. is a cave and let this be IN Common-circle of STPL mechanism . **[1]** *The applied force on this* NN *cave is*

$E = h.f = w.(h/2\pi) = w . Spin$, and **Spin** $= \frac{E}{w} = [\pm \overline{v} .s^2]/w = (r.s^2)$

[2] For $E = \pm \overline{v}$ then → **Spin** $= \frac{E}{w} = [\pm \overline{v} .s^2] / w = (\pm r . s^2)$ → Producing $\pm$ *Fermions with spin* $\frac{1}{2}$.

[3] For $E = [\Box i = 2(wr)^2 = 2.\bar{v}s^2] = 2.(r.s^2)$ then **Spin** $= \dfrac{E}{w} = [2.\bar{v}.s^2]/w = 2.(r.s^2) \rightarrow$ Producing ***Bosons of spin 1*** .

i.e. **Double energy $[2.(r.s^2)]$** on a constant cave creates **2** crests and doubling the frequency **(h)** , with **Spin 1.**For **N-times energy $[N.(r.s^2)]$** on a constant cave creates **N** crests N-times the frequency **(h)** with **Spin N/2** .
Since Energy in cave is an Electromagnetic Wave $[\bar{E}x\bar{H}]$ = Pressure = Spin S = $\rho.c.w$, or $[\varepsilon E^2 + \mu H^2] / 2$
= 2rc. sin2φ $\rightarrow$ then Energy / sin2φ = $[\varepsilon E^2 + \mu H^2] / \sin 2\varphi$ = 2rc/ ρw = $4r^2 /\rho$ = constant , happening only on Cycloidal motion , where ε = Permittivity and μ = Permeability in cave .

Above property happens in *Piezoelectric-effect* where *the Mechanical Energy* as { pressure or vibration} , executed on a material point or on a Dipole = $[\oplus\ominus]=\Box=AB$, *is converted into an Electric or transverse Magnetic wave* . [58]

Work from deformation is $dW = \dfrac{\sigma^2}{2E}(dx.dy.dz)$.

It was shown that the Intensity is $I_d = \dfrac{\rho^2\pi^2 c^3}{2\lambda^2}$, and for ρ =1 then is $I_d = \dfrac{\pi^2 c^3}{2\lambda^2}$. [58]

Applying this to light-velocity-vector then Electromagnetic Wave $\{I_d = \dfrac{\pi^2 c^3}{2\lambda^2}\}$ in vector $|c|$, is creating a Mechanical deformation on Material point $|c|$ { as

Outer - Spin $= \dfrac{E}{w} = h.f\,\}$, which is then converted to an ***inner*** Electromagnetic Wave and which is recycled .
The linear electrical behavior of a Material point is , D = ε E , where D = the Electric displacement field , E = the Inside Electric field strength and then according to Maxwell`s equations $\Box$ . D = 0 , $\Box$xE = 0 and since in Elasticity , Hook`s law is $\rightarrow$ s = m. σ and m = Young modulus then ,

Strain(s) $\equiv$ m **x** Stress(σ) and $\Box$. σ = 0 , s = $\Box$ _____ $^{u+u\Box}$ where u = displacement .
$\frac{}{2}$
All above when combined in *coupled equations* then s = m.σ +∂E and D = ε E +∂ σ . In case of a Dipole $=[\oplus\ominus]=\Box=AB$ in a Cave 2r , ON or OFF STPL , is $[(+(wr)^2) \leftrightarrow (-(wr)^2)]$ or $[(+(wr)^2) \cup\cup (-(wr)^2)]$ and is oscillated in itself as ***monad*** . Fig.5-6 -12 , i.e. ***The Free vibration of monad*** AB = $\bar{q}$ = $[s+\bar{v}\Box i]$, oscillating under the action (a thrust) inherent in itself , subject to , *damping ,* because energy is dissipated by the *stiffness* ,**k** , of monad and from a *constant of proportionality* ,**c**, regarding the motion of *mass* ,**m**, when placed into motion , the oscillation will take place at the natural frequency , ***f_n ,*** which is a property of monad. ***For Displacement*** , x = AP$_A$, ***The homogenous differential equation of this motion is*** , $m\ddot{x}+c\dot{x}+kx = 0$ ……. (1) which corresponds physically to the free damped vibration , where m = mass = a reaction coefficient to the change of velocity $\dot{x}$ and k = stiffness = a reaction coefficient to the change of length ,$|x|$, x = the displacement , $\dot{x}$ = velocity of monad , k and c constants as above ,with general solution given by the equation $\rightarrow$ x = A . $e^{s1\cdot t}$ + B.$e^{s2\cdot t}$ where

$s1,2 = -[c/2m] \pm \sqrt{\left[\dfrac{c}{2m}\right]^2 - \left(\dfrac{k}{m}\right)}$ and , S = $\sqrt{\left(\dfrac{k}{m}\right) - \left[\dfrac{c}{2m}\right]^2}$, a constant coefficient , and for initial conditions x(0) , $\dot{x}$(0) $\rightarrow$ A , B then displacement ,x, is , x = $e^{-i.(c/2m)t}$.[A.$eS.t$ + B.$e^{-S.t}$] = $e^{-i.(c/2m)t}$.[x(0).$eS.t$+$\dot{x}$(0).$e^{-S.t}$] and

Oscillatory x = $e^{\pm i \sqrt{\left(\frac{k}{m} - \left[\frac{c}{2m}\right]^2\right)}\cdot t}$ = $\cos\sqrt{\left[\dfrac{c}{2m}\right]^2 - \left(\dfrac{k}{m}\right)}$ $\pm i.\sin\sqrt{\left[\dfrac{c}{2m}\right]^2 - \left(\dfrac{k}{m}\right)}$ …..(2)
where ,

1.. For coefficients $\left[\dfrac{c}{2m}\right]^2 > \left[\dfrac{k}{m}\right]$, no oscillations are possible , *is the Over-Damped $\equiv$ The Particle like nature of monad* .

2.. For coefficients $\left[\dfrac{c}{2m}\right]^2 < \left[\dfrac{k}{m}\right]$ the exponent becomes an imaginary number and the terms are Oscillatory , *it is the Under - Damped $\equiv$ The Wave like nature of monad ,* and this because of space rotation only $\cup$.

3.. For $\left[\dfrac{c}{2m}\right]^2 = \left[\dfrac{k}{m}\right]$ then oscillatory , non-oscillatory and radical motion is zero , *It is the Critical Dumping in monads $\equiv$ The Critical-Energy-Quantity $\rightarrow$ CEQ as in M-point* .

The Particle and or the Wave nature of monads , or when $\rightarrow$ $C_c = 2m\sqrt{\left[\dfrac{k}{m}\right]} = 2mw_n = 2.\sqrt{k.m}$ is a relation depending on the three reactions c , k , m .
Electromagnetic fields of monads :

Any damping can then be expressed in terms of the critical damping by the non-dimensional number $\zeta = C/C_c$ and $\mathbf{S}$ in terms of ζ, $\left[\frac{C}{2m}\right] = \zeta\left[\frac{Cc}{2m}\right] = \zeta w_n$ is $\mathbf{S} = [-\zeta \pm \sqrt{(\zeta^2-1)}].w_n$ and the differential equation of motion becomes, $\ddot{x} + 2\zeta w_n\dot{x} + w_n^2 x = 0$ ....(1- n) with the general solution given by the following three cases and equations,

For $\zeta < 1$ is the __ Oscillatory __ motion, *The Under-damped case $\equiv$ Wave like nature* .

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

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

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

Planck's formula $E = h.f_n = h\{\frac{w_n}{2\pi}\}$ } represents the energy in monads .

For $\zeta > 1$ is the Non-oscillatory motion, the *Over-damped case $\equiv$ The Particle like nature* with the two roots increasing

and decreasing with the general solution, $\dot{x} = \vec{v}$ x $= A\cdot e^{[-\zeta+\sqrt{\zeta^2-1}].wn.t} + B\cdot e^{[-\zeta-\sqrt{\zeta^2-1}].wn.t}$ where

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

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

which indicates that the frequency of the damped oscillation is equal to $w_d = \frac{2\pi}{\tau d} = w_n.\sqrt{(1-\zeta^2)}$ and according to Planck's formula,

$E = h.f_n = h\{\frac{w_n}{2\pi}\} = h\{\frac{\vec{v}}{2\pi r}\} = M.v_n$, *and since also* $\vec{V}_n = w_n.r$, *and* M = The complex mass, thus represents the Kinetic energy in monads depending on velocity $\vec{V}_n$ and M.

For $\zeta = 1$, is the Internally Isochronal oscillatory motion, (*the Inner cycloidal motion of monads*) is *The Extrema*, *critical damped motion case* and displacement, $\mathbf{x}$, is as $\rightarrow$ $x = e^{-wn\cdot t}\cdot[A + B.t] =$

$= e^{-wn\cdot t}\cdot\{ x(0) + [\dot{x}(0) + x(0).w_n].t\}$ ....**(3b)**

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.

Above indicate that Extrema-frequency of this critical damped oscillation is equal to,

$w_d = \frac{2\pi}{\tau d} = w_n.\sqrt{(1-\zeta^2)} = 2\pi.f_n$ and according to Planck's formula $E = h.f_n = h\{\frac{w_n}{2\pi}\} = h\{\frac{\vec{v}}{2\pi r}\} = M.v_n$,

and since also $\vec{V}_n = w_n.r$, *and* M = The complex mass, then represents the Kinetic energy in monads depending on velocity $\dot{x}(t) = \vec{V}_n$ and M, and for any position, $x = x(t)$, of vibration, and $\rightarrow$ When Velocity $\dot{x}(t)$ is,

$\dot{x}(t) > 0$ then the type of response is Over x, $\dot{x}(t) = 0$ then the type of response is From x, $\dot{x}(t) < 0$ then the type of response is Under x,

and the rate of decay of oscillation is measured on logarithmic decrement, *meaning that*,

The Conservation of Energy in an , *Free - Vibration Un-damped system* , **happens when** Energy is partly **Kinetic T and** ,

1.. Because of the existence of *velocity vector* $\vec{V}_n$ it follows existence of mass, m, also { m = mass = *the reaction to the velocity change , which is a scalar quantity*} and Energy-System quantity is stored in velocity vector $\vec{V}_n$ by virtue of its **velocity - vector - cave** and not in the scalar quantity .

2.. In the absence of velocity vector, mass is not existing {*mass ,which is the reaction to the constant velocity change , is zero* } and Energy-System is stored in velocity vector $\vec{V}_n$ by virtue of its **velocity - vector - cave** , although the scalar quantity is zero, and for the Energy partly **Potential U,** In the Absence of velocity vector, mass is not existing {*mass ,which is the reaction to the constant velocity change , is zero* } and Energy is stored in velocity vector $\vec{V}_n$,

a.. **In the form of Strain - energy in Elastic Deformation for the Work done and which is a Force - field for Solids** , which is reverted to an Electromagnetic field .

b.. **Strain - energy in monads is the Velocity - Cross-Product-vectors in the Homogeneous Deformation of the Work done and which is an Electromagnetic - field in the V|$\vec{}$ n| , Stationary - Wave – cave**] .

In [22-23] , any Monad $NN = N(1) \leftrightarrow N(2)$ is the dipole, $(P_1 \leftrightarrow P_2)$, or $[\{N(P_1) \leftarrow 0 \rightarrow (P_2)N\}]$

It is the symbolism of the two opposite forces (P_1), (P_2) which vibrate perpendicularly in monad (*Resonance-cave with an Electromagnetic Response*) and are created Mechanical forces at the edge points N1, N2 . Balancing of Monads $\equiv$ Quaternions, happens on Evolute *Cycloid* , *Anti-cycloid* .

For velocity $\bar{v} = \bar{c}$ = light velocity, curvature radius is $\rho = XX` = 2c\sqrt{r/g}$ , and Spin S is, $\bar{S} = \bar{V}x(\tau) \times XX` = [g.\sin \varphi].\rho$

$= [g.\sin \varphi].2c\sqrt{r/g} = 2c.\sin \varphi.\sqrt{rg} = 2c \cdot \sqrt{r.g \cdot \sin \varphi}$, *i.e.* **Energy $\rightarrow$ c , as Spin $\bar{S}$, is Unified with the Space-Energy as radius ,r.**

3.9. The Free vibration of monads $\equiv$ Quaternion $KK_1 = \bar{q} = [s+\bar{v}\square i]$ $\rightarrow$ Figure 13-(3)

Material point may be considered as a flexible string of mass , ρ , per unit length which is stretched under tension $T = \pm \sigma$, due to the principal stresses. The lateral deflection ,y, of the string KK_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 ,

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

slope of the string KK_1 is $\theta = \dfrac{\partial y}{\partial x}$ equation (1) reduces to $\dfrac{\partial^2 y}{\partial x^2} = \dfrac{1}{c^2}\cdot\dfrac{\partial^2 y}{\partial t^2}$ .....(2) where $c = \sqrt{\dfrac{T}{\rho}} = \sqrt{\dfrac{\sigma}{\rho}}$

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 $y = F_1(ct - x) + F_2(ct + x)$ where , F_1 , F_2 , are arbitrary functions and regardless of the type of function , the argument (ct $\Box$ x) upon differentiation leads to equation $\dfrac{\partial^2 F}{\partial x^2} = \dfrac{1}{c^2}\cdot\dfrac{\partial^2 F}{\partial t^2}$ .... (3) and hence the differential equation is satisfied , the wave profile moves in the $\Box$ 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 $y(x,t) = Y(x).G(t)$ ......(4) and by substitution to (2)

then $\rightarrow \quad \dfrac{1}{Y}\cdot\dfrac{d^2 Y}{dx^2} = \dfrac{1}{c^2}\cdot\dfrac{1}{G}\cdot\dfrac{d^2 G}{dt^2}$ .... (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 $-\left[\dfrac{w}{c}\right]^2$, are obtained the two ordinary differential equations ,

$$\frac{d^2 Y}{dx^2} + \left(\frac{w}{c}\right)^2 = 0 \quad \text{and} \quad \frac{d^2 G}{dt^2} + w^2\, G = 0 \quad \text{with the general solution ,}$$

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

The arbitrary constants A , B , C , D , depend on the boundary conditions and the initial conditions . When the string KK_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 $y = [C\,.\sin wt + D\,.\cos wt].\sin\left(\dfrac{w}{c}\right).x$ .....(7)

The condition that $y(l, t) = 0$, leads to the equation $y = \dfrac{\sin\left(\dfrac{wl}{c}\right)}{} = 0$ or , $\sin\dfrac{wl}{c} = 0$ and , $\dfrac{w.l}{c} = \dfrac{w_n . l}{c} = n.\pi$

, where n = 1 , 2 , 3 , 4 , ... n ...... ∞ ....(8) and $\lambda = \dfrac{1}{f}$ is the wavelength , f = the frequency of oscillation

Each , n , represents a Normal - Mode - Vibration with natural frequency determined from equation ,

Natural frequency $\rightarrow \quad f_n = \dfrac{n}{2.l}\cdot c = \dfrac{n}{2.l}\cdot\sqrt{\dfrac{T}{\rho}} = \dfrac{n}{2.l}\cdot\sqrt{\dfrac{\sigma}{\rho}} = \dfrac{n}{4r}\cdot\sqrt{\dfrac{\sigma}{\rho}} = \dfrac{n}{4r^3}\cdot\sqrt{\dfrac{2\sigma}{\pi}} \quad \text{...} \quad \text{......(9)}$

The sinusoidal mode shape $\rightarrow \quad Y = \sin\left(n\pi\dfrac{x}{l}\right) = \sin\left(n\pi\dfrac{x}{2r}\right)$ for caves $l = 2r$ i.e.,

The rotating axis KK_1 creates the , Linear vibration of string , and the Natural - frequency f_n , in Material – point $K \equiv [\ominus] \leftrightarrow K_1 \equiv [\oplus\ ]$ ***or the Rotational vibration of string*** $[\oplus s^2 \circlearrowleft\circlearrowright \ominus\ s^2\,]$. The more general case of free vibration of Material-point , ***Linear*** $[\oplus s^2 \leftrightarrow \ominus\ s^2\,]$ ***or Rotational*** $[\oplus s^2 \circlearrowleft\circlearrowright \ominus\ s^2\,]$ in any manner , the solution will contain many of the normal modes and the equation for the displacement can be written as ,

$$y(x,t) = \sum_{n=1}^{\infty} C_n \sin(w_n\, t) + D_n \cos(w_n\, t)\,.\sin\left(n\pi\frac{x}{l}\right) \quad \text{and} \quad w_n = \frac{n\pi c}{l} = \frac{n\pi c}{2r} \quad \text{........(10)} \quad \text{where , by}$$

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

3.10. The Glue-bond of stresses in Material-point   Causes Rotation and motion .

In Figure.13-(3) , common point A executes a $\pm$ pressure on the two points of the circles K_r , K_R which is a Piezoelectric-effect , by causing a Centripetal force , C_P , and an equal and opposite Centrifugal force , C_F , which in turn creates rotation of the positive ,+, to the negative ,-, with Lever-arm Displacement , AP_A on AA_o.

KINETIC - ENERGY OF MATERIAL - POINT = DIPOLE { A SOLID } RELATED TO ANGULAR VELOCITY VECTOR $\overline{W}$
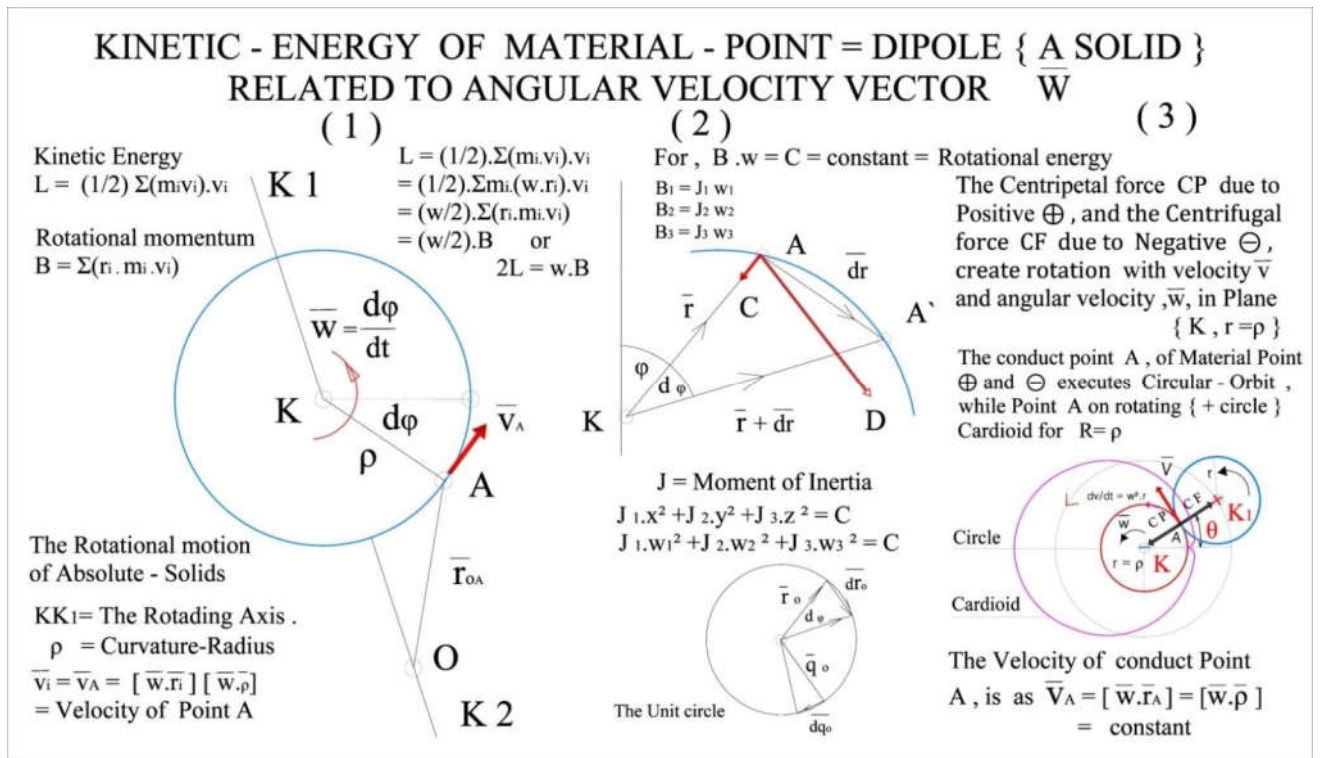
Figure.13.. *The Cycloidal motion in , Material Point ≡The monad is* Dipole ≡ [⊕⊖] = □= K_r AK_{R=r}   *where* → K_R ≡ [⊕]↔ K_r≡ [⊖   ] → ≡ 0 . The total torque becomes from ± Spin which

equilibrium in System of *circle* K_r , *Evolute circle* K_R , as *Cardioid of the same center.*   In (3) the Flexible - String OA is stretched under equilibrium Tension = □σ and rotated   around O center with a constant angular velocity ,w, and is vibrated in Normal modes .
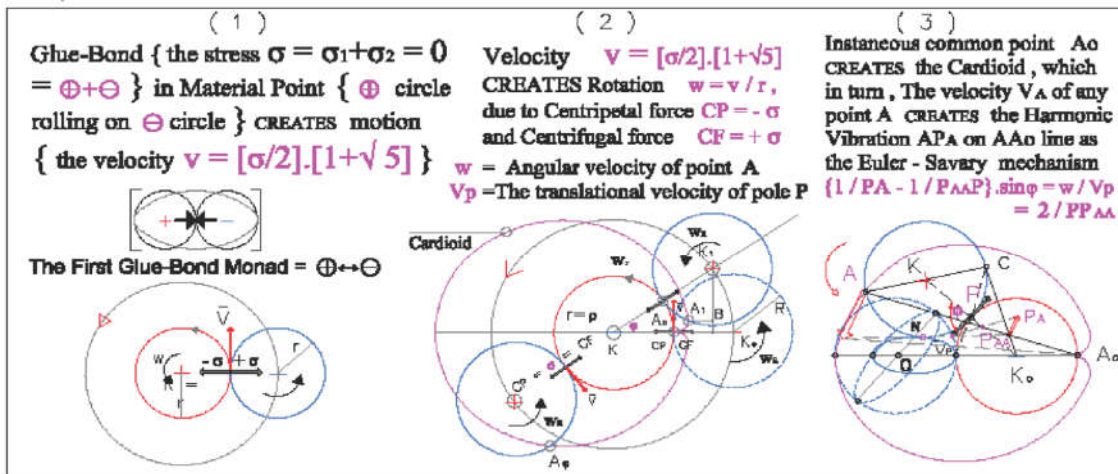
Figure.14.. *Pole of rotatation P . on STPL line APₐ, is the Instaneous centre of rotation for [⊕] .*

Space on [⊖] Anti-space , through Sub-space ,□, and or , every couple of lines between   Spaces and Anti-spaces . Cardioid is the envelope of circles (K_o,R) , (K ,r = R) whose   centres K_o , K lie on a given circle (P, PA_O) which pass through a fixed point , A_O, on   the given circle (P , PA_O) .Nutation happens at ,N, common point. Analytically in [58] .

In (1) GLUE-Bond becoming from opposite ± stresses σ1= - σ2 and create Velocity $\overline{v} = \frac{\sigma}{2} [1+\sqrt{5}]$

In (2) velocity $\overline{v}$ = w.r creates Rotation which becomes , according to Newton`s third law,   from the Centripetal ,C_P, and the Centrifugal force , C_F , and w is the angular velocity of point A. In (3) velocity v_A=w.(AP_{AA}) of point A creates the Free Harmonic Vibration on AP monad following   the Euler-Savary mechanism where , *Rolling motion is transformed to known Vibration curves*

.
Energy Dissipated by Damping :
It was shown before that Energy dissipated per cycle (x) in Material point is ,

$W_d = \oint c\dot{x}.\,dx = \oint cx'^2.\,dt = _{cw^2x^2}$ $\qquad \oint c\dot{x}.\,dx \quad \int_0^{2\pi/w} \cos^2(wt - \varphi)dt \qquad$ where ,

$w = \qquad\qquad \sqrt{k/m} =$ the circular velocity per circle $\sin^2(wt - \varphi)$,

$\overline{c = 2\zeta\sqrt{km}} =$ the linear velocity per circle , and at Resonance $W_d = 2\zeta\,\pi kx^2$ ......(a)

Writing the velocity in the form $\dot{x} = wX\cos(wt - \varphi) = \square\, wX\sqrt{1 - \sin^2(wt - \varphi)} = \pm w\sqrt{X^2 - x^2}$ the damping

force becomes $F_d = c\dot{x} = \pm w\sqrt{X^2 - x^2}$ ....(b) and by rearranging (b) then ,

$[\frac{F_d}{cwx}]^2 + [\frac{x}{X}]^2 = 1$ ....(c) Equation (c) is an ellipse with 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
$W_d = 2\zeta\,\pi kx^2 = 8.k\zeta(\pi r^2) = 8.k\zeta\,A_c$ where A_c= The area of cave , and Energy E

$$E = h.f = \frac{h(1+\sqrt{5}\,])}{4\pi}\cdot[\frac{\sigma}{r}] = W_d = 8.k\zeta\,A_c \qquad \text{where } h = \text{Planck's constant .}$$

Complex Numbers , Quaternion and Resonance :
Rotation of $[\oplus]$ constituent around $[\ominus]$ constituent in Material point is equivalent to a force $T = F_0$ Eternally and
Sinusoidal acting on String [Figure -23] , and is according to the differential equation , $\qquad m\ddot{x} + c\dot{x} + kx$
$= F_0.\sin wt$ .... (1) $\qquad$ where , m = The mass of the $[\oplus]$ constituent related to acceleration , c = A
constant related to its velocity , k = A constant related to its displacement , x ,
w $\qquad$ = The circular velocity of the $[\oplus]$ constituent related to the tension $T = \square\,\sigma\,t$ = The time of rotation .

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 ,
$\qquad F_0.(\cos wt + i.\sin wt) = F_0.e^{iwT}$ ....(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 ,
$\qquad \overline{X} = X.e^{i(wt-\varphi)} = [X.e^{-\varphi}].e^{iwT} = \overline{X}.e^{iwT}$ ....(3) $\qquad$ where ,
$\overline{X}$, is a complex displacement - vector equal to $[X.e^{-\varphi}]$, X = Displacement-amplitude of Resonance , and by substituting

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

into the differential equation and cancelling
from each side of the equation , then results to $(- w^2\,m + k\,w + k\,)\overline{X} = F_0$
and , and by introducing the complex frequency

response H(w) defined as the output divided by the input then becomes

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

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

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

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 $\qquad = A.\sin(wt - \varphi) + e^{-\frac{c}{2m}t}[C_1\sin\theta t + C_2\cos\theta t]$ $\qquad$ where ,
$\theta = (\sqrt{4mk - c^2})/m$,$\tan\varphi = \frac{c\,w}{k - mw^2}$, $\qquad\qquad A \qquad\qquad =$
$\frac{F_0\cos\varphi}{k - mw^2} = \frac{F_0}{\sqrt{k^2 + (c^2 - 2mk)w^2 + m^2w^4}} = \frac{F_0}{(k - mw^2)\cos\varphi + cw\sin\varphi}$ ...(5)
When the System is subjected to Harmonic excitation , it is forced to vibrate at the same natural Frequencies as that of
the excitation 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 hysterisis $T_H = \frac{\varphi}{w}$, 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 = $

$$T_R = 2\pi\sqrt{\frac{m}{k}}$$

$90°$, and Force $\rightarrow F_0.\sin wt$ is vibrated with Period $\qquad$, and amplitude $A = F_0/c\,w$, tends to infinite for
$c = \infty$.

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 the Wave Energy - Pattern .*

The rotating axis , $l = 2r = KK_1$ in Material–point , creates the **Linear vibration of string** , l , which is in String $K \equiv$

$[\ominus \quad] \leftrightarrow K_1 \equiv [\oplus \quad]$, and the Natural - frequency , $f_n = \dfrac{(1+\sqrt{5}).\sigma}{4\pi l}$ in points K , K_1 *or* , the **Rotational vibration Plan Energy** which is , The Spin as $[K \equiv \ominus s^2 \cup \cup K_1 \equiv \oplus s^2] \equiv \overline{B}$. *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 $\overline{B}$, and Angular velocity Ellipsoids $\overline{w}$. 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 .

<center>markos 20 / 12 / 2017</center>
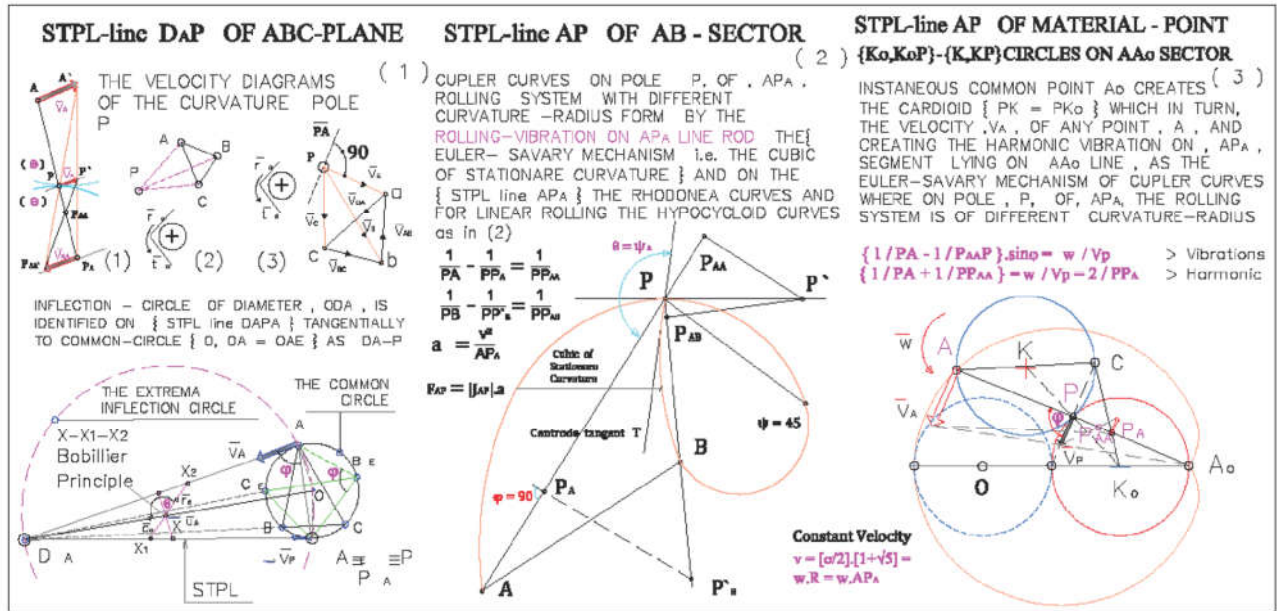
Figure.15.. The STPL line . **In** *a Material point* $\{\ominus \equiv K_o,K_oP – \oplus \equiv K , KP\}$. **In** *a Material-Segment* $\{AP\}$, *and* **In** *a Material-Plane triangle* { ABC } is as in (3),(2),(1) .

(±) Breakages { *in STPL lines* } become the , *Vibrating Curves of Material points* .

In (1) STPL line *of Plane ABC* , extrema $D_A P_A \equiv D_A P \equiv D_A A_E \equiv$,r, is tangential to Common-circle , and **Inflection- circle** passes through Space-point , $A \equiv [\oplus]$, Anti-space point $A_E \equiv [\ominus]$,which coincides with the Instaneous curvature-centre of rotation , *the Pole P* , and thus forming the material angle ,) . t , on angle $< AD_A P$.

c −r

$$\vartheta = \vartheta_A . t = (\frac{v_A}{\sqrt{^2 ^2}}$$

All chords through the Sub-space Plane-triangle $A D_A P$, follow Bobillier-Principle for curvature centres D_A and CREATE the Vibrating Energy-Geometry-Segments $D_A A$, $D_A P$. Velocity of point A , is $v_A = w_A . r_A$, *where* , $w_A =$ the angular velocity of point A , $r_A =$ the distance , AP, between the moving (+) point A and (-) point P the Pole .

In (2) STPL line , *of sector AB* which two points , A , B , are OFF Common-circle , and lie on the circumference of Envelope-circles , O,OA= OB , with the common Anti-space point , P(-) , and thus forming the material angle , $\vartheta = \vartheta_A . t = (\frac{v_A}{\sqrt{c^2 - r^2}})$. t , with centrode tangent T.

Euler-Savary mechanism establishes the relation among points A , P , P_A and P_{AA} and CREATE the Envelope curves , *Stationary-curvature paths* , generated by the Vibrating → Velocity-Energy - Geometry Segment $A P_A$, on AP line .

In (7) STPL line , *of Material point AP* , $\{\ominus \equiv K_o,K_oP – \oplus \equiv K , KP\}$ of Space point A(+) and Anti-point P(-) is rotating through point A_o , which is the center of common-circle and forming the material angle , $\vartheta = \vartheta_A . t =$ () . t , CREATE the Cardioid-Envelope curves $\frac{v_A}{\sqrt{^2 ^2}}$ generated c −r by the above Vibrating Velocity-Energy- Geometry-Segment $A P_A$, on AA_o rotating line .

Remarks in Figure 15 :

a.. It was shown in [58] that *Clashed Breakages which are located* IN *the* STPL *Cylinder , Acquire Oscillation from their inherent Vibration as in (1) – (2) , and consist the Moving Particles while , Un-clashed Breakages located* OUT *the STPL*

Cylinder , Acquire Oscillation from their between Glue bonding and consist the Rest Particles (3) . In all cases , STPL line mechanism consists the $<$ Energy-Geometry-Length $\equiv$ Quantum $\equiv$ AP $>$

The Space as Velocity-vector-energy V , in the cavity of the Common-circle of radius ,r, and constant angular velocity ,w , is transported as Energy from point A to Pole P , coinciding , with Point P as ,   P $\equiv$ A$_E$$\equiv$ P$_A$, where then the two conjugate points ,T,J, lie on STPL line as Pascal`s P$_A$ and Desargues

D$_A$ points with the constant angle $<$ φ $=$ $<$ D$_A$AP$_A$ $\equiv$ $<$ D$_A$OA , on Common circle and on Extrema circle. **b..** Since all properties of Physical entities exist only in Pairs and exists the scientific notion that $<$ Opposites Attract $>$

$<$ Similar Repel $>$ then *considering* , Material point A$\equiv$[$\oplus$] - Anti-space point A $_E$ $\equiv$ [$\ominus$] or AA $_E$ = AP as a *Physical System* which has only one physical property which is *Stress* $\equiv$ *σ* can predict measurements produced , and also results which are according to the Newton`s   second law , the Forces of Circular motion and tangential and angular velocities $\bar{v},\bar{w}$, $\bar{v} = w.r$ which is the *Hidden - variable of the System* .

This continuously equal velocity $\bar{v}$, creates on any Material-point [Point , A–Anti-point P=A $_E$] $\equiv${Energy-Geometry-Length $\equiv$ Quantum $\equiv$ AP } the envelopes of Cardioids which are of Wave function , whose domain is the configuration space in *Material - Point – Energy - equilibrium*.

Since also an Isolated system does not loses or gain Energy so , this Material-point is self - consisted and constitutes ,   *The First Eternal $<$ Self – Moving – Energy – Dipole $>$* $\equiv \equiv \equiv$ *The Rotating and Stationary Energy - Quantum , of this cosmos* .

c.. It was proved in [58] that , in case of a curve rolling on its constant envelope curve , then the   curvature center of the envelope curve coincides to that of the rolling curve .   In Figure 14-3,Euler-Savary mechanism on AP is

$$\left[\frac{1}{PA} - \frac{1}{Paa\,P} \right].\sin φ \;=\; \frac{w}{Vp} \;=\; \frac{Angular\ Velocity}{Tangential\ Velocity}$$

i.e. $\rightarrow$ a *Geometry-energy-motion relation in the Material-Point* , where energies become from , **w** , $\rightarrow$ is the angular velocity of point A and

v$_P$ $\rightarrow$ is the translational velocity of pole P , and Creating the curves , Free Harmonic Vibration .

d.. It was shown in [14-16] that , *in The Elastic material Configuration , the Strain energy is absorbed as Support Reactions and displacement field in the three dimensions* [$\Box$ε ($\bar{u},\bar{v},\bar{w}$)] *upon the deformed placement* , (these alterations of shape by pressure or stress is the equilibrium state of the Configuration) , *as* G.$\Box^2$. ε $+$ [m .G / (m-2)] **.** $\Box$ [$\Box$. ε] = F , and above in string KK$_1$, *where*

E = Young modulus of elasticity. G = Shear modulus = E .m/2(m+1)   m = Poisson`s ratio = 1 / μ $\approx$ 10/3 σ = Stress = Force / Area. **ε** = Strain = change of length / length . F = External forces .

The linear electrical behavior of a Material point is , Ď = ε Ê , where

Ď = the Electric displacement field , Ê = the Inside Electric field strength and then according to Maxwell`s equations $\Box$ . Ď = 0 , $\Box$xÊ = 0 and since in Elasticity , Hook`s law $\rightarrow$ ε = E . σ and then ,

$\Box$. σ = 0 ,   **ε** $= \dfrac{\Box u + u}{2}$ $\Box$ *where* u = displacement .

All above when combined in *coupled equations then* $\rightarrow$ **ε** = E . σ $+\partial$Ê and Ď = ε Ê $+\partial$ σ …..…(1) and since in Material-point σ = 2(1+√5).$\bar{v}$ = constant , *and since* v = w.r , then (1) becomes , **ε** = E . σ $+\partial$Ê = 2.E(1+√5). $\bar{v}$$+\partial$ Ê   Ď = ε Ê $+$ ∂σ = **ε** Ê $+0$ = **ε** Ê   ………(2)

System (2) defines the Strain **ε** , and the Electric displacement field Ê = [$\ominus$] , in Material-point .

4.. The Geometry of STPL .

In Figure.5-(3), the tangents at points A,B,C formulate triangle $K_A K_B K_C$, the inscribed to it largest circle O,OA=OB=OC , which incenter is the intersection of the three internal angle bisectors at K . Because the internal bisectors of angles are perpendicular to their external bisectors , it follows that the centers of the in-circle together with the three ex-circle centers form an orthocentric system .On this coordinate system is possible any geometrical analysis.

By using the Trilinear coordinate system on ABC Space –triangle then for ,

Incenter is → 1 : 1 : 1

Excenters is → -1 : 1 : 1 , 1 : -1 : 1 , 1 : 1 : -1

Incentral triangle Vertex opposite A = 0 : 1 : 1

Incentral triangle Vertex opposite B = 1 : 0 : 1   Incentral triangle Vertex opposite C = 1 : 1 : 0

External triangle Vertex opposite A = -1 : 1 : 1

External triangle Vertex opposite A = 1 : -1 : 1

External triangle Vertex opposite A = 1 : 1 : -1   Defining the lengths

$a = K_B K_C$, $b = K_C K_A$, $c = K_A K_B$, $d = [\frac{a+b+c}{2}] =$ The semi-perimeter then

Inscribe radius r = $\frac{\sqrt{d(d-a)(d-b)(d-c)}}{d}$ = |OA|

Coordinates for point K are, $\frac{bc}{b+c-a}$: $\frac{ca}{c+a-b}$: $\frac{ab}{a+b-c}$

Coordinates for point O are, $\frac{\frac{b+c-a}{b+c-a}}{a}$: $\frac{\frac{c+a-b}{c+a-b}}{b}$: $\frac{\frac{a+b-c}{a+b-c}}{c}$

The STPL mechanism is the Mould consisted from any Common circle O,OA= [OA`≡ OA_E] ,
O,OB = [OB`≡ OB_E] , O,OC = [OC` ≡ OC_E] , ***and the common lines*** D_A-P_A , D_B-P_B , D_C-P_C all on a line of STPL . ***On the infinite sectors*** AD_A-AP_A , BD_B-BP_B , CD_C-CP_C ***vibrate the breakages*** [± s² ≡ ± (wr)²] ***and*** [□i = 2(wr)²] , ***forming all families of curves and the Euler - Savary Coupler - curves of the Cubic – Of - Stationary - Curvature mechanism of Space , Anti-space Vibrating end-curves .*** [58]   Dimensioning of the mechanism is possible by using analytical geometry.

The most important of this Mechanism is that STPL produces ,
A.. [±v̄.s²] → Fermions and → [v̄.□i] → Bosons , ***which are Particles*** , *with Inherent Vibration* B.. [± s²] → [MFMF]-Field = ***The Energy - Chaos*** , and the binder Energy-Field [□i] called   Gravity force , *without Vibration* .
C.. [±c̄.s²] → Dark matter and the binder Gravity-Force [□i] , ***The Expanding Dark-Energy*** [c̄.□i]   constituents which are moving with light velocity ,c, causing the universe to grow.
Dark Energy DE ≡ [c̄.□i] (©) → Acting on the Five Constituents → [(□i),(+s²),(-s²),(+cs²),(-cs²)]
   [± s²] → MFMF Field   [± c̄.s²] → DM-DE Field , of , Dark matter and Anti-matter.

   [±v̄.s²] → Fermions   [□i] → $G_f = g.\nabla[\frac{\sigma}{c^2}]^2. r$ Gravity-Force in DM-DE Field.

Synopsis 2 :
*Point in E-Geometry , which is nothing and dimensionless , i.e. the Zero , can be derived from the addition of a Positive (+) and a Negative (-) number , while **Material point has dimension ,ds, and Energy the Work W** , the Segment **ds** = [⊕⊖] and Work **W** = P.ds , and originates in the the same way . Adding it as this to numbers i.e. to Monads , **creates the Primary Particles , the Rest-Gravity constituent and the Atoms of the Periodic System** in Planck`s Space-Level .*
*Monads are Spinning because of the **Inner Electromagnetic Waves** , E ⊥ P , which **create the External Spin** and again the **Inner Electromagnetic Waves** , E – P , continuing this eternal Cycle. In Mendeleyev`s Periodic Table , chemical properties of the elements are a periodic function of their atomic weight and in [58] was shown that , **any Next - Atom Energy , is equal to Prior + the distributed** . Since all material points are produced from (±)*
Breakages which consist the   [⊕,⊖,�] Energy-Units as follows ,
   Breakage s² = +(wr)² = The Positive. ⊕ Unit ,
   Breakage - s² = - (wr)² = The Negative ⊖ Unit ,
   [⊕↔⊖   ] = □ = The Rest Energy Quanta ≡ 0 The Zero Unit ,
   Breakage 2s² = 2(wr)² = The Energy ✺ Unit , then ,

Primary Segment of Material-point is of the Form [⊕   ↔⊖] = □ = 0 , *and its **Content*** $\bar{v} = \frac{\sigma}{2}[1 + \sqrt{5}]$

Finite |⊕↔⊖| *and **Infinite** , v̄=w̄.r= ∞.0 , to all Monads* $L_v = e^{i.(\frac{N\pi}{2})} b=10^{-N} = -\infty$, *and for* N≡ w̄=∞ → 0 , *the* ***Atraction*** [⊕ ↔⊖]*and the **Repulsion*** ⊕→ ←⊕ , *the **Quantity** in Real part Form* AB=L_v=⊕| ↔⊖| *and in Imaginary part* [⊕↔⊖] = 0 , *and the **Quality** [⊕↔⊖ = σ] ≠ 0 by differentiation , and so on .*

*Since also **Imaginary Part** is always* [⊕↔⊖] = 0 *then Form and Content are absolutely inseparable and pass from zero for all Opposites , so all Entities are embodied with the Laws , and since also valid* [⊕↔⊖]
≠ 0 *then , the **Zero equality is the Constant and Critical-Energy-Quantity** → CEQ ← and is {{ Stress , σ = CEQ is Producing velocity **v̄ = w.r** , and consists the **Hidden-variable of this tny and Self– Moving– Energy– Dipole , System** }},for any transition in Quality , a kind of Constant-Catalyst which is not changing the composition of Primary Material-*

Segment, the unity of opposites *and also the Work ≡ Energy involved in all levels*. *In this way in nature nothing remains constant because by changing ,w,r, in an eternally existing constant velocity vector* $\bar{v}$ *then everything is in a perpetual state of transformation , motion and change*. *The Rest Energy-Quanta acquire a Resistance in motion which is Stress ,* σ = CEQ , *i.e. a meter , a number measuring this magnitude and it is that what is called* **Matter** *which has nothing to do with energy*. **GR** *considering Energy and Mass equivalent creates a great confusion because , Energy is motion it is*

Content $\bar{v} = \frac{\sigma}{2}\left[1 + \sqrt{5}\right] \equiv [\oplus \leftrightarrow \ominus]$, *while Mass* **is a Number**

measuring the changes in velocity-vector motion **V**‖ , *and it is the law ,* **while Content** $|AB| \equiv v|\lrcorner \equiv [\oplus \leftrightarrow \ominus] \equiv The$ *Energy length (the energy - quanta) of opposite points* |A ,B| .

In Primary-material-point , **Form** (r) *is the cave* **and Content** , $[\oplus \leftrightarrow \ominus$] *is the energy , and both are constant while in all others issues the laws of transformation of* **Quantity into Quality** , *extended from the smaller particle to the largest phenomena are also constant* .

Since Material-point is of Form $[\oplus \leftrightarrow \ominus$] = □ = 0 , *it is with binding points with no energy released* . *Since mass is the meter of Energy-velocity-vector changes , then this meter cannot exceed the frequency of light-velocity* . *The why light-velocity* $\bar{v}$ *is the maximum and constant in* [58] .

Changing the Form(r) *means much more the Content* $\oplus$ *or* $\ominus$, *or* $[\oplus \leftrightarrow \ominus$] ≠ 0 , *is Negative-Energy ,* *while the ,* **Changing of Content ,** *is an increasing in frequency which occurs in standing-waves and where then decreases*

the reaction to the motion (the mass) , because $v = w.$ $r = \frac{2\pi r}{T} = 2\pi r.f = $ constant .

It was shown in [58] *that ,* **any Next-Atom , Energy** , *is equal to Prior + the distributed i.e.* **the law of Quality and Quantity** . *The same also in Chemistry from gas to liquid or solid which is usually related to variations of temperature and pressure* . *Anti-Energy or Negative-energy is not existing because it is the Difference between the two* (+) ≡ $\oplus$ *and* (-) ≡ $\ominus$ *Contents , in Energy-Form , and this in direction only* ← → *clockwise or anticlockwise , i.e. it is a meter of the difference between the two magnitudes* .

Energy , *motion , and* **the reaction to the change of velocity-vector** , *mass , are absolutely inseparable.*

B.. *The How , Energy from Chaos becomes Monad* .

1.. General :

It was shown [33-36] that Un-clashed Fragments through center O , consist the Medium-Field Material-Fragment →[± s²] = [MFMF] as base for all motions , and Gravity as force [□i], while the clashed with the constant velocity ,$\bar{c}$, consist the Dark matter [± $\bar{c}$.s] and the Dark energy [$\bar{c}$.□i] , or from → Breakages[± s² = ± (wr)²] and [□i ≡ 2(wr)²] where then become Waves { *Distance* ds = A A$_E$ *is the Work embedded in monads and* **it is what is vibrated , because for this is the angular velocity vector** } with Vibrating equations of motion becoming ,

A → Particles, with Inherent Vibration ,

B → Gravity-field-energy, without Vibration

C → Dark-matter-energy constituents and as ,

A.. [±$\bar{v}$.s²] → Fermions and [$\bar{v}$.□i] → Bosons ,

B.. [± s²] → [MFMF]= Field = ***The Chaos*** , and the binder , Field is [□i] → ***is Gravity force*** ,

C.. [±$\bar{c}$.s²] → Dark matter , and the binder Gravity force [□i] , [$\bar{c}$.□i] → and Expanding Dark energy.

From above is seen that in , A , *and ,* C , *case { Energy as velocity ,* $\bar{v}$, } *exists in the Discrete monads ,* ± $\bar{v}$.s² *and* ± $\bar{c}$.s² .

B *case , is the transportation of Energy , from Chaos to Material points* [+s² ↔ - s²]. The How ??

2.. The Kinetic - Energy in Material- Point $[+s^2 \leftrightarrow -s^2]$ and the Central Axial-Ellipsoid .

It was referred that the Constant and Critical-Energy-Quantity becomes from Stress , σ , between the two opposite

Contents $[\oplus \leftrightarrow \ominus]$ which in turn Produces velocity $\bar{v} = \dfrac{\sigma}{r}[1+\sqrt{5}]$ and $\bar{v}$ in turn the angular velocity $\bar{w}$ on $\ominus$ sphere of radius ,r, where $\bar{v} = w.r$, and consisting the Hidden-variable of this tiny *Content , which is a* **Self –Moving –Energy– System** . The circular Rotational-motion of this $\oplus$

Material-sphere on the $\ominus$ sphere , is as that of a Rigid-body . [57]

Following Euler-Lagrange classical-mechanics for the solution of equations in tautochrone-problem and Energy is expressed as a function of positions and velocities , i.e. *During Space-Energy-motion* exist ,

2.1. *Angular Velocity and Rotational Kinetic Energy* .

In Figure.14-3 and Figure.15 , $\oplus$ sphere is composed of (i) material-points A_i , of discrete mass $m_i=1$ rotating with velocity ,$\bar{v}_i$, about center-point ,O, of $\ominus$ sphere and angular velocity w_i and ,w, the angular velocity for the center of mass K . Mass m_i is constant ,m, at every point of $\oplus$ sphere.

In Mechanics , Kinetic-Torque is identity $\dfrac{d}{dt}[r\bar{v}]$ $\{=[\dfrac{dr}{dt}\bar{v}]+[\bar{r}\dfrac{d\bar{v}}{dt}]=[\bar{v}\,\bar{v}]+[\bar{r}\dfrac{d\bar{v}}{dt}]\}=[\ \bar{r}\dfrac{d\bar{v}}{dt}\ ]$, and since

$\bar{v}=\dfrac{\sigma}{2}[1+\sqrt{5}]$ and $\dfrac{d\bar{v}}{dt}=\dfrac{d\sigma}{2}[1+\sqrt{5}]$ then $\dfrac{d}{dt}[r\bar{v}]=\dfrac{d}{dt}[r\dfrac{\sigma[1+\sqrt{5}]}{2}]=\dfrac{d}{dt}[\dfrac{r.\sigma[1+\sqrt{5}]}{2}]=[r.\overline{dw}\ ]$ $=[r.\,\text{Force}]=[r.F]$

Momentum $\bar{B}=[r.mv]$ and Moment $\bar{M}=[\,\bar{r}.\,\bar{F}\,]$, so Moment $\rightarrow$ $\bar{M}=[\ \bar{r}.\ \bar{F}\ ]=\dfrac{d\bar{B}}{dt}$, i.e.

The Moment $\bar{M}$ of the moving force $\bar{F}$, from a constant point ,O, is equal to the change of Momentum to , O center , and for (i) points ,

Rotational momentum is expressed as $\rightarrow$ $\bar{B}=\Sigma[\,\bar{r}_i.\,m_i\bar{v}_i\,]$

Rotational Velocity , is expressed as $\rightarrow$ $\bar{v}_i=[\,\bar{w}.\,\bar{r}_i\,]$

From above equations is defined ,

a) the momentum of , $\oplus$ sphere as the Summation of linear momentum $m_i\bar{v}_i$ of material points A_i rotating about center ,O, and **b**) the velocity $\bar{v}_i$ for every point A_i related to angular velocity $\bar{w}$ of mass-center K , as ,

$\bar{B}=\Sigma m_i.\{\bar{r}_i.[\bar{w}.\,\bar{r}_i]\}=(\Sigma m_i.r_i^2)\bar{w}-\Sigma\,(m_i\,\bar{r}_i\,.\bar{w}\,\bar{r}_i)$ ………. (1)

The referred magnitudes m_i , $\bar{r}_i$ of the $\oplus$ sphere and center-point ,O, are fixed to $\ominus$ sphere. Considering $\{\bar{B}$ and $\bar{w}\}$ as *two rotating vectors* $\{\,\bar{\rho}\,,\,\bar{a}\,\}$ then , (1) becomes

$\bar{\rho}=(\Sigma m_i.r_i^2)\,\bar{a}-\Sigma(m_i\,\bar{r}_i\,.\,\bar{a}\,\bar{r}_i)$ …….. (1a) , then , $\bar{\rho}^{\bar{a}}=(\Sigma m_i\,r_i^2)\,a^2-\Sigma\,m_i(\overline{ar_i})^2$ and since $\overline{ar_i}=a.(\,\overline{a_o\,\bar{r}_i}\,)$ where $\overline{a_o}$ is the unit vector on radius $\bar{a}$ then , $\bar{\rho}^{\bar{a}}=a^2\,\Sigma m_i\,[\,r_i^2-(\overline{a_o\,\bar{r}_i})^2\,]$

The meaning of terms $\overline{a_o}$, $\bar{r}_1$, $\sqrt{r_i^2-(\overline{a_o\,\bar{r}_1})^2}$ are shown , and the last one denotes the distance of point A_i from $\bar{a}$ axis , therefore $\bar{\rho}^{\bar{a}}=J_a.a^2$, where J_a is Moment of Inertia of $\oplus$ sphere and ,a, distance related to , $\bar{a}$, axis . Denoting as moment of inertia of $\oplus$ sphere to (OKoK) Plane, the Sum of products of $m_i\bar{r}_i^2$, $\bar{r}_i$ perpendicular to , (OKoK) plane then is , $\Sigma m_i.(\overline{a_o\,\bar{r}_i})^2=J_{(a)}$

Considering rotating vectors $\{\bar{\rho},\bar{a}\}$ as in (1a) the changeable vectors $\{\bar{B},\bar{w}\}$ become $\bar{B}\bar{w}=J_w w^2$ ………(2a) where $J_w=$ the moment of inertia to Instaneous axis of rotation .

Since also the *Rotational Kinetic Energy* $L=\dfrac{1}{2}J_a w^2$, then $\rightarrow \bar{B}\bar{w}=2\,L$

In a three Dimensional Coordinate –System where $r_i^2=x_i^2+y_i^2+z_i^2$

$(\Sigma m_i.r_i^2)=\Sigma m_i.(\,x_i^2+y_i^2+z_i^2\,)$ and $\Sigma m_i\,(y_i^2+z_i^2)\equiv J_x$, $\Sigma m_i\,(z_i^2+x_i^2)\equiv J_y$, $\Sigma m_i\,(x_i^2+y_i^2)\equiv J_z$ ….(3) where J_x , J_y , J_z are the moments of Inertia of, $\oplus$ sphere , on the three ,x,y,z axis and (3) to the three Planes , becomes $\rightarrow \Sigma m_i x_i^2=J_{(x)}$, $\Sigma m_i y_i^2=J_{(y)}$, $\Sigma m_i z_i^2=J_{(z)}$ …………(3a) where $J_{(x)}$, $J_{(y)}$, $J_{(z)}$ are the moments of Inertia of, $\oplus$ sphere , to the three Planes , i.e. to the yz , zx , xy .

$\Sigma\,m_i.\,y_i z_i=J_{yz}$, $\Sigma\,m_i.\,z_i x_i=J_{zx}$, $\Sigma\,m_i.\,x_i y_i=J_{xy}$ …………(3b)

Magnitudes J_{yz} , J_{zx} , J_{xy} and the equivalent J_{yz} , J_{xz} , J_{yx} are the *Diverted-Moments* or Centrifugal to Planes (y)-(z) , (z)-(x) , (x)-(y) respectively .

$\Sigma\,m_i r_i^2=\Sigma m_i\,(x_i^2+y_i^2+z_i^2)=J_p$ …………..(3c) where J_p magnitude is the Polar-moment of Inertia to center , O . Equalities are proved as ,

$J_{(y)}+J_{(z)}=J_x$, $J_{(z)}+J_{(x)}=J_y$, $J_{(x)}+J_{(y)}=J_z$ and $J_x+J_y+J_z=2\,J_p$ ……(3c) where x, y, z are projective of vector , $\bar{a}$, on coordinate axis and x_ρ , y_ρ , z_ρ those of vector $\bar{\rho}$. Projective vectors of (1a) on , x , axis is holding $x_\rho=(\Sigma m_i\,r_i^2)\,x-\Sigma\,m_i\,x_i.\overline{ar_i}$ and since $\overline{ar_i}=xx_i+yy_i+zz_i$, then $\rightarrow x_\rho=x\,\Sigma m_i\,(r_i^2-x_i^2)-y\,\Sigma m_i\,x_i\,y_i-z\,\Sigma m_i\,x_i\,z_i$ and according to symbolism then $\rightarrow x_\rho=x.J_x-y.\,J_{xy}-z.\,J_{xz}$. Analogically to ,y, and ,z, axis exists, $x_\rho=x.J_x-y.\,J_{xy}-z.\,J_{xz}$, $y_\rho=-x.J_{yx}+y.\,J_y-z.\,J_{yz}$, $z_\rho=x.J_{zx}-y.\,J_{zy}+z.\,J_z$ ……..(4)

Working Analogous on $\bar{B}$, $\bar{w}$ vectors then ,

$B_1=J_x w_1-J_{xy}w_2-J_{zx}w_3$, $B_2=J_{xy}w_1+J_y w_2-J_{yz}w_3$, $B_3=-J_{zx}w_1-J_{yz}w_2+J_z w_3$ ……..(4a) where B_1 , B_2 , B_3 w_1 , w_2 , w_3 Projections of vectors $\bar{B},w$— on ,x,y,z, axis .

The equivalent to (1) equations define Torsional-momentum $\bar{B}(B_1,B_2,B_3)$ from angular velocity $\bar{w}(w_1,w_2,w_3)$, through the parameters J_x , J_y , J_z and through Tensor T , as ,

$$T = \begin{pmatrix} J_x & - J_{xy} & - J_{zx} \\ -J_{xy} & J_y & - J_{yz} \\ - J_{zx} & - J_{yz} & J_z \end{pmatrix}$$ and (4a) becomes $\bar{B} = T\bar{w}$

Equations (4) ,(4a) give a new relation between $\bar{\rho}^{\,\bar{a}}$, $\bar{B}\bar{w}$, and since $\bar{\rho}^{\,\bar{a}} = x_\rho x + y_\rho y + z_\rho z$ and $\bar{B}\bar{w} = B_1w_1 + B_2w_2 + B_3w_3$ then $\bar{\rho}^{\,\bar{a}} (=J_a a^2) = J_x x^2 + J_y y^2 + J_z z^2 - 2J_{yz} yz - 2J_{zx} zx - 2J_{xy} xy$ ...(5) and $\bar{B}\bar{w} (= Jw^2 = 2L) = J_x w_1^2 + J_y w_2^2 + J_z w_3^2 - 2(J_{yz}w_2w_3 + J_{zx}w_2w_1 + J_{xy}w_1w_2)$ ....(5a) From equations (4) , then (5a) becomes ,

$$\frac{\partial L}{\partial w_1} = B_1 \ , \quad \frac{\partial L}{\partial w_2} = B_2 \ , \frac{\partial L}{\partial w_3} = B_3 \qquad \text{or ,} \qquad \bar{B} = \bar{i}\frac{\partial L}{\partial w_1} + \bar{J}\frac{\partial L}{\partial w_2} + \bar{k}\frac{\partial L}{\partial w_3} \ ....(5b)$$

Considering a changeable radius $\bar{a}$ and constant the product $\bar{\rho}.\bar{a} = C = $ constant then equation (5) $\bar{\rho}^{\,\bar{a}} (=J_a a^2) = J_x x^2 + J_y y^2 + J_z z^2 - 2J_{yz} yz - 2J_{zx} zx - 2J_{xy} xy = C$ ....(6)

Equation (6) defines a second degree surface , *Ellipsoid* , by the Radius-spearhead $\bar{a}$ and when ,

1... From (1a) and for any radius $\bar{a} = \infty$ then $\bar{\rho} = \infty$ also , therefore $\bar{\rho}\bar{a} = \infty$, although this   product was considered as constant , $\bar{\rho}\bar{a} = C$.

2... This Inertial Ellipsoid of , $\oplus$ sphere is referred to O center , it is a body dependent on constant C 3... The $\oplus$ sphere is moving , then Inertial Ellipsoid is moving also because it a body .

$$i = \frac{1}{a} \sqrt{\frac{C}{\Sigma m_i}} \qquad ....(7)$$

From equation (6) $J_a a^2 = C$ and also (Σm_i). $i^2 a^2 = C$ therefore $\rightarrow$ $i = \frac{1}{a} \sqrt{\frac{C}{\Sigma m_i}}$ ....(7)

i.e. *the rotational radius ,i, on ,a, radius is equal to the inverse value of this radius ,i* .   During displacement , $\delta\bar{a}(\delta x , \delta y , \delta z)$ on Ellipsoid , equation (6) is equal to zero so ,

$J_x x \, \delta x + J_y y \, \delta y + J_z z \, \delta z - J_{yz} z \, \delta y - J_{yz} z \, \delta x - J_{zx} z \, \delta z - J_{zx} x \, \delta z - J_{xy} y \, \delta y - J_{xy} x \, \delta x = 0$ and in case of   radius $\bar{a}$ coincides with one of x,y,z, axis say ,x, then y = z = 0 and , $J_x x \, \delta x - J_{xy} x \, \delta y - J_{zx} x \, \delta z = 0$ and in case of radius $\bar{a}$ coincides with one of the principal axis of Ellipsoid where then $\delta x = 0$ then $x (J_{xy} \delta y + J_{xz} \delta z) = 0$ valuing for any variable , δy , δz and simultaneously $J_{xy} = J_{zx} = 0$.

Proceeding above logic for all principal axis then , The Centrifugal-moments are zero for any coordinate System on the Principal axis of Inertial-Ellipsoid and equations (4) become , $x_\rho = x \, . J_1$, $y_\rho = y \, . J_2$, $z_\rho = z \, . J_3$ ....(8) *where* , J_1 , J_2 , J_3 are the Moments of Inertia of Ellipsoid related to Principal axis , and so $\rho = \bar{i} \, J_1 x + \bar{J} J_2 y + \bar{k} J_3 z$, ...(8a) $\bar{\rho}^{\,\bar{a}} = J_a . a^2 = J_1 x^2 + J_2 y^2 + J_3 z^2$, ...(8b) and if a,b,c are the directional cosines of $\bar{a}$ then , $J_a = J_1 a^2 + J_2 b^2 + J_3 c^2$ ....(8c) and equation of Inertia $\bar{\rho}^{\,\bar{a}} = C$, becomes $\rightarrow J_1 x^2 + J_2 y^2 + J_3 z^2 = C$, $\bar{B}\bar{w} = C$ ..... (8d) Inserting restriction $\bar{B}\bar{w} = C$ in (5a) then we have the equation ,

$J_x w_1^2 + J_y w_2^2 + J_z w_3^2 - 2(J_{yz}w_2w_3 + J_{zx}w_3w_1 + J_{xy}w_1w_2) = C$ ....(9)

Equation (9) defines angular velocity , $\bar{w}$ (w_1 ,w_2 ,w_3) in all directions of constant, $\bar{B}\bar{w}$, *Therefore issues and for the Constant Kinetic-Energy ,L, of* $\oplus$ sphere $\{\bar{B}\bar{w} = 2L\}$.

Equation (9) defines the same Ellipsoid as equation (6) , *i.e.*

Every radius of Inertial-Ellipsoid acquires meter , the angular velocity which $\oplus$ *sphere must be rotated, so that kinetic energy remains constant and* $\equiv \frac{1}{2}C$ *Because of above property Inertial-Ellipsoid coincides to Angular-Velocity-Ellipsoid.*

The shape of ellipsoid does not change the motion of sphere because behaves as a Rigid-body. Considering in (4a) coordinate axis the Principal axis of Ellipsoid , then

$B_1 = J_1 w_1 , B_2 = J_2 w_2 , B_3 = J_3 w_3 ,$ ....(10) , therefore

$\bar{B} = \bar{i} J_1 w_1 + \bar{J} J_2 w_2 + \bar{k} J_3 w_3$ and $(B^2 = J_1^2 w_1^2 + J_2^2 w_2^2 + J_3^2 w_3^2)$ ....(10a)

$\bar{B}\bar{w} = 2L = Jw^2 = J_1 w_1^2 + J_2 w_2^2 + J_3 w_3^2$ ......(10b)

The equation of Ellipsoid of Angular velocity becomes , $J_1 w_1^2 + J_2 w_2^2 + J_3 w_3^2 = C$ ......(10a)

This Changeable relation between Angular – Velocity - Ellipsoid and Rotational - Momentum as in (1a) , allows equations of motion to coincide with those of the solid $\oplus$ *Sphere* . Product $\bar{\rho}\bar{a}$ of (1a) variables $\bar{\rho}$ and $\bar{a}$ is constant defined in x,y,z coordinates of $\bar{a}$, and when defined in x_ρ ,y_ρ ,z_ρ coordinates by choosing Principal-axis of Inertial-Ellipsoid

then $x = \frac{1}{J_1} x_\rho$, $y = \frac{1}{J_2} y_\rho$, $z = \frac{1}{J_3} z_\rho$,

$\bar{\rho} \ \bar{a} = (x_\rho x + y_\rho y + z_\rho z) = \frac{1}{J_1} x_\rho^2 + \frac{1}{J_2} y_\rho^2 + \frac{1}{J_3} z_{\rho_2}$ and considering $\bar{\rho}\bar{a} = C$

$\frac{1}{J_1} x_\rho^2 + \frac{1}{J_2} y_\rho^2 + \frac{1}{J_3} z_\rho^2 = C$ ....(11)

Equation (11) consists another Ellipsoid with the same positions of Principal-axis .

The two surfaces of (8d),(11) are Interchangeable .

Considering $\bar{\rho_1}$, $\bar{a_1}$, $\bar{\rho_2}$, $\bar{a_2}$ as in (1) as radii vectors and as the equal (8a) then $\bar{\rho_1} = \bar{i} J_1 x_1 + \bar{J} J_2 y_1 + \bar{k} J_3 z_1$, $\bar{\rho_1} = \bar{i} J_1 x_2 + \bar{J} J_2 y_2 + \bar{k} J_3 z_2$ and for $\bar{a_1} = \bar{i} x_1 + \bar{J} y_1 + \bar{k} z_1$, $\bar{a_2} = \bar{i} x_2 + \bar{J} y_2 + \bar{k} z_2$,   then become $\bar{\rho_1} \bar{a_2} = J_1 x_1 x_2 + J_2 y_1 y_2 + J_3 z_1 z_2 = \bar{\rho_2} \bar{a_1}$ ....(12)

Considering two radii $\bar{\rho}$, $\bar{a}$ and their bordering $\bar{\rho} + \delta\bar{\rho}$, $\bar{a} + \delta\bar{a}$ with $\delta\bar{\rho}$, $\delta\bar{a}$ zero variations

i.e. replacing $\overline{a}_1, \overline{a}_2$, ρ_1, ρ_2 of (12) with responding , $\overline{a}_1$, $\overline{a}+\delta\overline{a}$ and $\overline{\rho}$, $\overline{\rho}+\delta\overline{\rho}$ then $\overline{\rho}.\delta\overline{a}= \overline{a}\delta\overline{\rho}$..(12a) and because variable is not under restriction $\overline{\rho a} = C$, then $\overline{\rho}.\delta\overline{a} + \overline{a}.\delta\overline{\rho} = 0$ ....(12b) and from (12a),(12b) is concluded $\rightarrow \overline{\rho}\,\delta\overline{a} = 0$ and $\overline{a}\;\delta\overline{\rho} = 0$ …...…....(12c)

Condition $\overline{\rho}.\overline{a} = C$ defines as (1a) two surfaces : *First-Surface* is the end points of radii $\overline{a}$, of the Inertial Ellipsoid and the *Second-surface* is the end points of radii $\overline{\rho}$, for the changeable Ellipsoid as in (11). The two surfaces are joint through (12c) as in Figure.16-2.

Remarks :

1..Since radii $\overline{a}$ Surface , consist the Inertial-Ellipsoid , i.e. ***the Reaction to the Angular-Velocity-Ellipsoid and which is the Mass of Space of the*** $\oplus$ **sphere** , so ***radii*** $\overline{\rho}$, consist the Changeable Momentum-Ellipsoid , i.e. ***the Angular-Velocity-Ellipsoid ,monad , which is the Energy in Sphere. This Ellipsoid is not conserved when in Principal-axis even in the absence of applied torques.***

2..Since in radii $\overline{a}$ Surface , of *Inertial-Ellipsoid* due to Angular-Velocity corresponds the radii $\overline{\rho}$, perpendicular to ,$\delta\overline{a}$, vectors , therefore it is a ***Tangential-Plane of*** $\overline{a}$ ***Surface*** , on spearhead of $\overline{a}$.

3..Since in radii $\overline{\rho}$ Surface , of *Energy-Ellipsoid* due to Angular-Velocity corresponds the radii $\overline{a}$, perpendicular to , $\delta\overline{\rho}$, vectors , therefore it is a ***Tangential-Plane of*** $\overline{\rho}$ ***Surface*** , on spearhead of $\overline{\rho}$.

4..The two Ellipsoids that of , *Angular-velocity-Ellipsoid*, and that of , *Momentum≡Energyy-Ellipsoid* are Interchangeable , meaning that ***Energy ≡ Momentum from Chaos ≡ monad*** , sweeps out a cone centered on the Ecliptic-pole of Angular-velocity Ellipsoid as Spin in this tiny Energy-ellipsoid .

The Two magnitudes in the absence of Principal axis are both conserved .
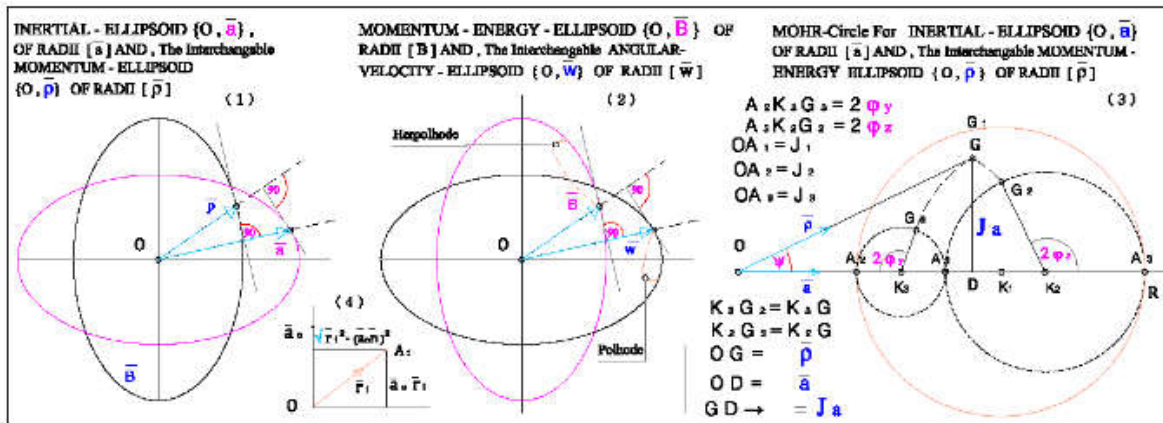
Figure.16.. In (4) is shown the Geometrical-meaning of $\overline{a}_o$ $\overline{r}_i$ and $\sqrt{r_i^2 - (\overline{a}_o\,\overline{r}_i)^2}$ terms.

In (1) is shown the *Inertial - Ellipsoid* (O, $\overline{a}$) of Radii , $\overline{a}$, and the Interchangable Momentum – Ellipsoid (O , $\overline{\rho}$) of Radii , $\overline{\rho}$. (O , $\overline{\rho}$)

In (2) is shown the *Momentum - Energy - Ellipsoid* (O , $\overline{B}$) of Radii , $\overline{B}$, and the Interchangable Angular Velocity – Ellipsoid (O , $\overline{w}$) of Radii , $\overline{w}$.

In (3) is shown in Mohr-method , the Geometrical construction from the two Interchangable Ellipsoids → *The Energy – Rotational Momentum–Ellipsoid* (O , $\overline{\rho}$) , { *Work* } and the Angular-Velocity-vector -Unit-sphere → *The Inertial- Ellipsoid* (O , $\overline{a}$) , { *Force* } and the reaction to the velocity-change-motion → *The Mass - Ellipsoid* (GD=J$_a$≡$\overline{M}$) , { *Mass* }

Rotational Momentum–Ellipsoid (O , $\overline{\rho}$) , { ***Work*** } and the Angular-Velocity-vector -Unit-sphere → *The Inertial-Ellipsoid* (O , $\overline{a}$) , { ***Force*** } and the reaction to the velocity-change-motion → *The Mass - Ellipsoid* (GD=J$_a$≡$\overline{M}$) , { ***Mass*** } The above property of the two Interchangable-Ellipsoids defines the deep relation between ,

The Angular-velocity-Ellipsoid $\rightarrow J_1 w_1^2 + J_2 w_2^2 + J_3 w_3^2 = 2L = C$ ….....(13) *and*

The Momentum-Energy-Ellipsoid $\rightarrow \dfrac{1}{J_1} B_1^2 + \dfrac{1}{J_2} B_2^2 + \dfrac{1}{J_3} B_3^2 = 2L = C$ …....(13a)

Above equation (13) Fig.14-2 defines that, in radii $\overline{w}$, Angular-Velocity of $\oplus$ **sphere** , corresponds

Radii $\overline{B}$ of (13a) Fig.14-3 defining Rotational-Angular-Momentum from the common point , O, of $\ominus$ *sphere* . Radii $\overline{B}$ is perpendicular on spearhead $\overline{w}$ tangential-Plane , of the Angular-velocity- Ellipsoid and radii $\overline{w}$, is perpendicular on spearhead $\overline{B}$ tangential-Plane , of the Rotational - Momentum-Energy –Ellipsoid as in Figure 14-3.

It was shown in ***Material-Geometry*** [58] , that Velocity-vectors and that of light–velocity becomes from geometry as *expression of Lorentz factor* ,γ, *from* **sec φ** = γ = OD$_A$: AD$_A$= ± 1 / [√1 – (v/c)²]. It was accepted in (1a) that the correlated vectors , $\overline{\rho},\overline{a}$ follow restriction $\overline{\rho}\overline{a}$ = constant C .

From Pythagoras theorem in Euclidean-geometry the equation of Unit-Sphere in a ,x,y,z, coordinate
System is → a² = x²+y²+z² = 1 (14) , and in vector form , $\overline{a}\overline{a}$ = 1 . (14a)

5.. Let see variation ,*motion*, of , $\overline{\rho}$ vector-radii , to the corresponding vector-radii $\overline{a}$, as in (1a) under Premise → the spearhead $\overline{a}$, lies on Unit-Sphere as in (14)-(14a) ←

Choosing Principal axis as the coordinate system of Inertial-Ellipsoid , equalities of (8) are ,

$$x = \frac{1}{J_1} x_\rho \ , \ y = \frac{1}{J_2} y_\rho \ , \ z = \frac{1}{J_3} z_\rho \quad \text{and from (14) follows } \frac{1}{J_1{}^2} x_\rho{}^2 + \frac{1}{J_2{}^2} y_\rho{}^2 + \frac{1}{J_3{}^2} z_\rho{}^2 = 1 \quad \text{…..(15)} \quad \text{as}$$

equation of the surface on which , spearhead of radii $\overline{\rho}$ (x_ρ , y_ρ , z_ρ) , is displaced .
This surface is responding to (1a) Ellipsoid which semi-axis are the distances J_1 , J_2 , J_3 .
The geometrical meaning of this view is seen when in (2) is placed the relation a² = 1 and $\overline{\rho}\overline{a}$ = J$_a$

i.e. The Orthogonal-Projection of , $\overline{\rho}$ radii on the corresponding $\overline{a}$ radii of Unit-Sphere , provides the meter of Moment of Inertia of , The Unit-Spheres which are monads **.**

Above conclusion demonstrates the method of Geometric-presentation of Sphere`s Moment of inertia to different axis through constant point O , and this because the Ellipsoid-radii -length acquires the Reciprocal meter-length of the corresponding Inertial-radii –Sphere-meter .
Mohr method impresses on Unit-Sphere , $\overline{a}$, the Projection of the Rotational-Momentum , $\overline{\rho}$, and finds the Inertial momentum J$_a$, i.e. in Unit-Energy-Sphere , Kinetic – Energy as Momentum , defines the Reaction to this Energy-motion .

6.. For the center , K , of $\oplus$ sphere , issues $\overline{V_K} = [\ \overline{w}. \overline{r_K} \ ] = [\frac{\sigma[1+\sqrt5]}{2r} 2r] = \sigma [1+\sqrt5]$ ....…..(a)
and $\overline{B} = [\overline{r} . m\overline{v}] = [$ r.m. σ(1+√5)] and for m = 1 then $\overline{B} = [$ r σ (1+√5)] …....…(b) Interchangable Ellipsoids of Angular velocity (13) , and Momentum (13a) for the same Moment of Inertia $J_1 = J_2 = J_3 = J$, Angular Velocity $w_1=w_2=$
$w_3=w$, and Momentum $B_1=B_2=B_3= B$ become 3J w² = C and 3B²/J =C and since for circle J = $\frac{\pi r^4}{4}$ then $\frac{3\pi r^4}{4}$

$w^2 = C = \frac{(\frac{3\pi r2}{4})}{} w^2 =$
$(\frac{3\pi r^2}{4})(rw)^2 = (\frac{3\pi r^2}{4})[\frac{\sigma}{2} (1 + \sqrt5)]^2 = \frac{3\pi r^2.\sigma^2}{8}[3+\sqrt5]$ → *The Ellipsoid of Angular velocity* $\overline{a}$ ....(c)
and 3B²/J= $\frac{3(rmv)^2}{J} = \frac{3(rv)^2}{J} = \frac{3r^2.\sigma^2[3+\sqrt5]}{2}(\frac{4}{\pi r^4}) = \frac{6.\sigma^2[3+\sqrt5]}{\pi r^2}$ → *The Momentum-Ellipsoid* $\overline{\rho}$ ....(d)

Equations (c),(d) define the two interchangeable Ellipsoids related to Sphere-radius , r , Stress , σ . The what is measured in Material point is the Momentum Ellipsoid , which is soon proved that is the Spin of particles. The mass of the M-P , i.e. *the reaction to the change of velocity*, is proved to be the Inertia of the cave . From equation 3J w² = C , is seen that in Material point *Moment of Inertia* and *Angular velocity* are two interchangeable magnitudes defining the *Space part* ,
J = $\frac{\pi r^4}{4}$ and the
Energy part , w = $\frac{v}{r} = \frac{\sigma}{r} [1+\sqrt5]$, depending on radius ,**r**, of the cave and on Principal Stress ,**σ**, of the two opposite constituents $\ominus$, $\oplus$, of the cave .

2.2. Mohr - circle , method :
1.. On OR straight-line and from initial point ,O, sectors OA$_1$, OA$_2$, OA$_3$ are taken equal to J_1 , J_2 , J_3 respectively .
2.. On diameters A$_2$A$_3$, A$_3$A$_1$, A$_1$A$_2$ are drawn semicircles with K$_1$, K$_2$, K$_3$ centers .
3.. Let angles φ$_y$, φ$_z$, be the , $\overline{a}$ vector to , y , z , axis , and draw the circles K$_3$G$_3$, K$_2$G$_2$ from K$_3$, K$_2$ centers forming to K$_3$A$_2$, K$_2$A$_3$, angles 2φ$_y$, 2φ$_z$.
4.. Draw the circles G$_3$G , G$_2$G , with centers K$_2$, K$_3$ and G their intersection .
5.. Vectors , **OG** define the Magnitude of , $\overline{\rho}$, *Rotational -Momentum-Energy -Ellipsoid vector* , **OD** define the Magnitude of , $\overline{a}$, *Angular-Velocity-Radius-spearhead-Ellipsoid vector* , with angle , ψ = GOR = GOD , between $\overline{\rho}$ and $\overline{a}$ vectors ,

GD define the Magnitude of , **$\overline{M}$ = J$_a$** , which is *The meter of the Change = Reaction , the Orthogonal-projective of* $\overline{\rho}$ Radii to $\overline{a}$ Radii , of the Unit-sphere , and which consists the moment of inertia of Sphere , i.e. that what we call , ***mass*** , in Classical mechanics .
Remarks :
Moment of inertia , J$_{(a)}$, of a perpendicular to $\overline{a}$ Plane passing through O is used Ellipsoid (1a) from relation $\overline{\rho}$ = Σ (m$_i$ $\overline{r}_i$. $\overline{a}$ $\overline{r}_i$) ……………. (16) , and for $\overline{\rho}\overline{a}$ = Σ m$_i$($\overline{a}$ $\overline{r}_i$)² = $\overline{a}$ ²J$_{(a)}$ and if $\overline{a}$(x ,y ,z) defines the Unit-Sphere-Radii , then $\overline{\rho}\overline{a}$ = J$_{(a)}$ Equations in (4) become ,

$x_\rho = J_{(x)} x + J_{xy} y + J_{zx} z$, $y_\rho = J_{xy} x + J_{(y)} y + J_{yz} z$, $z_\rho = J_{zx} x + J_{yz} y + J_{(z)} z$ ….. (16a)   and when defining the Principal-axis $J_{xy} = J_{yz} = J_{zx} = 0$ as coordinate axis for Ellipsoid then , $x_\rho = J_{(1)} x$, $y_\rho = J_{(2)} y$, $z_\rho = J_{(3)} z$ ………….….

(16b)   and the Perpendicular *Ellipsoid* becomes , $\dfrac{1}{J_{(1)}{}^2} x_\rho{}^2 + \dfrac{1}{J_{(2)}{}^2} y_\rho{}^2 + \dfrac{1}{J_{(3)}{}^2} z_\rho{}^2 = 1$.…… (16c)

Mohr method is applied for sectors OA_1 , OA_2 , OA_3 and are equal to $J_{(1)}$, $J_{(2)}$, $J_{(3)}$, which are the moments of Inertia to Principal-Planes .

1.. Angle , $\psi = GOD = 0 \rightarrow$ defines $\bar\rho \equiv \bar a$ and , $\bar M = J_a \equiv 0$, meaning that
Energy-Momentum-Ellipsoid , $\bar\rho$, coincides with that of Angular-Velocity-Ellipsoid vector , $\bar a$, and the Velocity-Reaction-Ellipsoid $\bar M = J_a = 0$

2.. Angle , $\psi = GOD = 90^\circ \rightarrow$ defines $\bar\rho \equiv \bar M$ and , $\bar a \equiv 0$, meaning that
Energy-Momentum-Ellipsoid , $\bar\rho$, coincides with that of Velocity- Reaction-Ellipsoid $\bar M$.

Since Work $\bar W = \bar F . \overline{ds} = (F.\cos \psi) . \overline{ds} = F . (\overline{ds} . \cos \psi)$, then Force , F , defines the ***Kinetic-Energy $\equiv$ Energy*** , and Displacement $(\overline{ds} . \cos \psi)$ defines the ***Discrete-Monad $\equiv$ Space*** which represent the two magnitudes , $\bar\rho$ and $\bar a$ i.e. $\rightarrow$ **$W \equiv \bar\rho$ and $(\overline{ds} . \cos \psi) \equiv \bar a$** .

In trigonometry $\cos \psi = - \cos(90 + \psi) = \sin(90 - \psi)$, so from figure , $\sin(90 - \psi) = GD$, i.e. *in Extrema case* , where Space $= (\overline{ds} . \cos \psi) = 0$, Kinetic-Energy does not vanish since then holds
$\bar W = \bar F =$ Constant $= GD = J_a = $ *The reaction to the velocity-motion = The Mass-Ellipsoid =* M

3.. Angle , $\psi = GOD \not\equiv$ $0 \rightarrow$ defines $\bar\rho \not\equiv \bar a$ $\not\equiv M \not\equiv$ 0 , meaning that exist the magnitudes ,
  Rotational-Momentum Ellipsoid $\equiv$ Work $\equiv \bar\rho$, $\rightarrow$ ***the Energy-vector***
  Angular-Velocity–Inertial-Ellipsoid $\equiv$ Force $\equiv \bar a$, $\rightarrow$ ***the Space - vector*** Reaction to velocity-change-motion
$\equiv$ Mass- scalar $M \equiv J_a$, $\rightarrow$ ***the Mass – meter***

  *i.e. The three meters of **Energy-monads** , which are **the Energy-vectors** and **the Mass –meter** . It was shown in* [58] *that the maximum velocity in a closed system occurs in Common circle , when the two velocities , $\bar c$, $\bar v$ are perpendicular between them , and 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 , $r = |(\bar c.T)| = \sqrt{v^2 + c^2}$ *and by using Space Vector* $r = |(\bar c.T)| = \sqrt{v^2 + c^2}$ *then , The total Rotating energy is $\rightarrow$*

$\pm \bar\Lambda = \bar p.r = (M.c).r = (M.c).\sqrt{v^2 + c^2}$ *and squaring both sites then ,*
$[\pm \bar\Lambda]^2 = p^2.r^2 = M^2.c^2.(v^2+c^2) = (M^2.v^2).c^2 + M^2.c^4 = (p^2.c^2) + M^2.c^4 = [p.c]^2 + [m_o.c^2]^2$ ….(c)

*The Geometrical-analogous happens in Figure.*14.-3 *where according to Pythagoras-theorem holds ,*
   $(\bar\rho)^2 + (\bar a)^2 = (\bar M = J_a)^2$ ...……(d) Equations (a) and (b) are Identical in Energy-Space content and define ,
[Work $\equiv$ Energy $\equiv$ Torsional-momentum] $^2 = $ [Moving-Space-Energy] $^2 + $ [Rest-Space-Energy] ^{2} .

2.3. *Second-degree Moments in Sphere and Planes* :
Considering Density of $\bigoplus$ sphere the same for the (i) points then mass m_i at every point is (m) for the tiny volume ,dV, and the different elements become , m.dV , and for m=1 ,dV, and for Plane ,dF. Placing x=0 in (5) and $\bar a$ in ,yz, Plane , then $J_a a^2 = J_y y^2 + J_z z^2 - 2J_{yz} yz$ ………….. (17)   or $J_a = J_y \cos^2\varphi + J_z \sin^2\varphi - 2 J_{yz} \cos \varphi . \sin \varphi$ ………….. (17a) *where* φ , is the angle of $\bar a$ radii to , y axis , and give the moment of inertia J_a of the Sphere to the axis on Plane through initial point , O , of rotation . In case that coordinate axis coincide with the Principal axis then equations (17) and (17a) become , ,
   $J_a a^2 = J_2 y^2 + J_3 z^2$ ……….. (17b)   and $J_a = J_2 \cos^2\varphi + J_3 \sin^2\varphi$ …….. (17c) Equations denote Moment of inertia for all Planes to axis on Planes , and in case of Plane surfaces the Inertia-Ellipsis which is $J_2 y^2 + J_3 z^2 = C$ ………..….. (18)

2.4. Euler-Lagrange , equations of motion :
I.. For the positioning of a rotating Solid around a Fixed-Point O , with a three coordinate system   x,y,z at ,O , is chosen a second three coordinate system x`, y`, z` at , O , joint to the moving   solid and rotated to O . Its position define the nine -(9) Directional-cosines of the axis i.e. the
  products , $i \bar\imath$, $j \bar\jmath$, $\bar k \bar{\bar k}$. The six identities joining cosines , degrade the six to three parameters   and Solid acquires Three-degrees-of freedom around the fix point O . Euler-method-System is   consisted of three parameters which are the three angles between axis .   Let be Unit-vector $\bar s_o$ on x y - x`y` Planes section , such that system $(k^\frown, \bar k, \bar s_o)$ is right-turned .
Euler angles are in Figure.17-(1) , *Angle ,φ,* for, $i^\frown$ to $\bar s_o$ axis , *Angle ,ϑ,* for, $k^\frown$ to $\bar k$ axis and *Angle , ψ ,* for, $\bar s_o$ to $i^\frown$ axis . Angles φ ,ϑ , ψ , follow the Right-hand-rule-direction along the axis $k^\frown$, $\bar s_o$,k— , of rotation respectively . Angle φ , defines the position of $\bar s_o$ section in , x` , y` plane . On perpendicular to $\bar s_o$ plane angle ,ϑ , defines the position of ,z, axis while on perpendicular to z , plane angle , ψ , defines the position of ,x, axis . In this way angles φ ,ϑ , ψ , define the position of the moving-system , x , y , z related to the fixed , x` , y` , z`.
The Directional-cosines $i \bar\imath$, $j \bar\jmath$, $\bar k \bar{\bar k}$,of 1—, J—, $\bar k$ axis related to $i^\frown$, $j^\frown$, $k^\frown$, axis is done by the displacement of , x , y , z system , from $i^\frown$, $j^\frown$, $k^\frown$ position to , 1—, J—, $\bar k$, in three stages as ,

1.. By rotating on $\vec{k}$ axis , according to , φ , angle , such that ,x, axis moves from $\vec{\imath}$ to the $\vec{s}_o$ position where then issue as in F.17- (2) the equalities ,

$$\vec{s}_o = \vec{\imath}.\cos φ + \vec{\jmath}. \sin φ \quad \text{and} \quad \vec{q}_o = -\vec{\imath}.\sin φ + \vec{\jmath}. \cos φ \qquad \text{...............} (a)$$

where $\vec{q}_o$ index is perpendicular to $\vec{k}$, and { $\vec{s}_o$ and $\vec{q}_o$ } , { $\vec{k}$ and $\vec{s}_o$ } , Right-hand-rule direction system .

2.. By rotating on $\vec{s}_o$ axis , according to , ϑ , angle , such that ,z, axis moves from $\vec{k}$ to the $\bar{k}$ position where then issue as in F.17- (3) the equalities ,

$$\vec{t}_o = \vec{k}.\sin θ + \vec{q}_o.\cos θ \quad \text{and} \quad \bar{k} = \vec{k}.\cos θ - \vec{q}_o.\sin θ \qquad \text{...............} (b)$$

where $\vec{t}_o$ index is perpendicular to $\bar{k}$, and { $\vec{s}_o$ and $\vec{t}_o$ } , { $\bar{k}$ and $\vec{s}_o$ } , Right-hand-rule direction system .

3.. By rotating on $\bar{k}$ axis , according to , ψ, angle , such that ,x, axis moves from $\vec{s}_o$ to the $\bar{\imath}$ position where then issue as in F.17- (4) the equalities ,

$$\bar{\imath} = \vec{s}_o .\cos ψ + \vec{t}_o \sin ψ \quad \text{and} \quad \bar{\jmath} = -\vec{s}_o. \sin ψ + \vec{t}_o \sin ψ \qquad \text{...............} (c)$$

Thus axis ,z, and ,x, arrive to { $\bar{k}$, $\bar{\imath}$ } final positions carrying the (x,y,z) Solid to ($\bar{\imath}$, $\bar{\jmath}$, $\bar{k}$) Position , and if between equalities (a) (b) (c) delete Unit-vectors $\vec{s}_o$, $\vec{q}_o$, $\vec{t}_o$, by placing in (b) , the ($\vec{q}_o$ } of (a) and then in (c) the { $\vec{s}_o$ and $\vec{t}_o$ } of (a) (b) , then acquire expression of equations in $\bar{\imath},\bar{\jmath},\bar{k}$ from those of $\vec{\imath}$, $\vec{\jmath}$, $\vec{k}$ *and* of angles , φ ,ϑ , ψ . The Directional-cosines are

$$\vec{\imath}\bar{\imath} = \cos a_1 == \cos φ.\cos ψ - \sin φ. \cos θ.\sin ψ$$
$$\vec{\imath}\bar{\jmath} = \cos a_2 == - \cos φ.\sin ψ - \sin φ. \cos θ.\cos ψ$$

$$\vec{\imath}\bar{k} = \cos a_3 == \sin φ.\sin θ.$$
$$\vec{\jmath}\bar{\imath} = \cos b_1 == \sin φ.\cos ψ + \cos φ. \cos θ.\sin ψ \qquad \text{...............} (d)$$
$$\vec{\jmath}\bar{\jmath} = \cos b_2 == - \sin φ.\sin ψ + \cos φ. \cos θ.\cos ψ$$
$$\vec{\jmath}\bar{k} = \cos b_3 == - \cos φ. \sin θ$$
$$\vec{k}\bar{\imath} = \cos c_1 == \sin θ. \sin ψ$$
$$\vec{k}\bar{\jmath} = \cos c_2 == \sin θ. \cos ψ$$
$$\vec{k}\bar{k} = \cos c_3 == \cos θ$$

II.. For the rotation of a Solid with ,**w**, angular velocity is used the following equation ,

$$\overline{w} = \overline{k}\,\frac{d\varphi}{dt} + \overline{s}_o\,\frac{d\vartheta}{dt} + \overline{k}\,\frac{d\psi}{dt}\ . \qquad\qquad\qquad \text{............ (19)}$$

composed of **one** Rotation , *around , z`, axis with angular velocity* $\frac{d\varphi}{dt}$, **a second** , *around* , $\overline{s}_o$, *axis with angular velocity* $\frac{d\vartheta}{dt}$, *and* **a third** , *around , z , axis with angular velocity* $\frac{d\psi}{dt}$.
Since is needed Angular-velocity , $\overline{w}$, tobe related to the Fix to Solid directions of x , y , z , axis
then the three components w_1 , w_2 , w_3 of vector $\overline{w} = \overline{\imath}\,w_1 + \overline{\jmath}\,w_2 + \overline{k}\,w_3$ are related
to angles , φ ,ϑ , ψ , and to angular velocities $\frac{d\varphi}{dt}$, $\frac{d\vartheta}{dt}$, $\frac{d\psi}{dt}$.

Projecting (19) on $\overline{\imath}, \overline{\jmath}, \overline{k}$ axis then become the equations ,

$$w_1 = \overline{w}.\overline{\imath} = \frac{d\varphi}{dt}.\overline{k\imath} + \frac{d\vartheta}{dt}.\overline{s}_o\overline{\imath} + \frac{d\psi}{dt}.\overline{k\imath}$$

$$w_2 = \overline{w}.\overline{\jmath} = \frac{d\varphi}{dt}.\overline{k\jmath} + \frac{d\vartheta}{dt}.\overline{s}_o\overline{\jmath} + \frac{d\psi}{dt}.\overline{k\jmath} \qquad \text{.......... (19a)}$$

$$w_3 = \overline{w}.\overline{k} = \frac{d\varphi}{dt}.\overline{k k} + \frac{d\vartheta}{dt}.\overline{s}_o\overline{k} + \frac{d\psi}{dt}.\overline{k k}$$

and since holds , $\overline{kk} = 1$, $\overline{k\imath} = \overline{k\jmath} = \overline{k}\overline{s}_o = 0$, $\overline{s}_o.\overline{\imath} = \cos\psi$, $\overline{s}_o.\overline{\jmath} = -\sin\psi$

then from (d) exists $\overline{k\imath} == \sin\vartheta\sin\psi$, $\overline{k\jmath} = \sin\vartheta\cos\psi$, $\overline{k k} = \cos\vartheta$

and replacing above to (19a) then become Euler equations ,for Angular-Velocity-components ,

$$w_1 = \frac{d\varphi}{dt}\sin\vartheta\sin\psi + \frac{d\vartheta}{dt}\cos\psi$$

$$w_2 = \frac{d\varphi}{dt}\sin\vartheta\cos\psi - \frac{d\vartheta}{dt}\sin\psi \qquad \text{.......... (20)}$$

$$w_3 = \frac{d\varphi}{dt}\cos\vartheta + \frac{d\psi}{dt}$$

which are related to the three angles , φ ,ϑ , ψ of rotation.

III. Euler equations , for Angular-Velocity $\overline{w}$ and Momentum $\overline{B}$:

In (10)-(10a) Angular-velocity-Ellipsoid and Momentum $\overline{B}$ are simplified when defined
by the projections of, w_1 , w_2 , w_3 and B_1 , B_2 , B_3 as ,

$$B_1 = J_1 w_1 , \quad B_2 = J_2 w_2 , \quad B_3 = J_3 w_3 ,$$
$$\overline{B} = J_1 w_1 \overline{\imath} + J_2 w_2 \overline{\jmath} + J_3 w_3 \overline{k} \qquad \text{............. (10)}$$
$$B^2 = J_1{}^2 w_1{}^2 + J_2{}^2 w_2{}^2 + J_3{}^2 w_3{}^2 \qquad \text{............ (10a)}$$
$$\overline{Bw} = Jw^2 (= 2L) = J_1{}^2 w_1{}^2 + J_2{}^2 w_2{}^2 + J_3{}^2 w_3{}^2 \qquad \text{............ (10b)}$$

Placing Momentum-equation (10a) in equation $\frac{d\overline{B}}{dt} = \overline{M} = \overline{\imath}\,M_1 + \overline{\jmath}\,M_2 + \overline{k}\,M_3$ then ,

$$\overline{\imath} J_1\frac{dw_1}{dt} + \overline{\imath} J_2\frac{dw_2}{dt} + \overline{\imath} J_3\frac{dw_3}{dt} + \frac{d\overline{\imath}}{dt}J_1 w_1 + \frac{d\overline{\jmath}}{dt}J_2 w_2 + \frac{d\overline{k}}{dt}J_3 w_3 = \overline{\imath}\,M_1 + \overline{\jmath}\,M_2 + \overline{k}\,M_3 =$$

$$= \overline{M} = \overline{\imath}\,M_1 + \overline{\jmath}\,M_2 + \overline{k}\,M_3 \quad \text{where } M_1 , M_2 , M_3 \text{ are the Momentum-components .}$$

.

Since from vector-calculus ,

$$\frac{d\overline{\imath}}{dt} = [\,\overline{w}\,\overline{\imath}\,] = \overline{\jmath} w_3 - \overline{k} w_3 , \quad \frac{d\overline{\jmath}}{dt} = [\,\overline{w}\,\overline{\jmath}\,] = \overline{k} w_1 - \overline{\imath} w_3 , \quad \frac{d\overline{k}}{dt} = [\,\overline{w}\,\overline{k}\,] = \overline{\imath} w_2 - \overline{\jmath} w_1 \text{ , then}$$

$$J_1\frac{dw_1}{dt} - (J_2 - J_3). w_2 w_3 = M_1$$
$$J_2\frac{dw_2}{dt} - (J_3 - J_1). w_3 w_1 = M_2 \qquad \text{.......... (21)}$$
$$J_3\frac{dw_3}{dt} - (J_1 - J_2). w_1 w_2 = M_3$$

Equations (21) are differential equations of the first order when external moments are given related to time and define
Angular-velocity-components { w_1 , w_2 , w_3 } and the **Position** { φ ,ϑ , ψ } from (20) . If moment $\overline{M}$ is given related to
position only , then w_1 , w_2 , w_3 } are placed in (21) where then position is produced by differential equations of second
order .
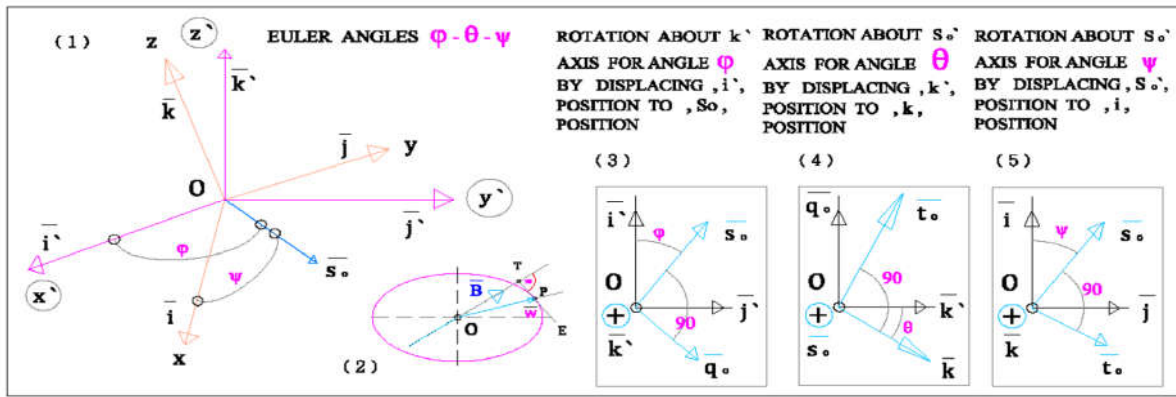
Figure.17. . In (1) are shown Euler angles { φ , ϑ , ψ } in a *Fix*-Three-Coordinate-System x , y , z   through ,O, and one *Movable* x`, y`, z` at , O .

   In (2) is shown the Spearhead , P , of OP Angular-velocity $\overline{w}$ vector , and the

   Tangential Plane ,E ,to Angular-velocity-Ellipsoid $\overline{w}$, on Momentum vector $OT = \dfrac{2L}{B}$ In (3) , (4) , (5) are shown the Three-Stages nedded for transforming $i^{\frown}, j^{\frown}, k^{\frown}$,   axis to the $1\text{\_}, J\text{\_}, \overline{k}$ axis . **IV.** Zero Static - Moment :
For $\overline{M}=0$, i.e. the Solid is supported through center of mass and then Euler equations become ,

$$J_1 \frac{dw_1}{dt} - (J_2 - J_3). \, w_2 w_3 = M_{1_{= 0}}$$

$$J_2 \frac{dw_2}{dt} - (J_3 - J_1). \, w_3 w_1 = M_{2_{= 0}} \qquad \text{...........} \, (21a)$$

$$J_3 \frac{dw_3}{dt} - (J_1 - J_2). \, w_1 w_2 = M_{3_{= 0}}$$

and for rotation through Principal axis of Inertial-Ellipsoid [for ,z, axis $w_1 = w_2 = 0$] then $w_1 = $ constant ($= 0$) $w_2 = $ constant ($= 0$) $w_3 = $ constant

i.e. rotation is continued through this axis with constant angular velocity $\overline{w} = \dfrac{\overline{v}}{r} = \dfrac{\sigma}{2r} [\, 1 + \sqrt{5}]$ *of that of material-point and the three axis are called Free-axis* .

V.. The Poinsot`s Geometrical-motion :

I.. Multiplying the first equation of (21a) by w_1 , the second by w_2 , and the third by w_3 , and adding each other then , Static-Moment $\overline{M}$ is ,

$$J_1 w_1 \frac{dw_1}{dt} + J_2 w_2 \frac{dw_2}{dt} + J_3 w_3 \frac{dw_3}{dt} = 0$$

$$\frac{1}{2} J_1 w_1{}^2 + \frac{1}{2} J_2 w_2{}^2 + \frac{1}{2} J_3 w_3{}^2 = \text{constant} \qquad \dots\dots\dots (21b)$$

i.e. for $\overline{M} = 0$, kinetic energy $\frac{\partial B}{dt} = \text{constant}$, as in (10b).

Also multiplying the first equation of (21a) by $J_1 w_1$, the second by $J_2 w_2$, and the third by $J_3 w_3$, and adding each other then , Rotational-Moment $\overline{B}$ is ,

$$J_1{}^2 w_1 \frac{dw_1}{dt} + J_2{}^2 w_2 \frac{dw_2}{dt} + J_3{}^2 w_3 \frac{dw_3}{dt} = 0$$

$$J_1{}^2 w_1 + J_2{}^2 w_2 + J_3{}^2 w_3 = \text{constant} \qquad \dots\dots\dots (21c)$$

i.e. for $\overline{M} = 0$, Rotational-momentum $\overline{B} = \text{constant}$, as in (10b).

As Kinetic energy cannot be changed , the same also for Momentum $\overline{B}$ which is constant .
The Tangential Plane E , of Angular-velocity-Ellipsoid $\overline{w}$ Spearhead point P , on Momentum vector OT , remains unmoving and this because ,

a.. Plane E , is perpendicular to the unmovable Momentum-vector $\overline{B}$,

b.. Cuts the constant sector OT $= \overline{w}\overline{b}o$, where $\overline{b}o$ is the Unit-vector on momentum $\overline{B}$,

and this because $\overline{w}\overline{b}o = \frac{\overline{w}\overline{B}}{B} = \frac{2L}{B} = \text{constant}$, therefore

Angular-velocity-Ellipsoid *is **Rolling on the unmovable plane** E , the point of conduct **P** lyies on OP axis , has zero velocity , and aquires OT distance such Geometry positions from O for the unmovable plane E , to remain unchanged* , always by following the Solid`s-motion .

Some points of the moving Ellipsoid , which are common to unmovable E , plane , define the each one rotating axis , and are those which are of equal distance Tangential-Planes from center O .

This geometrical locus on Ellipsoid is called *Polar-axis* , **the Polhode** , while on Plane E , the *Unti-Polar-axis* , **the Herpolhode** , **on where Vector-radius** $\overline{w}$ is tracing the , *Polar-axis* on the moving-solid and the , *Unti-Polar-axis* on the Fix-system .

Remarks :

Applying above to Material-Points [⊕↔⊖] of Figure.12 then all referred are becoming ,and since , between the two consituents , exists only Pressure , σ , which is turned to velocity , $\overline{v}$, no other External forces exist to create any Moment to the initial point **O** of rotation . ***Because of Zero-Moment** , the motion of the , ⊕ , **Content** , is the only motion* , w , **and it is the Rolling of the Angular-Velocity-Ellipsoid , on Plane , E ,** (*the Polar-axis* on the *Unti-Polar-axis or the , Polar-Plane on the Unti-Polar plane*) , *Polhode on Herpolhode , where ,* **Momentum-Ellipsoid , $\overline{B}$,** *is perpendicular to ,* **Angular – velocity - Ellipsoid , $\overline{w}$,** *which Planes are both circles and the ,* **Unmovable plane E ,** *Tangential to the each one circle through the three axis ,* **and Parallel to Principal –axis-Plane of Ellipsoid .**

From Euler-Lagrange Mechanics and Vector analysis ,

Position vector , $\overline{r}$, always points radially from the origin O .

Velocity vector , $\overline{v}$, always tangent to the path , direction , of motion . *Acceleration vector* , $\overline{a}$, not parallel to the radial motion but offset by the angular and

Coriolis accelerations , nor tangent to the Path but offset by centripetal and radial acceleration

II. Above analysis was presented by by Poinsot without being sufficient for the complete motion description , because does not define the positions of Solid relating to time .
On Angular-velocity-Ellipsoid exists ,

$J_1 w_1{}^2 + J_2 w_2{}^2 + J_3 w_3{}^2 = 2 L$ (L = constant) and Polar position is defined from relation
$J_1{}^2 w_1{}^2 + J_2{}^2 w_2{}^2 + J_3{}^2 w_3{}^2 = B^2$, where , B , is the constant Momentum value .

On a constant Angular-velocity-Ellipsoid , by changing Momentum , is possible of infinite Polar-Paths according to the different motions of the Solid . Paths near maximum or minimum Principal axis become ring-shaped while near the center of axis extend to a couple of ellipses. Rotation happens near maximum or minimum axis , continuing motion about these , and round Instaneous axis of the Polar-path , in contrary to the middle axis which are not continued , but

rounded to axis off Polar-path around Ellipsoid . A complete identity of the rotated axis and the Principal axis doesn`t happen as this happens on Earth .

A.. The Integration of (21a) differential equations results to Elliptic-functions , except that of Inertial-moment- Ellipsoid and which becomes of rotation . In case of Material-Point both Momentum and Angular velocity are constants for all motions . Placing ,z, axis as the rotating then $J_1 = J_2$ and equations are simplified as ,

$$\frac{dw_1}{dt} = \frac{J_1-J_3}{J_1} w_1 w_2 \ , \quad \frac{dw_2}{dt} = \frac{J_3-J_1}{J_1} w_3 w_1 \ , \quad \frac{dw_3}{dt} = 0 \ , \qquad \dots\dots\dots(21d)$$

And placing $\frac{J_1-J_3}{J_1} = \gamma$, then $\frac{dw_1}{dt} = \gamma w_2 w_3$, $\frac{dw_2}{dt} = -\gamma w_3 w_1$, $\frac{dw_3}{dt} = 0$ $\dots\dots\dots\dots(22)$

From the first becomes $w_3 =$ constant , while by multiplying w_1 with its components and w_2 for the second one and adding , then $w_1 \frac{dw_1}{dt} + w_2 \frac{dw_2}{dt} = 0$ therefore , $w_1{}^2 + J_2 w_2{}^2 = a^2$ and a = the constant of integration , i.e. during motion Angular velocity value is constant unchanged and equal to $w^2 = a^2 + w_3{}^2$, becoming also from Poinsot`s solution . In reality since Angular velocity-Ellipsoid is symmetrical to ,z, axis , all of equal distance from , O, tangential planes , are symmetrically placed around ,z, axis and so the Polar-Paths are parallel circles .

The algebraic value of angular-velocity-vector remains unaltered and thus , *is drawing the Solid regular-Cone as Polar-surface around symmetrical , z , axis , and in Fixed system at O , on the unmovable Momentum-vector another Solid-regular-Cone , as Anti-Polar-surface* .

Since $w_1{}^2 + w_2{}^2 = a^2$, *a circle* , by introducing parameter ,u, then is holding ,

$w_1 = a \sin u$, $w_2 = a \cos u$ and the two first equations of (22) are satisfied *when* $\frac{du}{dt} = \gamma . w_3$

and also since $w_3 =$ constant , *when* $u = \gamma . w_3 t + b$ (where ,b, is the constant of integration), i.e. equations (22) are solved by the new system ,

$$w_1 = a \sin(w_3 t + b) \ , \quad w_2 = a \cos(w_3 t + b) \ , \quad w_3 = \text{constant} \qquad \dots\dots\dots(22a)$$

Angular-velocity-vector is rotating the Cone-Polar-surface , and returning to initial position

in period $T = \frac{2\pi}{w}$, or $T = \begin{bmatrix} \dfrac{2\pi}{\gamma w_3} \end{bmatrix} = \begin{bmatrix} \dfrac{2\pi J_1}{w_3(J_1 - J_2)} \end{bmatrix}$ $\dots\dots\dots(22b)$

B.. Integrating equations (21a) became the projections of angular velocity w_1 , w_2 , w_3 related to time ,t . Integrating (20) on unmovable axis ,z`, of Momentum , then on symmetrical axis ,z, projection of B_3 is according to (10) , equal to $B_3 = J_3 w_3$, and for Euler ,ϑ , angle exists ,

$\cos \vartheta = \frac{J_3 w_3}{B}$ = constant , and $\vartheta =$ constant and Euler equations (20) become ,

$$w_1 = \frac{d\varphi}{dt} \sin \vartheta \sin \psi \qquad w_2 = \frac{d\varphi}{dt} \sin \vartheta \cos \psi \qquad \dots\dots\dots (23)$$
$$w_3 = \frac{d\varphi}{dt} \cos \vartheta + \frac{d\psi}{dt}$$

From the first two exists $\frac{w_1}{w_2} = \tan \psi$ while from (22a) $\frac{w_1}{w_2} = \tan(\gamma w_3 t + b)$ so ,

$\psi = \gamma w_3 t + [b + k\pi] = \gamma w_3 t + \psi_o$, $\psi_o =$ constant , and $\frac{d\psi}{dt} = \gamma w_3$,

Placing above in third equation of (23) then ,

$$w_3 = \frac{d\varphi}{dt}\cos\vartheta + \gamma\, w_3 \text{ , or } \qquad w_3 = \frac{d\varphi}{dt}\frac{J_3 w_3}{B} + \gamma\, w_3 \text{ , therefore} \qquad \frac{d\varphi}{dt} = [1-\gamma]\frac{B}{J_3} = \frac{B}{J_1} \text{ , and}$$

since by definition of ,γ, then , $J_3 = [1-\gamma]\, J_1$ and $\varphi = \frac{B}{J_1}t + \varphi_o$ where φ_o is
the integration constant , and the Position of the Solid is defined by Euler φ ,ϑ , ψ , angles as ,

$$\varphi = \frac{B}{J_1}t + \varphi_o$$
$$\vartheta = \text{constant} \qquad\qquad \text{............ (23a)}$$
$$\psi = \frac{J_1-J_3}{J_1}w_3\, t + \psi_o$$

2.

2.4.1 *Application to Material-Points* [⊕↔⊖] of Figure.19 , and by considering Positive

Constituent with angular velocity $\bar{w} = \bar{v}/r = \frac{\sigma}{2r}[1+\sqrt{5}]$ and an angle 45° from ,x , axis.
The Ellipsoid of angular velocity is perpendicular to the plane of motion . Moment of Inertia
to ,z, axis is that of sphere equal to $J_3 = \frac{\pi r^4}{4}$ which is the same in all Principal axes , and

$J = J_1 = J_2 = J_3 = \frac{\pi r^4}{4}$, therefore (13) which is Angular-kinetic–energy ≡ Angular-velocity-Ellipsoid
then becomes , $J_1 w_1{}^2 + J_2 w_2{}^2 + J_3 w_3{}^2 = 2L$, or →

$$w_1{}^2 + w_2{}^2 + w_3{}^2 = \frac{2L}{J} = \frac{8L}{\pi r^4} = B^2 = 3Jw^2 \text{ and from (10) then } \bar{B} = [r\,\sigma\,(1+\sqrt{5})].$$

The value of constant momentum is $B^2 = 2L = 3Jw^2$, and is

$$B^2 = 3\frac{\pi r^4}{4}(\frac{\sigma}{2r}[1+\sqrt{5}])^2 = \frac{3\pi r^2 \sigma^2}{16}[6+2\sqrt{5}] = \frac{3\pi r^2 \sigma^2}{8}[3+\sqrt{5}].$$

For Planck`s length $r = 4,453.10^{-35}$, $r^2 = 19,629.10^{-70}$ and velocity $|\bar{v}| = \frac{\sigma}{r}[1+\sqrt{5}]$ becomes

$$|\bar{v}| = \frac{3,236.\,\sigma}{4,453.10^{-35}} \text{ , or} \qquad\qquad |\bar{v}| = \overrightarrow{0,7267.}\,10^{35}.\,\sigma \quad ....(a)$$

and for maximum velocity $c = 3.\,10^8$ m/s then $\sigma = \frac{3.10^8}{0,7267.10^{35}} = 4,128.\,10^{-27}$ Kg/m²

and the value of the Angular-velocity is , $|w| = \frac{\sigma}{2r}[1+\sqrt{5}] =$

$(\frac{4,128.10^{-27}}{2.4.45310^{-35}}).\,3,2360675 = 1,499.\,10^8$, or $|w| = 1,5.\,10^8$ rad/sec

and the constant figure of the Torsional-Momentum becomes ,

$$B^2 = \frac{3\pi r^2 \sigma^2}{8}[3+\sqrt{5}]\frac{3\pi 19,825.10^{-70}\sigma^2}{8}[5,236] = 122,315.\sigma^2 \text{ , therefore , } B = 11,06.\,\sigma \quad ....(b)$$

and for $\sigma = 4,128.\,10^{-27}$ Kg/m² then $B = 11,06.\,4,128.\,10^{-27} = 4,566.\,10^{-26}$J = {Kgm²/s}

Constant plane ,E, is tangential to Ellipsoid at Spearhead point ,P, of $\bar{w}$ radii and Polar-line is parallel
circle PT , Anti-Polar-line   PS circle on plane , E , with circle that of vector - radii projection point of
Momentum $\bar{B}$. Polar-cone POT is rolling on the Fix Anti-Polar-Cone POS with constant velocity and each
common line-vector the Instaneous rotating axis . Since Angular – velocity - vector is constant then returns

to initial position after the period of time $T = \left[-\!-\!-\!-\dfrac{2\pi J_1}{w_3(\,J_1 - J_2)}\right] = \left[\dfrac{2\pi}{w_3}\right].$

and for $r = 4,453.10^{-35}$ then , period $T = \dfrac{2\pi}{w} = \dfrac{2\pi r}{v} = \dfrac{4\pi r}{\sigma(1+\sqrt{5})} \rightarrow$

$$T = \frac{4\pi.4,45310^{-35}}{\sigma(1+\sqrt{5})} = \frac{1,729}{\sigma}.10^{-34} = \left\{\frac{1,729}{\sigma}\right\}.10^{-34} \text{ s , or } T = \left[\frac{1,729}{10^{34}.\,\sigma}\right]_s \text{ .... (c)}$$

and for $\sigma = 4,128.\,10^{-27}$ Kg/m² , then $T = \dfrac{1,729}{10^{34}.4,12810^{-27}.} = \dfrac{4,188}{10^8} = 4,188.\,10^{-8}$ s

and frequency $f = \frac{1}{T} = 5,7836.\,10^{35}.\,\sigma$ and $f = 2,388.10^7$ Hz respectively .
Above frequency corresponds to an Energy beam of light according to equation ,

Energy = h x f = 6 ,63. 10^{-34} Js . 2,388 .10^7/s = 1 , 58 .10^{-26} J , while for frequency of light f = 6,70 .10^{11} Hz , then Energy of photon in the beam = 6 ,63.10^{-34}. 6,70.10^{11} = 4,44.10^{-22} J . i.e. Torsional-Momentum B = 4 , 566 . 10^{-26} J , is 10^5 times smaller .

In case of Rotation near the Symmetrical-Ellipsoid-axis , is that of *Nutation* , which happens   to Earth`s rotating axis in case that doesn`t coincide with the Major-Geodic free axis .

Figure.18.. In (1) , are shown Paths near maximum or minimum to Principal axis from where   become-ring shaped or Small-circles , while near the center of axis extend to a couple   of ellipses or Great circles . Rotating on small circles is created the □ $\frac{1}{2}$ Spin ≡ $\overline{B}$

In (2) is shown Rotation with angular-velocity $\overline{w}$, 45° to the instaneous material   axis OP ≡ [⊕↔⊖   ] of rotation where point P is the , *Nib* ,of Angular-velocity vector $\overline{w}$ and Sweeps-Out at OP slant height of the Central , POT-Cone , with $\overline{w} = \frac{v}{R}$.

In (3) are shown Polhode , *circle PT* , Herpolhode , *PS circle in plane E* . Polhode-Cone   POT is rolling on the Fixed- Herpolhode-Cone POS , with the constant velocity

$$| \overline{v} | = \frac{\sigma}{r} [1+ \sqrt{5}]$$ dependent on Pressure ,σ, of the two material constituents .

3.. The Central Axial-Ellipsoid and the ⊕ constituent Rotating through constant point O .
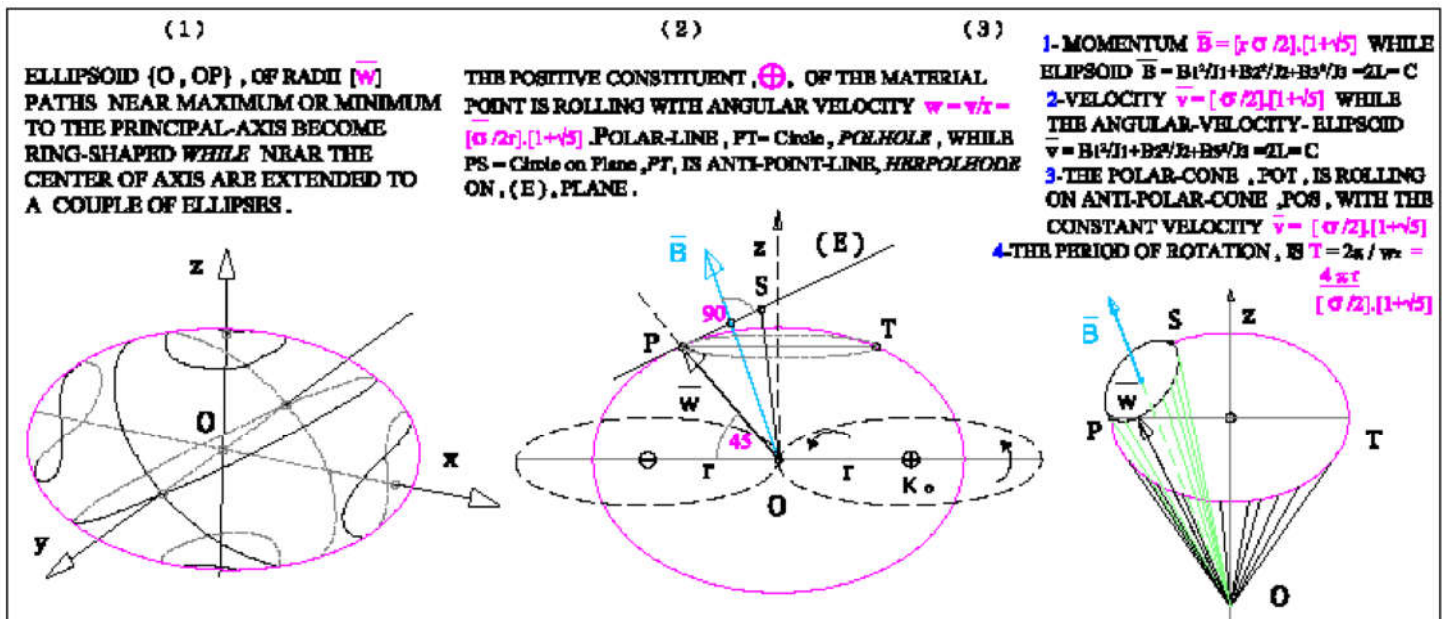
Integrated Equations of motion become not from center of mass K_o , but from center O.   Since motion of ⊕ constituent becomes from Stress ,**σ**, only , the constant coordinate system   is taken at O with , **z`** , axis perpendicular to Unit-vector $\overleftarrow{\mathbf{k}}$, on OK_o axis , the **x** axis .

The x`, y` axis are perpendicular to $\overrightarrow{\mathbf{k}}$, vector and , x , y axis are perpendicular to $\overrightarrow{OK_o}$ direction.
Let be $\overline{s}_o$ the common axis of , x,y and , x`, y` planes such that coordinate system $\overleftarrow{k}, \overline{k}, \overline{s}_o$ Is Right-handled . Vectors $\overline{s}_o$, $\overline{t}_o$ and x , y axis , are directed to Ellipsoid-equator of   Angular velocity and thus , to both ,x , y axis , moment of inertia is the same as J_1 and J_2 to z .   For the definition of , ϑ , φ , ψ , related to time is proved that are needed three differential   equations , the *first* , due to the intersection of , z , axis by $\overrightarrow{OK_o}$, where $M_s = 0$. Euler third   equation (21) is then simplified to , $\frac{dw_3}{dt}$ = 0 and $J_1 = J_2$ where is shown that projection of   angular velocity w_3 on symmetrical axis ,z, is constant . Euler`s third equation of (20) becomes

$$(w_3 =) \frac{d\varphi}{dt} \cos \vartheta + \frac{d\psi}{dt} = \text{constant} \quad \text{……………..(24)}$$

A   different ascertain was defined before for Moment , of the first integral which is zero on z` axis , therefore Momentum $\overline{B}\,\overline{k}$` to this axis is constant . Momentum in the three directions $\overline{s}_o$, $\overline{t}_o$, $\overline{k}$, and to , O , axis is defined by equality , $\overline{B} = \overline{s}_o B_s + \overline{t}_o B_t + \overline{k} B_3$
B $_s = J_1 .w_s$, $B_t = J_1 .w_t$, $B_3 = J_3 .w_3$ …………..(24a)

Where , B_s , B_t , B_3 and w_s , w_t , w_3 are the corresponding projections of Momentum and Angular-velocity to the three axis . From above issues ,

$\rightarrow \overline{B} \overline{k} = \overline{s}_o \overline{k} . J_1 w_s + \overline{t}_o \overline{k} . J_1 w_t + \overline{k} \ \overline{k} . J_3 . w_3$ and since ,

$\overline{s}_o \overline{k} = 0$, $\overline{t}_o \overline{k} = 0$, $\overline{k} \ \overline{k} = \cos \vartheta$, then $\rightarrow \overline{B} \overline{k} = J_1 w_1 \sin \vartheta + J_3 w_3 . \cos \vartheta$

From (19) issues $\overline{w} = \overline{k} \dfrac{d\varphi}{dt} + \overline{s}_o \dfrac{d\vartheta}{dt} + \overline{k} \dfrac{d\psi}{dt}$ therefore ,

$w_t = \overline{w} \overline{t}_o = \overline{k} \overline{t}_o . \dfrac{d\varphi}{dt} + \overline{s}_o \overline{t}_o . \dfrac{d\vartheta}{dt} + \overline{k} \overline{t}_o . \dfrac{d\psi}{dt}$ and since ,

$\overline{k} \overline{t}_o = \sin \vartheta$, $\overline{s}_o \overline{t}_o = 0$, $+ \overline{k} \overline{t}_o = 0$, therefore , $w_t = \dfrac{d\varphi}{dt} \sin \vartheta$ and above become,

$(\overline{B} \ \overline{k} =) \ J_1 \dfrac{d\varphi}{dt} \sin^2 \vartheta + J_3 w_3 \cos \vartheta = C_1$ where C_1 = constant ....(24b) which is a differential equation of the first order .

Another one integral exist from velocity constancy , where then Mechanical energy remains unchanged and Dynamic energy is , $V = Q(s) \cos \vartheta$ where $(s) = OS$, and from Kinetic-energy (L) to directions $\overline{s}_o$, $\overline{t}_o$, $\overline{k}$, on the three principal axis is ,

$$L = \frac{1}{2} (J_1 . w_s^2 + J_1 . w_t^2 + J_3 . w_3^2) \quad \text{and} \quad \text{using} \quad \text{equation} \quad (19)$$

$w_s = \overline{k} \overline{s}_o . \dfrac{d\varphi}{dt} + \overline{s}_o \overline{s}_o . \dfrac{d\vartheta}{dt} + \overline{k} \overline{s}_o . \dfrac{d\psi}{dt}$ and since also

$\overline{k} \overline{s}_o = 0$, $\overline{s}_o \overline{s}_o = 1$, $\overline{k} \overline{s}_o = 0 \rightarrow w_s = \dfrac{d\vartheta}{dt}$ therefore ,

$L + V = \frac{1}{2} J_1 [(\frac{d\vartheta}{dt})^2 + (\frac{d\varphi}{dt})^2 + \sin^2 \vartheta] + \frac{1}{2} J_3 w_{32} + Qs \cos \vartheta = C_2$ ....(24c)

where C_2 = constant , therefore the system of the three differential equations is , $\dot{\varphi} \cos \vartheta + \dot{\psi} = w_3$,

$J_1 \dot{\varphi} \sin^2 \vartheta + J_3 w_3 \cos \vartheta = C_1$ ....(24d)

$\frac{1}{2} J_1 (\dot{\vartheta}^2 + \dot{\varphi}^2) + \frac{1}{2} J_3 w_3 + Qs \cos \vartheta) = C_2$ where , w_3 , C_1 , C_2

Since Momentum-Ellipsoid , $\overline{B}$ *, is perpendicular to ,* *Angular - velocity-Ellipsoid ,* $\overline{w}$ *, no Work is produced and the Status is Neutral . This property issuing in Material-point allows , Spin $\equiv \overline{B}$ Vector and , Velocity-Magnitude $\equiv \overline{w}$, be conserved as Total Energy*

$2L = \overline{B} . \overline{w} = J . w^2$.

In Material point *, and because of rotation , 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 $n < \dfrac{1}{N\lambda}$,

i.e. the biggest whole number less than $\dfrac{1}{N\lambda}$ *which is always integer and* $\rightarrow$ *the N loops are the N Energy-stores in M-P . This is the Why Spin is ,* $\dfrac{l}{2}, \dfrac{l}{3}, \dfrac{l}{4}, \dfrac{l}{5}, ... \dfrac{1}{N}$, *i.e.*

One , Half ,Third ...$\dfrac{1}{N}$. - Lengths $\rightarrow [\dfrac{l}{2}, \dfrac{l}{2}], [\dfrac{l}{3}, \dfrac{l}{3}], , , [\dfrac{l}{N}, \dfrac{l}{N}]$, *with One ,Two ,Three ,,, N - Wave-nodes.*
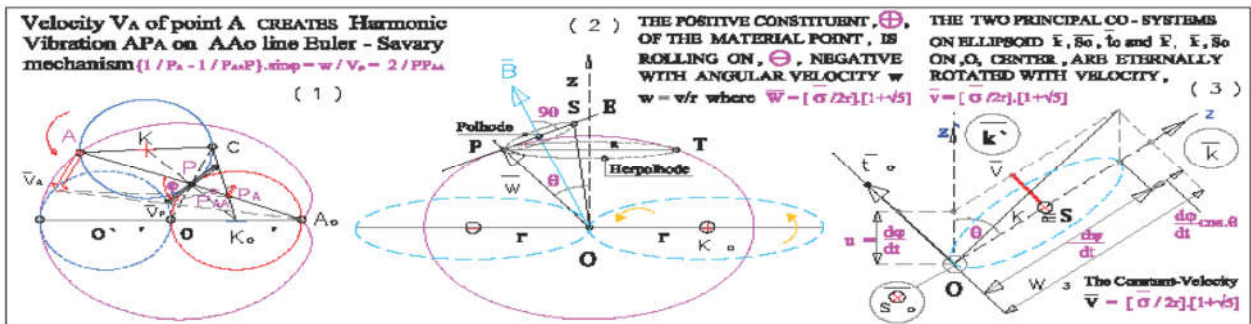

Figure.19. In (1) *Material point AP* , {the two circles $\ominus \equiv K_o, K_o P - \oplus \equiv K$, KP } of the Space point A (+) and Anti-point P(-) is rotating through point A_o , which is the center of Common circle and form material angle .t , CREATE the Cardioid Envelope curves

c^2-r, generated by the above Vibrating $\vartheta = \vartheta_A . t = (\frac{v_A}{\sqrt{\frac{}{2}}})$ -Velocity-Energy-Geometry-Segment, A P_A, on, AA rotating line.

The rotation of Space point A (+) and Anti-point P (-) through point A_o defines Angular momentum $\overline{B}$, so Position of Spaces, point A (+) and point P (-), **and Momentum are simultaneously determined**, which is a direct violation of the uncertainty principle. In (**2**) is shown Angular-velocity-vector $\overline{w}$ Ellipsoid, and $\overline{B}$ Momentum-Ellipsoid both

Due to the Opposite-Stresses, $\pm\sigma$, which create the constant velocity $|\overline{v}| = \frac{\sigma}{2r}[1+\sqrt{5}]$ of the K_o Rotating-Center of mass of the $\oplus$ constituent.

In (**3**) are shown the two Coordinate -Systems on Principal axis, the one of the, $\oplus$,

Central-Momentum-Ellipsoid about the Fixed center ,**O**, {the $\overline{s}_o$, $\overline{t}_o$, $\overline{k}$, System } of the POT Cone and the other one of the same, $\oplus$, rotated constituent, around the Instaneous axis of rotation, **z**, of POS-Cone and about center ,**O**, {the $\overline{s}_o$, $k^{\leftarrow}$, $\overline{k}$, System }.

According to Poinsot, *on Symmetrical-Ellipsoid around an axis*, the equidistance tangential Planes are symmetrically placed around this axis and the Polar-curves are Parallel-circles and are sketsing on the solid as the Polar-surface- regular-cone, **the Porhode**, around the symmetrical axis, and on the constant system a regular-cone also, **the Herpolhode**, around the constant vector $\overline{B}$.

3.1. The Vector-equation of motion.

The vector equation of Rotational-axis-motion is defined by analyzing $\overline{w}$ to $\overline{k}$ direction of Ellipsoid-Inertial-axis, and another one perpendicular to $\overline{k}$, and then $\overline{w} = \overline{i}\,w_1 + \overline{j}\,w_2 + \overline{k}w_3 = \{ \overline{k}\,[\,\overline{w}\,\overline{k}\,]\} + \overline{k}\,\overline{w}$ and since $[\,\overline{w}\,\overline{k}\,] = \frac{d\overline{k}}{dt}$ then,

$$\overline{w} = [\,\overline{k}\,\frac{d\overline{k}}{dt}\,] + \overline{k}w_3 \qquad \text{............ (25a)}$$

Analyzing Momentum-vector $\overline{B}$ as above to $\overline{k}$ direction then exists,

$$\overline{B} = (\overline{i}\,w_1 + \overline{j}\,w_2)J_1 + \overline{k}w_3 J_3 = [\,\overline{k}\,\frac{d\overline{k}}{dt}\,].J_1 + \overline{k}w_3.J_3 \qquad \text{............ (25b)}$$

Moment of external forces Q, to ,O, is equal to $\rightarrow [\,\overline{s}\,\overline{Q}\,] = - sQ\,[\,\overline{k}\,\overline{k}`\,]$ and Momentum becomes

$$J_1\{\,\overline{k}\,\frac{d^2\overline{k}}{dt^2}\,\} + J_3 w_3 \frac{d\overline{k}}{dt} + sQ\,[\,\overline{k}\,\overline{k}`\,] = 0 \qquad \text{............ (25)}$$

Angular velocity w_3 was shown constant.

Equation (25) defines Unit-vector, $\overline{k}$, of Ellipsoid-rotating-axis, related to time and after the solution, equations (25a) and (25b) define Angular velocity, $\overline{w}$, and Angular-momentum-vector $\overline{B}$ respectively. It is proved [page 62] that $\overline{B}$ vector is that what we call Spin of particles.

3.2. The Intrinsic rotation, Precession, and Nutation. General:

Since Earth is as Sphere, names of longitude and latitude, *which are angles*, are referred to a Right Ascension and Declination in a spherical Polar coordinate system. What is seen from Earth, is the celestial equator on which the Ecliptic, *the apparent path of the Sun through the year*, where the Sun moves into Northern hemisphere and which is called the, *Vernal equinox*, and the analogous motion of the Sun to Southern-hemisphere and called the, *Equinox*.

Sun`s apparent motion is not completely regular and also, both celestial-equator and Ecliptic, are moving with respect to the stars. By far, Precession of the equinoxes is the largest effect, where Earth`s rotation axis sweeps out a cone centered on the Ecliptic pole, completing one revolution in about 26000 years and is called the, *luni-solar precession*. The cause of the motion is the torque exerted on the distorted equatorial bulge of the spinning Earth by the Sun and the Moon.

At the equinoxes equatorial bulge and torque shrink to zero and it is the smaller-faster effect and is called Nutation. Note that Precession and Nutation are simply different frequency components of the same Physical effect.

The orbit of the Earth-Moon system is not fixed in orientation because of the attraction of the Planets, and this slow secular rotation of the Ecliptic about a slowly moving diameter, is the Planetary Precession.

From Classical Mechanics:

The Angular-Kinetic-Energy $\overline{B}$, *Angular momentum vector*, is conserved, so $\frac{d\overline{B}}{dt} = 0$ and since may be expressed in terms of the moment of Inertia Tensor, J, and the Angular velocity vector, $\overline{w}$, so then according to (21a-21b) the ellipsoid of Angular velocity vector is $J_1 w_1^2 + J_2 w_2^2 + J_3 w_3^2 = 2L$ where Kinetic-Energy $L = \frac{\overline{w}^2 J_n}{2}$, and, w, is on the surface of the Inertial Ellipsoid. The tangent Plane-normal at $\overline{w}$, is $\square$

$$\frac{\overline{w} J_n}{2} = \nabla\frac{1}{2}[\,J_1 w_1^2 + J_2 w_2^2 + J_3 w_3^2\,] = [\,J_1 w_1 + J_2 w_2 + J_3 w_3\,] = \overline{B}$$ i.e. the attitude of the

Tangent-Plane is constant and at a distance $\frac{\overline{w}.\overline{B}}{|\overline{B}|} = \frac{2\overline{L}}{|\overline{B}|}$ which is also constant,

or from $\overline{B}.\overline{w} = L = \frac{1}{2}J_1 w_1^2 + \frac{1}{2}J_2 w_2^2 + \frac{1}{2}J_3 w_3^2$, where w_1, w_2, w_3, are the components of vector $\overline{w}$, along the Principal axes, and J_1, J_2, J_3, are the Principal-moments of Inertia. (Fig.18)

Thus , the conservation of Kinetic-Energy ,L, imposes a constraint on the three-dimensional Angular velocity vector , $\bar{w}$, and an Ellipsoid in the Principal axis frame , *the Inertia Ellipsoid ,* J . The Ellipsoid axes values are the half of the Principal-moments of Inertia , and the Path traced-out on this Ellipsoid by the Angular velocity vector , $\bar{w}$, is called , *Polhode* .

From above , the Tangent-Plane is Fixed and so , The Energy - Ellipsoid rolls without slipping on this Constant Plane . On Fixed-Constant-Plane is traced the Herpolhode path , while on the Energy-Ellipsoid is traced the Polhode path . i.e. On any Angular-velocity-vector , $\bar{w}$ *, produced from velocity due to the ,* main Stress , σ , and which represents the Energy from Chaos , *corresponds an Angular-momentum-vector ,* $\bar{B}$ *, which represents the Energy-monad , to the common point O, of rotation . Vector ,* $\bar{B}$ *, is perpendicular to the Tangential to ,* $\bar{w}$ *, nib Angular-velocity-Ellipsoid , while ,* $\bar{w}$ *, is perpendicular to the Tangential to ,* $\bar{B}$ *, nib Energy-Momentum-Ellipsoid .* Figure.14. **This Energy-Ellipsoid is what is called** ,the **Spin** .

According to Euler`s equations (20) , in the Principal axis frame , Angular-momentum-vector (which is rotating in the absolute space) is not conserved even in the absence of applied torques , but varies as in (20). However , in the absence of applied torques , (4a) , magnitude , $\bar{B}$, of the Angular momentum B ^{2} = B$_1$ ^{2}+ B$_2$ ^{2} + B$_3$² and Kinetic Energy , L , are both conserved and as in (13a)

for Angular-velocity-momentum-Ellipsoid $L = \dfrac{B_1{}^2}{2J_1} + \dfrac{B_2{}^2}{2J_2} + \dfrac{B_3{}^2}{2J_3}$, where B$_1$, B$_2$, B$_3$ are the components of the Angular-momentum-vector along the Principal axes , and the J$_1$, J$_2$, J$_3$ are the Principal moments of Inertia . These conservation laws are equivalent to two constraints to the three dimensional Angular-momentum-vector , $\bar{L}$, The Kinetic energy constrains of , L to lie on an Ellipsoid , whereas the angular momentum constraint , constrains ,L , to lie on a Sphere . These two surfaces intersect in taco-shaped curves that define the possible solutions for , L . This is a construction method based on Angular-momentum-vector , $\bar{L}$, rather than that of Poinsot`s which is based on Angular-velocity-vector , $\bar{w}$,

In case of an Axisymmetric Rotating Body , with Angular-velocity ,w, *the moment of Inertia ,* **J** *, about two of the Principal axis ,* x - y *, are equal , then The Angular – velocity - vector ,* $\bar{w}$ *,* describes the Ellipsoid of Angular Velocity and its nib describes a Cone of which Plane-Base is Fixed *, and Simultaneously ,* **The** *Angular-Momentum ,* $\bar{B}$ *,* describes the Ellipsoid of *Angular-Momentum and its nib describes* a Cone also of which Plane-Base is also Fixed *.*

The Nib of Angular – velocity - vector , $\bar{w}$ *, describes on the Tangential-Plane of the Angular-Momentum-Ellipsoid , the Herpolhode , while , The Nib of Angular-Momentum describes on the Tangential-Plane of the Angular-Velocity-Ellipsoid , the Polhode .*

The Fixed-Tangential-Planes of , $\bar{w}$ *, and ,* $\bar{B}$ *, are alternately Perpendicular to ,* $\bar{B}$ *, and ,* $\bar{w}$ *, central axes of rotation and thus form the Material-Point-energy-monad .*

Vector , $\bar{B}$ *, is perpendicular to the Tangential to ,* $\bar{w}$ *, nib Angular –velocity -Ellipsoid , while ,* $\bar{w}$ *, is perpendicular to the Tangential to ,* $\bar{B}$ *, nib Energy-Momentum-Ellipsoid.*

All above happen in Material-Point , where the , $\oplus$ *, constituent is Eternally self-rolling on the ,* $\ominus$ *, constituent ,* with Angular-Velocity , **w** *, becoming from constant constituents Glue-Bond Pressure ,* σ *, in Infinite Spherical traces , either at Great-circles or Small-circles , or any other close Spherical-curve , and by applying all laws of Mechanics into this Energy-Chaos , is thus created the First-Discrete-Energy-monad which is the Material - Point , and from this all the other Energy and material monads .* (q . e .d)

Equations (24)-(25) , show immediately if the motion is Possible , and under which circumstances. To examine the Possibility for Ellipsoid-Symmetrical-axis ,OS , to perform rotation as Regular-Cone around the vertical axis $\bar{k}$` , **i.e.** if it is possible , under the presupposition , *ϑ = constant* , to solve above referred equations of motion . Because w$_3$ = constant , from (24d) Second-equation implies $\dfrac{d\varphi}{dt}$ = constant , while First-equation implies $\dfrac{d\psi}{dt}$ = constant

Meaning that , according to equation $(19) , \quad \bar{w} = \bar{k}` \dfrac{d\varphi}{dt} + \bar{k} \dfrac{d\psi}{dt}$ .... (26a)

and which is considered as the rotation of Material-point around the Ellipsoid-Symmetrical-axis ,OS , with constant Angular-velocity u= $\dfrac{d\psi}{dt}$, and simultaneously rotated through the vertical $\bar{k}$` axis with the same constant angular velocity $\dfrac{d\varphi}{dt} =$ u . Since Angular-velocity-vector $\bar{\bar{w}}$ , is constant then its algebraic-figure is also constant and lies in , $\bar{k}\,\bar{k}$` , Plane .

Because [$\bar{k}\,\bar{k}$`] = - $\bar{s}_o$ sin ϑ , and $\dfrac{d\bar{k}}{dt}$ = [$\bar{w}$ $\bar{k}$] and from (26a)

$$\frac{d\bar{k}}{dt} = \bar{s}_o \sin\vartheta , \{\ \bar{k}\ \frac{d\bar{k}}{dt^2}\ \} = [\ \bar{k}\ \bar{s}_o . u . \sin\vartheta\ ] = \bar{t}_o . u . \sin\vartheta \qquad \text{and}$$

$$\frac{d}{dt}\ [\ \bar{k}\ \frac{d\bar{k}}{dt}\ ] = [\ \bar{k}\ \frac{d^2\bar{k}}{dt^2}\ ] = \frac{d\bar{t}_o}{dt} . u . \sin\vartheta \qquad \text{and because}$$

$\dfrac{d\bar{t}_o}{dt}$ = the nib of velocity-vector $\bar{t}_o$ = - $\bar{s}_o$. u . cos ϑ then , $[\ \bar{k}\ \dfrac{d^2\bar{k}}{dt^2}\ ] = - \bar{s}_o . u^2 . \sin\vartheta . \cos\vartheta$

Introducing above in (25) and , division by sin ϑ , and when $0 < \vartheta > 0$, and , $\pi < \vartheta > \pi$, then becomes relation J$_1$. u² cos ϑ - J$_3$ w$_3$ .u + s .Q = 0 .... (26) which is the Necessary-Proposition , *Precession* , for the motion

of the Material-Point [$\ominus \cup \cup \oplus$]. Second degree Equation (26) gives real roots for velocity , **u** , only for negative cos ϑ , i.e.

the center of mass , S , is below rotational point O. If cos $\vartheta > 0$ then $\qquad w_3{}^2 >= \dfrac{4\,J_1 sQ.\cos\vartheta.}{Js^2}$ ....(27)

$$= |\overline{w}| = \frac{d\varphi}{dt} = \frac{J_3 . w_3}{2\,J_1 . \cos\vartheta} \pm \sqrt[2]{ -\frac{sQ}{J_1 . \cos\vartheta} + \left(\frac{J_3 . w_3}{2\,J_1 . \cos\vartheta}\right)^2 } \qquad \dots (27a)$$

and by solving (27) then Angular-velocity u
Since equation (27a) , is of 2nd degree and has two solutions ,a, and ,b.

a.. Algebraic-magnitude-figure w_3 is such that , the within square root is zero or near zero . From figure this happens when figure w_3 coincides with that of Angular velocity vector , $|\overline{w}|$, and from $\dfrac{d\psi}{dt}$, where then its direction coincides with the Ellipsoid-Symmetrical-axis ,OS. The second term being in square is strengthening J_1 moment of inertia directing the axis to J_3 direction.
Material point occupies a large moment of Inertia by rotating about the Ellipsoid-Symmetrical-axis through constant point O, on Ellipsoid-axis , of the truncated Cone , i.e.

The Inner-Rotation of Material-point , happens through the algebraic and constant Angular-velocity-vector , $|\overline{w}|$, { on the Ellipsoid-Symmetrical-axis } , where the Surface of the Truncated-Polar-Cone is Rolling , *sweeps out , on the Unmovable-Polhode-Cone with a very large figure , *the absolute value , of Angular velocity vector , $|\overline{w}|$.
In Material-point where External forces are equal to zero (Q=0) , the above equation becomes ,

$$|\overline{w}| = \frac{d\varphi}{dt} = \frac{J_3 . w_3}{2\,J_1 . \cos\vartheta} \pm \sqrt[2]{\left(\frac{J_3 . w_3}{2\,J_1 . \cos\vartheta}\right)^2} = \frac{J_3 . w_3}{2\,J_1 . \cos\vartheta} + \frac{J_3 . w_3}{2\,J_1 . \cos\vartheta} = \frac{J_3 . w_3}{J_1 . \cos\vartheta}$$

Angular-velocity-figure , u= and when

$J_1 = J_3$ then , $u = \dfrac{w_3}{\cos\vartheta} = w_3 . \sec\vartheta$, meaning that the constancy of ,u, becomes from Geometry of the rotating energy only as this happens to the constancy of velocity , **c** , in cave , **r** .
This is the analogous which happens to Lorentz factor $\gamma \equiv \boldsymbol{sec.\varphi}$, *and then* $u = w_3 . \sec\vartheta = \gamma . w_3$ **b..** Algebraic-magnitude-figure ,u, is equal to w_3 and $\dfrac{d\psi}{dt}$ and to ,w, also .
In this case , the direction of the Angular-velocity-vector $\overline{w}$ is diverging the $\overline{k}$ axis of the Central-Truncated-Ellipsoid and Angular-velocity ,**u**, occupies , low and high values.
This Phenomenon happens in Astronomy where Equator-points , i.e. on Celestial-Sphere traces of sections ($\overline{s}_o$) of the Planes of ecliptic ($\overline{k}`$) and Ecuador ($\overline{k}$) , are slowly moving on Zodiac circle with an approximate Period of 21000 years .
Due to Earth-Geoid , Precession of Equator-points is proved to become from rotation of the Earth Polar-axis perpendicular to Ecliptic and thus not producing Work .
c.. The algebraic figure within the square root is zero or near zero . In case ,$\oplus$, constituent is rolling on great circles on $\ominus$ constituent then , all moments of Inertia of Material point are equal and $J_1 = J_2 = J_3$ and angular velocities of mass center are also equal therefore $w_1 = w_2 = w_3$ and $\sec\vartheta = 1 / \cos\vartheta$, therefore (27a) becomes ,

$$= \frac{d\varphi}{dt} = \frac{J_3 . w_3}{2\,J_1 . \cos\vartheta} = \frac{w}{2\cos\vartheta} = \frac{w}{2} (\sec\vartheta) = \frac{w}{2\sqrt{1-(\frac{v}{c})^2}} = \frac{w.c}{2\sqrt{c^2-v^2}} =$$

Angular-velocity **u**

$$2\,\frac{wr.c}{\sqrt{c^2 r^2 - 2\sigma^2 .[3+\sqrt5]}} = \frac{v.c}{4\sqrt{c^2 r^2 - 2\sigma^2 .[3+\sqrt5]}} = \left[\frac{c.\sigma}{4r}\right].\frac{[1+\sqrt5]}{\sqrt{c^2 r^2 - 2\sigma^2 .[3+\sqrt5]}} = \mathbf{u} \qquad \dots\dots\dots(c)$$

Equation (c) , defines the Angular-velocity-figure ,**u,** related to constant velocity ,**c** , and Stress , **σ** .
***i.e. Constant Angular-velocity-value ,*u , *is such because of the two constants , *c , *and Glue-Bond , *σ , *or* , ***The Energy of opposite , $\ominus$, $\oplus$, *from Chaos { r $\equiv$ 0 } , *is transformed as Discrete - Monad* $|\ominus\oplus$ *| in the Self -Rotated Material-Point {$|\ominus \leftrightarrow\oplus$ |} , *due to the Glue-Bond Stress , *σ . [58] **d..** The Eternal Precession .
Torque , T , is the Twisting - Force that tends to cause rotation { T = Q.r sin ψ where Q is the force and ,ψ, the angle between radius ,r, and force Q } and the Angular-momentum-vector , L = J .w . ***Material - point is a System which has an Inner – Rotation - constrained* , *Due to the velocity vector* , $\overline{v} = \dfrac{d\psi}{dt}$ *becoming from Stress , *σ , *which is the Force-applied on lever - arm , 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** .
Equation (26) is the Necessary-Proposition , *Precession* , for the motion of the Material-Point In case that is not holding then Precession near the axis of Ellipsoid is continuously existing .

Considering the Material-Point rotating with a great speed $\dfrac{d\psi}{dt}$, around a fix point O, and near the symmetrical axis of the Central Ellipsoid , and lying on this axis also then , because of the great velocity exists a great Angular velocity and therefore a strong Rotational-Momentum , so that change is very small as , $d\overline{B} = \overline{M}dt = [s\overline{Q}]\,dt = - s\,Q\,[\overline{k}\,\overline{k}`]\,dt$, and for a short of time it is very small to real Momentum , as ($|B| >> |s\,Q|$) . The same also happens to Kinetic energy for

a small displacement on $\ominus$, constituent . In figure.17-1 and F.18-3 , the $\oplus$ constituent executes different rings near maxima or minima. Around the fixed Vector of Momentum , $\overline{B}$,is moving the Angular-velocity-vector , and Inertial Ellipsoid is Rolling on Poinsot`s constant Plane , following a Circular Polar curve and , the animated rolling on the fixed Central-Pole-Cone , drawing the symmetrical axis , Oz ,to Precession . Because Vectors , $\overline{B}$ and $\overline{w}$, are very near each other and both to $\overline{k}$ axis , Polar curves are very narrow rings as in figure , the Animated on the Ellipsoid of that of Angular-velocity while the Un-movable on Poinsot`s Plane and around Vector , $\overline{B}$.

During motion , Momentum , $\overline{B}$,is altered because of the different moment of Inertia due to the Area of the traced-curve and so is added , - s Q [$\overline{k}$ $\overline{k}$`]dt , perpendicular to $\overline{k}$ symmetrical axis and thus to the mean-Position of Vectors , $\overline{B}$ , and $\overline{k}$` axis .

The above is happening because of the equivalence of Kinetic-Energy and the Rotating-Energy , as

$$L = (1/2). \Sigma m_i.\overline{v}_i^2 = (1/2).[\Sigma m_i].\overline{v}_s^2 = (1/2). \Sigma m_i.[\overline{w}. \overline{r}_i]^2 = (1/2).(\Sigma m_i.\overline{r}_1^2).\overline{w}^2 = \frac{1}{2}J_a w^2$$, i.e.

Rotational Kinetic Energy $L = \frac{1}{2}J_a w^2$ $= (1/2).[\Sigma m_i].\overline{v}_s^2 = L = Kinetic\ Energy$, *is dependent on the moment of Inertia which is related to the Area of the curve* , so Rotational-Momentum-vector $\overline{B}$, is slowly rotated on Central axis with angular velocity , **u** , which is $\frac{d\overline{B}}{dt} = - sQ [\overline{k}\,\overline{k}`]$. Integrating (Angular velocity , u =) becomes → $\frac{sQ}{B} = \frac{sQ}{J_3 w}$

and the Period of rotation $T = \frac{2\pi}{u} = \frac{2\pi J_3.w}{sQ}$.

Since also frequency f = 1 / T , then $f = \frac{sQ}{2\pi.J_2.w}$ which denotes the *frequency-monad* .
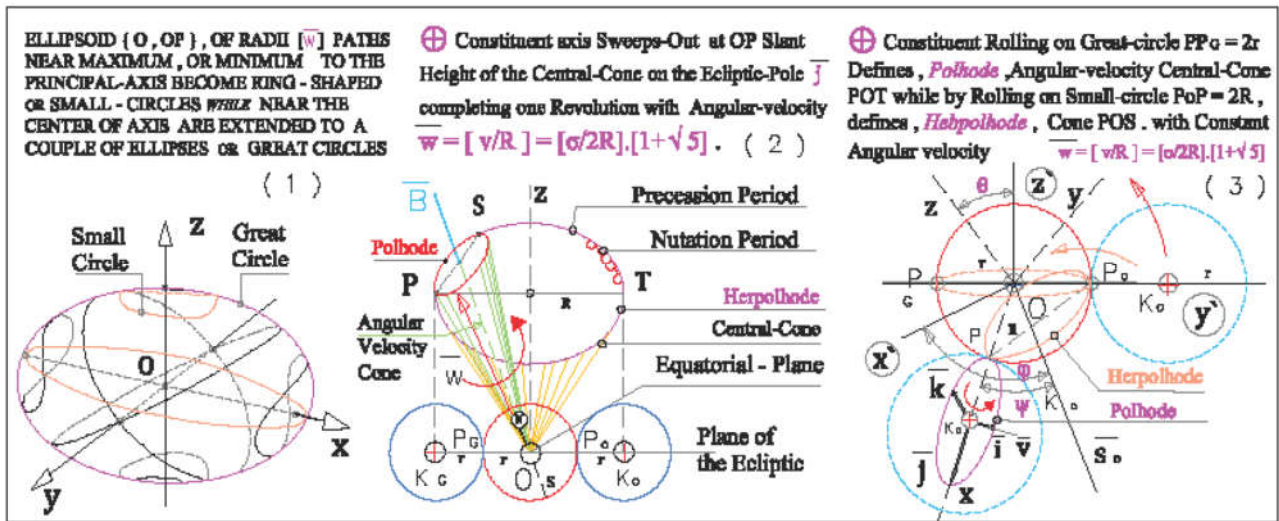
Figure.20. In (1) , are shown different Paths near maximum or minimum Principal axis from where become-ring shaped or Small-circles while near the center of axis extend to a couple of ellipses or Great-circles .For a constant Angular-velocity ,**w**, and by changing torsional momentum ,**B**, only then Infinite curves are possible for the motion .

In (2) , $\oplus$ constituent is rolling on Great-circle $P_G P_o$ = 2r Sweeps-out , at OP slant height of the Central-Cone of Angular velocity on the Ecliptic-Pole , O $\overline{j}$, with angular velocity , $w = \frac{v}{r}$. Angular-velocity-Ellipsoid describes Central-Cone POT with , *Herpolhode* , on Fixed Base-circle PT while Momentum-Ellipsoid describes Cone POS with , *Polhode* , on Fixed Base-circle PS. The tangential-Plane of Angular-velocity-Ellipsoid at , P , is perpendicular to Angular-momentum-Ellipsoid axis $\overline{B}$, while the tangential-Plane of $\overline{B}$ vector is perpendicular to Angular-velocity-Ellipsoid $\overline{w}$ vector .

In (3) , $\oplus$ constituent is rolling on Small-circle PP_o= 2R , Sweeps-out , at OP slant height of the Central-Cone of Angular velocity , *Polhode* , on the Ecliptic-Pole, $\overline{j}$, with the angular velocity , $w = \frac{v}{r} < \frac{v}{R}$ such that , the Rotational-momentum $\overline{B}$ becomes ,

$$\overline{B} = \overline{j} J_2 . \frac{v}{R} = \frac{\pi r^4}{4}.\frac{\sigma}{2r}[1+ \sqrt{5}] = \frac{\pi r^3 \sigma}{8}[1+ \sqrt{5}].$$

Because vertical force ,Q, cannot be zero and Angular velocity , $u = \dfrac{sQ}{2\pi\, J_3.w}$, $\dfrac{sQ}{B} = \dfrac{sQ}{J_3 w} = $ constant and Period

of rotation , $T = \dfrac{sQ}{sQ}$ changes , and this from , J_3 , by the area of the New

Great- circle (πR^2) instead of Initial (πr^2) , becomes $Q = \dfrac{u\bar{B}}{s}$

3.3. Application to Material-Points [⊕↔⊖] , [⊕ ℧℧ ⊖] of Figure.19.

Since the constituents of Material Point are without mass , and this because there is not any reaction to the inter motion ,

the Rotational Momentum becomes from Angular-velocity ,w, and so equation of *Rotational Kinetic Energy* $L = \frac{1}{2} J_a w^2$, is related to moment of Inertia J_a , *therefore* any change to the Great-circle-area of Ellipsoid , changes Kinetic-Energy , *so* , On ⊕, constituent Inertia J_a becomes from the Inertia of Area , of the Surface traced on the Great circle of the ⊖

constituent and is $J_3 = J_r = \dfrac{\pi r^4}{4}$ for circle-radius , r , and of Area = $\pi.r^2$, while on Small-circle of radius R is

$J_3 = J_R = \dfrac{\pi.R^4}{4}$ and of Area = $\pi.R^2$.

The change in moment of Inertia is $J_D = \dfrac{\pi}{2}(r^4 - R^4)$ and becomes of the different trace of motion .

The ⊕ , constituent is rolling on ⊖ constituent with the constant velocity $\bar{v} = \dfrac{\sigma}{2}[1+\sqrt{5}]$ because

of the Constant Stress ,σ. Circular motion happens with parallel circles perpendicular to ,z , axis .

Case a.. ⊕, constituent is *Not-Rolling around ,z, axis .*

The Algebraic-figure of Momentum to center of mass is $J_2. w_2$, where J_2 is the moment of Inertia to vertical axis y , and

w_2 is the Angular-velocity-meter and equal to $\dfrac{v}{R}$, where R is the Curve-Radius of Curvature .

The direction of the Momentum is on , y , axis and that of Angular-velocity-vector is $\bar{i}\, w_2$ and issues ,

$\bar{B} = \bar{i}\, J_2\, w_2 = \bar{i}\, J_2 . \dfrac{v}{R}$

Because the first derivative of Momentum is zero therefore magnitudes , v , R , J_2 are unaltered and so is not needed any other force to act on , z , axis , *except that of Centripetal* , to follow curve.

Case b.. ⊕, constituent *Is-Rolling around ,z, axis on Small-circles* .

Because of the constant Stress , σ , and Angular velocity w_2 , Momentum $\bar{B}$ is containing another term on $\bar{k}$ axis , $\bar{k}\, J_3\, w_3$ with much greater Algebraic-figure , and this because during rolling on semicircle, another curve R < r on ⊖ constituent

executes greater number of turns about its axis , x and $J_3 = \dfrac{\pi R^4}{4} < \dfrac{\pi r^4}{4}$ and the difference moment of Inertia is

$J_D = \dfrac{\pi}{2}(r^4 - R^4)$.

Angular velocity w_3 becomes greater to w_2 as it is , $J_R > J_2$. The first derivative of this term

under the restriction w_2= constant becomes $\dfrac{d\bar{B}}{dt} = J_3\, w_3\, \dfrac{d\bar{k}}{dt}$, where $\dfrac{d\bar{k}}{dt} = \bar{i}\, w_2 = \bar{i}\, \dfrac{v}{r}$, so for

the continuity of motion is needed a couple of forces at the end points of axis such that moment is

$\bar{M} = \bar{i}\, J_D\, w_3 w_2 = \bar{i}\, J_D\, w_3 . \dfrac{v}{r}$. Reactions are created at the ends of , z , axis and for 2R distance

then Reaction is F = $\dfrac{J_D\, w_3 w_2}{2R} = \dfrac{J_D\, w_3\, v}{2R^2} = \dfrac{J_D\, v^2}{2R^2\, r} = \dfrac{\pi(r^4 - R^4)\sigma^2(3+\sqrt{5})}{2R^2 r.r^2} = \dfrac{\pi\sigma^2(r^4 - R^4).(3+\sqrt{5})}{2R^2 r^3}$, which is the Gyrostatic reaction of motion .

The vertical force Q = $\dfrac{u\bar{B}}{s} = \dfrac{u\bar{B}}{R} = \dfrac{\frac{\sigma}{r}[1+\sqrt{5}].\pi r^3 \sigma}{R\quad 8}[1+\sqrt{5}] = \dfrac{[\pi\sigma^2(3+\sqrt{5})]}{8.R}$ and for rotation the needed

moment is , M = $Q.(r^2 - R^2) = \dfrac{[\pi\sigma^2(r^2 - R^2)(3+\sqrt{5})]}{8}$ with Reactions on perpendicular to , y , axis .

For Planck`s length and ratio $k = \dfrac{R}{r} = 0{,}5$, the above become in Algebraic figures ,

F $= \dfrac{\pi\sigma^2(r^4 - R^4).(3+\sqrt{5})}{2R^2 r^3} = \dfrac{\pi\sigma^2(1 - k^4).(3+\sqrt{5})}{2k^2 r} = \dfrac{\pi.17{,}04.10^{-54}.0{,}75.5{,}236.}{2.0{,}25.4{,}453.10^{-35}} = 9{,}442 . 10^{-18}$ N $_{[1Kg.m/s^2]}$

Q $= \dfrac{[\pi\sigma^2(3+\sqrt{5})]}{8.R} = \dfrac{[\pi\sigma^2(3+\sqrt{5})]}{8.kr} = \dfrac{\pi.17{,}04.10^{-54}}{8.0{,}5.4{,}453.10^{-35}} = 3{,}000 . 10^{-19}$ N $[1Kg.m/s^2]$

M $= \dfrac{[\pi\sigma^2(r^2 - R^2)(3+\sqrt{5})]}{8} = \dfrac{[\pi\sigma^2 r^2(1-k^2)(3+\sqrt{5})]}{8} = \dfrac{\pi.17{,}04.10^{-54}0{,}75.19{,}829.10^{-70}5{,}236.}{8} = 1{,}327.10^{-121}$ KN $_{.m}$

Remarks :

Forces , F , Q , applied on lever-arms , r , and , R , *which are both in the* , Material-point-System , are differing on the Moment of Inertia J_r and J_R values , of the sketching circles of rotation .
Since momentum m = Q/s then ***momentum due to Spin*** = $\bar{B}$ = 3 ,000 . 10^{-19} [1Kg.m/s] .

***Synopsis* 3 :**
The Material-point *is the discrete continuity **Content*** ≡ |{⊕+⊖ }|= ***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 ≡ **The Form** *, and consists the deep concept of Material-geometry ,* ***i.e. Material-Point becomes as , DISCRETE - FORM , from Euclidean-Point which is the CHAOS , by its Eternally – Moving-Content → the in Mode Content of existence , which is the Energy-Quanta in Mechanics. In Article is clarified the* How *, the* When *and the* Why *CHAOS becomes DISCRETE and thus Joining Euclidean - Geometry – Mechanics – Physics in One Unity and with the same Universal Laws , from Zero ≡ Non-existence ≡ Chaos , to Discrete , Microcosms to Macrocosms .***

***In Primary**-material-point ,* **Form** (distance = r) *and* **Content**, [⊕ ʊʊ ⊖] *, is constant while in all others issues the law of transformation of **Quantity into Quality** , and this is extended from the smaller particle to the largest phenomena , i.e. in all levels of the Energy-space universe .*
Form (distance = r) ,**of** ***Material point*** **AB** ,{ *the two Spherical constituents ,*[⊖≡ K_o,K_oB]–[⊕≡K,KB]} *of Space point* , A (⊕) *and Anti-point ,* B (⊖) *and created on STPL Mould* , *by the rotating velocity vector* v_A = w.r , ***is thus forming*** *the material angle ,) . t , which in turn* { **r** *and* **ϑ** } $\quad \vartheta = \vartheta_A . t = (\dfrac{v_A}{\sqrt{\quad}^2}$
c^2–r *create the Envelope of Harmonic-Vibration-curves on this* $\quad$ *, r , ϑ rotating STPL - line* . In [58] ,

Quantity into Quality *transformation can be seen in many levels as , the velocity* v_A *of any point A , in Primary-Dipole AB which creates Infinite Free Harmonic Vibrations on AB monads , following Euler-Savary mechanism where Rolling motion is transformed to Vibration curves , and on different waves which properties is determined by the number of oscillations per second , i.e.*
*The **frequency related to vibrations** is the quantitative change giving rise to different kinds of the wave-signals . Increasing the rate of vibrations turns the colours from Red indicating low frequency, to Orange -Yellow , to Violet , to the invisible Ultra-violet and , X-rays , and to gamma rays . Reversing the process at the lower end , we go from infrared and heat rays to radio-waves , as in* [39]. *Also the changing of Temperature offers no resistance to electric-currents , and for Helium which is the only substance which cannot be frozen because is in Primary-Form and exists the Critical – Energy Quantity CEQ as before .*
Instead , a particle`s intrinsic Angular-momentum is just another property that it has , like charge or mass , which is the structure of space itself .
The difference between Organic and Inorganic Chemistry is only relative , i.e. the different collection of atoms and the DNA structure. [54-55]
The elementary particles which make up the atoms interact constantly by passing into each other while at every moment are both themselves and something else (are a different entity which in turn determines the behavior of its component parts) while the Union of atoms into molecules follows chemical formulas, the atoms themselves had remained unchanged with only a purely quantitative relationship , in contradiction to Molecule which cannot be reduced to its component parts without losing its identity . The Principle of the < Whole being equal to the parts > issues for all compositions either in Form or in
Content or for both , as happens to the square root of a number which can be either positive or negative . It was referred that the Zero equality in Content , $(P_A + P_B)$=0 *is the Critical-Energy-Quantity {CEQ} for any transition in Quality , is a kind of Catalyst which is not changing the composition of Primary Segment , the unity of opposites and also the Work ≡ Energy ≡ Heat ≡ Pressure ≡ velocity ≡ motion involved in all levels , and generally on Material-Points , in Material-Geometry . Beyond a certain Critical-Energy-Quantity the Bonds ≡ Content are broken and then a qualitative leap occurs .*

AS , Zero(0) *is the Border-line between all Positive* (+) *and Negative magnitudes* (-) *and stands in a relation of infinity to every other number and represents a real magnitude , THUS* {CEQ} *which is zero in Material-point , is identified with that Zero of Euclidean-geometry.*

Quality *in a particle is ± Spin dependent on its direction , giving the Outer Electromagnetic-Wave of moving and the Inner Electromagnetic-Field of monads . This Inner unity of opposite* [⊕↔⊖] ≡ 0 *is , in nature , the velocity ≡ motor-force of all motion , starts to recover → gathering strength as Spin which in turn to Outer-Spin and to the Electromagnetic - Wave .* [40]
All above occur either by Rolling of Space A ≡ (⊕) *on Anti-space B ≡* (⊖) *sphere , joint by ,σ, Stress , on STPL Mould , or by Rolling of Space A ≡* (⊕) *on Anti-space B ≡* (⊖) *Evolute-Cycloid , joint by the ,v̄, energy , on STPL Mould-length which is the → Isochronous curvature radius from the Cycloid , Evolute-cycloid Rolling points .* All above in Energy-Space Universe is a Slit for Future-Technologies .
From math theory of Elasticity , the Total Work on free edges where there is no shear becomes from

Principal stresses only and the Work is $W = \dfrac{\sigma^2}{2E} + \dfrac{\tau^2}{2G}$, where the analogous Energy in monads

$W = \dfrac{1}{2}[\varepsilon E^2 + \mu H^2]$ is spread as the First Harmonic and equal to outer Spin $\overline{S} = E / w = 2\pi r.c$.

Equation of Planck`s Energy $E = h.f = (h/\lambda).c$ is equal to the Isochromatic pattern fringe-order in monad as $\rightarrow \sigma 1 - \sigma 2$ = $(a/d).N = (a/d)nf1 = (8\pi r^2/3).n.f1$. where , n = the order of isochromatic , *a number* , and f1= the frequency of Fundamental-Harmonic .

This is the why colors exist in fringe-order and are of wave form. 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 total energy , E , in the same cave $(wr)^2$ as ,

$E = $ Spin , $w = \overline{S}.w = (h/2\pi).2\pi f = \left[\dfrac{8\pi r^2 f1}{3}\right].\left[\dfrac{n(n+1)}{2}\right] = \left[\dfrac{4\pi r^2 f1}{3}\right].n.(n+1)$ ......(a)

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 $\varphi = kx - wt$ = Spatial and Time Oscillation dependence , For n = 1 , Energy in the First Harmonic is , $E = 2\pi r.c = \left[\dfrac{4\pi r^2}{3}\right].f_1.[1]$, and for n = 2 , Energy in the First and Second Isochromatic Harmonic is , $E = \left[\dfrac{4\pi r^2}{3}\right].f1.[3]$ in threes, and , φ , is trisected with Energy-Bunched variation f2 , i.e.

Energy stored in a homogeneous resonance , is spread in the First of Seven-Harmonics beginning from the (first) Fundamental and after the filling with frequency , f_1 , follows the Second - Harmonic with frequency , $2.f_1$, and so on . f_1
In this - *way the Energy Space monads are generated from the frequency in caves , or slits .*

Also this is the How Spin is 1 or ½ or $\dfrac{1}{N}$ *`. The Why Spin is ,* $\dfrac{l}{2}, \dfrac{l}{3}, \dfrac{l}{4}, \dfrac{l}{5}, ...N$, in monads *i.e.*

One , Half ,Third $...\dfrac{1}{N}$ - Lengths $\rightarrow [\dfrac{l}{2}, \dfrac{l}{2}], [\dfrac{l}{3}, \dfrac{l}{3}], , , [\dfrac{l}{N}, \dfrac{l}{N}]$, with One ,Two ,Three ,,, N - *Wave-nodes.*
In Second-Harmonic energy as frequency is doubled and this because of sufficient keeping homogeneously in Spatial dependence , Quantity $kx = (2\pi/\lambda).x$, which is in threes , meaning that , $\rightarrow$ ***Dipole–energy is Spatially-trisected*** in Space - Quantity Quanta the Spin$=h/2\pi$ as the angle φ , of phase $\varphi = kx - wt = (2\pi/\lambda).x$, ***and Bisected*** by the Energy-Quantity Quanta as this happens in an RLC circuit . [49] .

B.. *How , from Chaos , becomes the Monad and Spin .*
1.. *The Intrinsic and Ordinary Rotation of monads* :
 a.. Momentum and Spin , in Material-Point .
In Material-point , the two magnitudes of the Energy ellipsoids , are those of , Angular-velocity - Ellipsoid $\overline{w} \rightarrow J_1 w_1^2 + J_2 w_2^2 + J_3 w_3^2 = 2L = C$ .... (13)

Angular - Momentum-Ellipsoid $\overline{B} \rightarrow \dfrac{1}{J_1} B_1^2 + \dfrac{1}{J_2} B_2^2 + \dfrac{1}{J_3} B_{3_2} = 2L = C$ .... (13a) *and for Constant Kinetic-Energy* ,L, of $\oplus$ sphere then exists $\overline{B}\overline{w} = 2L$. and Equation (9)
$\rightarrow J_x w_1^2 + J_y w_2^2 + J_z w_3^2 - 2(J_{yz} w_2 w_3 + J_{zx} w_3 w_1 + J_{xy} w_1 w_2) = C$ .... (9) Defines angular velocity , $\overline{w} (w_1, w_2, w_3)$ in all directions of constant , $\overline{B}\overline{w}$, *Therefore issues and for the Constant Kinetic-Energy* ,L, of $\oplus$ sphere $\{\overline{B}\overline{w} = 2L\}$ and defines the same Ellipsoid . From the relation of Kinetic energy $L = (\dfrac{B}{2}) w = (\dfrac{B}{2}).2\pi.f = \pi.Bf$, and from E $= h.f = h.(w/2\pi) = w.\dfrac{h}{2\pi}$
$= w.[Spin]$ then $\rightarrow$ **Spin** $= \dfrac{h}{2\pi}$, and from $\overline{B}\overline{w} = 2L = $ Energy $= h.f = w.2\pi$, or $\rightarrow$ $\overline{B} = \dfrac{h}{2\pi}$, **then ,**

The Momentum-Energy-Ellipsoid $\overline{B} = \dfrac{h}{2\pi}$ = Spin of monads . and also from (9) , *Every radius of Inertial-Ellipsoid acquires meter , the angular velocity which $\oplus$ sphere must be rotated , so that kinetic energy remains constant and equal to* $\rightarrow \equiv \dfrac{1}{2} C$ *and Because of above property Inertial-Ellipsoid coincides to Angular – Velocity - Ellipsoid.*
The two Ellipsoids that of , *Angular-velocity-Ellipsoid* , and that of , *Momentum $\equiv$ Energy - Ellipsoid* are Interchangeable , meaning that ***Energy $\equiv$ Momentum from Chaos $\equiv$ monad*** , sweeps out a cone centered on the *Ecliptic-pole of Angular-velocity Ellipsoid as* , **The Spin ,** in this tiny Energy-ellipsoid . The Two magnitudes , of *Angular-velocity-Ellipsoid* , and of *Angular-Momentum $\equiv$ Energy - Ellipsoid* , in the absence of Principal axis are both conserved , *i.e. Energy and mass are* interchangeable . **b.. *The Value of Energy - quanta in Material - Point* .**

A Standing Wave or *Stationary Wave ,* is a wave having parts remaining in constant position [49]. Equation of Gravity , *which is the minimum and less attractive Force in a Standing wave ,* equal to $\square i = 2(wr)^2$ *on dispersion*

→|[+(w̄.r)²|↔|-(w̄.r)²|=|λ|] **cycloidal cave** ← and *which cave is the material energy length consisted of **the material end points |(wr)²|** and are the two ± |(wr)²| dipole , restrained by the above Electromagnetic field ,* E , P *, and becoming from the binding force ,* |2(wr)²| are as follows ,

   In a cave of length ,*l,* where vibrations are of two fixed nodes , *one pair* at each end , and since also c = f.λ then exist for ,

First Harmonic   f 1 → $l = λ/2 = c / (2.f)$ and **f 1** = c / (2*l*) = **f 1**

Second Harmonic   f 2 → $l = λ = 2c / (2.f)$ and **f 2** = c / (*l*) = **2 .f 1**

Third Harmonic.   f 3 → $l = 3λ/2 = 3c / (2.f)$ and **f 3** = c / (*l*) = **3.f 1**

Fourth Harmonic.   f 4 → $l = 4λ/2 = 4c / (2.f)$ and **f 4** = c / (*l*) = **4.f 1**

When the applied force **E** =hf= **w**.(h/2π) = w .**Spin** then **Spin** $= \dfrac{E}{w} = [\pm\overline{v}$ .s²] /w = (r.s²) on cave ,**r**, and are created the **Fermions** with **Spin** = [$\dfrac{E}{w}$] = $\dfrac{1}{(r .s^2) \to 2}$

When the applied force **E** = h.f = **w**.(h/2π) = [☐i = 2(wr)² = 2.v̄s²] on cave then **Spin** $= \dfrac{E}{w} = [2.\overline{v}$ .s²] / w = 2.(r.s²) and are created **Bosons** with **Spin** = [$\dfrac{E}{w}$]= 2.(r.s²) → 2.($\dfrac{1}{2}$) = 1 *which is double the before.* i.e.

Energy as velocity vector v̄ or **E** =[±v̄], applied on the material energy dipole points [± s²] *as the Dipole Quantity* |v̄|² =|w̄xr̄|² = |w̄.r|² = s² , separately creates the massive Particles , ***Fermions*** , while *the* velocity vector v̄ , applied on the ***Double Quantity*** **Energy** vector breakages ☐i = 2(wr)² = 2.s² =2[±v̄]² =**2E** and since v = (w.r) , 2v.s² = 2|v̄|s²= 2.|w̄xr̄|³ = 2v.|w̄.r|² = 2s² creates the Energy Particles , ***the Bosons*** , by doubling its frequency [f₂= 2. f₁] in the same cave and equal amplitude . Fig.21.

N = Node   A-N = Anti-Node
E = Energy $\overline{v}, \overline{\sigma}, \overline{P}, \overline{E}$
$l = 2\pi r$ = Cycloidal length
$\lambda = 2l$ = Particles' Wavelength
$w = [2\pi/h]$. E = Angular velocity

FERMIONS — SPIN $= \frac{E}{w} = (rs^2) = \frac{1}{2}$
BOSONS — SPIN $= \frac{E}{w} = 2(rs^2) = 1$

$\sigma1, \sigma2$ = main stresses   L = Angular Momentum
$\overline{E}$ = Electric Force-Vector   SPIN $= -\sigma1.P = l[1/2]$
$\overline{P}$ = Magnetic Force-Vector   Displacement

$E = h.f$
$= v.s^2$
$= v.(w.r)^2$

FERMIONS

$l = \lambda/2 = 2\pi r = 2|(wr)^2|$
Energy $= \overline{v} = \overline{w}.r$

SPIN

$l = \lambda/2 = 2\pi r = 2|(wr)^2|$
Energy $= \overline{v} = \overline{w}.r$

Cycloidal Displacement

Energy $= \overline{P} = \overline{v}(y) = \overline{w}.r$
Magnetic Force - Vector

$SPIN = -\sigma2.P = l[1/2]$
$l = \lambda/2 = 2\pi r = 2|(wr)^2|$

Energy $= \overline{E} = \overline{v}(x) = \overline{w}.r$
Electric Force-Vector

$2E = h.(2f)$
$= v.2.s^2$
$= v.[2(w.r)^2]$

BOSONS

$l = \lambda = 4\pi r = 2|(wr)^2|$
E = Energy $= 2.\overline{v} = 2.|w.r|$

SPIN

$SPIN = -\sigma2.P = 2.l.[1/2]$
$l = \lambda = 4\pi r = 2|(wr)^2|$
E = Energy $= 2.\overline{v} = 2.|w.r|$

Cycloidal Displacement

Energy $= \overline{P} = \overline{v}(y) = 2.\overline{w}.r$
Magnetic Force - Vector

$SPIN = -\sigma2.\overline{P} = 2.l.[1/2]$
$l = \lambda/2 = 2\pi r = 2|(wr)^2|$

Energy $= \overline{E} = \overline{v}(x) = 2.\overline{w}.r$
Electric Force - Vector
Double Angular-velocity w

Figure.21. The Energy $\overline{B} = \frac{h}{2\pi}$ = Spin $= \frac{h.f_1}{\overline{w}}$ = as velocity , v = (wr) in cave , l , is the Spin ½ , while Doubled $\overline{B} = \frac{h}{2\pi}$ = Spin = 2 $= \frac{h.f}{\overline{w}} = 2.\overline{B}$, in the same cave , l , then $\rightarrow$ f = 2. f_1

i.e. In the same cave , l , Energy is quantized as $\frac{1}{2}$ / 2 . $\frac{1}{2}$ =**1** / 3 . $\frac{1}{2}$ =**1,5** / 4 . $\frac{1}{2}$ =**2** ,… n $\frac{1}{2}$ and so on , depending on the number , n , of Wave-notes in cave , l .
Above Energy quantized **n** , lobes in Stationary waves define the Wave-functions of elements . Question : *How and Where* Energy $\overline{B} = \frac{h}{2\pi}$= Spin *is becoming Halve and in a changing Direction* .

1.1. *The Intrinsic Angular Momentum and Spin .*
The both rest , Gravity Field and Dark-matter are consisted of the same material points jointed by the *inward* E,P fields , *which two* , consist Gravity`s and Dark-matter`s rest material dipole.
From Planck`s energy equation E=h.f=(h/λ).c and Isochromatic pattern , $\sigma1-\sigma2$ = (a/d).N=(a/d).n.f1 where the Isochromatic fringe *Quantized* order n.f_1= (wr)², is varying from the First–Harmonic Energy-Bunched variation $f_1 \rightarrow \lambda/2$ to Second $f_2 \rightarrow \lambda$ for doubled Energy and to n.f_1. [40]
The Standing waves in caves , $l = \lambda/2 \rightarrow \lambda$, and the Intrinsic Angular momentum of Particles for ,
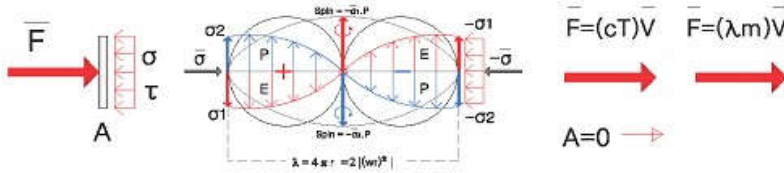
[1] *The applied force on NN cave is* $\mathbf{E} = h \cdot f = \mathbf{w} \cdot (h/2\pi) = w \cdot$ SPIN $\rightarrow$ **Spin** $= \dfrac{\bar{E}}{w} = [\pm \bar{v}.s^2]/w = (r.s^2)$

[2] For $\mathbf{E} = \pm \bar{v}$ then $\rightarrow$ Spin $= \dfrac{E}{w} = [\pm \bar{v}.s^2]/w = (\pm r.s^2) \rightarrow \pm$ **Fermions** *with spin* $\dfrac{1}{2}$

[3] For $\mathbf{E} = [\square i = 2(wr)^2 = 2.\bar{vs}^2] = \mathbf{2.(r.s^2)}$ then $\rightarrow$ Spin $= \dfrac{E}{w} = [2.\bar{v}.s^2]/w = \mathbf{2.(r.s^2)} \rightarrow$ **Bosons** *of spin* **1**

i.e. **Double energy** $[2.(r.s^2)]$ on a constant cave creates **2** crests and doubling the frequency (h) , with Spin 1 . **N-times energy** $[N.(r.s^2)]$ on a constant cave creates N crests N-times the frequency **(h)** with **Spin N/2** .

Since Energy $[\bar{E}x\bar{H}]$ = Pressure = Spin S = $\rho.c.w.$ $[\varepsilon E^2 + \mu H^2] / 2 = 2rc. \sin 2\varphi$ then
Energy $/ \sin 2\varphi = [\varepsilon E^2 + \mu H^2] / \sin 2\varphi = 2rc/ \rho w = 4r^2 / \rho$ = constant , only on Cycloidal motion.

The Inner Monad's {Electromagnetic–Vortex Field } ENERGY–QUANTA

$F=(cT)\bar{V}$ $F=(\lambda m)\bar{V}$

The motion of { Energy – Space } Monads   SPACE - QUANTA

$\bar{F} = \partial p / \partial t$ $\bar{F} = \partial W / \partial s$ $\bar{F} = W/s$

F = Force
A = Area
σ = Stress
W = Work
V = Velocity
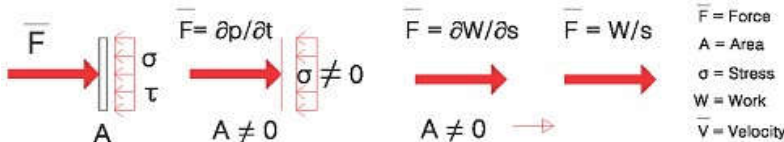
Figure .22. *Transformation of principal Stresses into Force-velocity.* Inversing the Spin becomes the Quantization of Work as Discrete Velocity Force (The Kinetic Energy) =The Electromagnetic field [E , P] = momentum = (p) = Force
For Area A=0 then Force is Transformed as Velocity $\bar{v}$ and as Stationary - Kinetic Energy of monads .

Remarks :

In Fig.22 Spin $\bar{B} = \dfrac{h}{2\pi} = h \cdot (\dfrac{f_1}{w})$ in cave's length , l $= \dfrac{\lambda}{2}$, for wavelength , λ , and Double

Spin $\bar{B} = \dfrac{h}{2\pi} = h \cdot (\dfrac{2.f_1}{w})$ in cave's length , l $= \dfrac{\lambda}{4}$, for wavelength , λ , and when this in

Conversely . i.e. $\rightarrow$ If a Force (as frequency f_1) in a cave of length ,l, is *Coerced* to enter another cave of a smaller length , then is separated into two Half-lengths , $\dfrac{l}{2}$, $\dfrac{l}{2}$, with $l = \dfrac{\lambda}{4}$ *and Spin* $\bar{B} = h \cdot (\dfrac{f_1}{2w}) = h \cdot (\dfrac{f_1}{4\pi f_1}) = \dfrac{h}{4\pi} =$

One halve of the Initial Spin $\dfrac{h}{2\pi}$. In Fig.2 In (1) $\overline{\sigma(1+\sqrt{5})}$ The Glue-Bond pair of opposites $[\ominus \oplus$] in the **Straight Direction of Great circles** , creates rotation on circle of radius , r , with velocity v

$= w.r = \dfrac{2\pi}{T}.r$ $= 2\pi r. f = [\dfrac{\sigma}{2}].(1+\sqrt{5}$), where frequency $f = \dfrac{(1+\sqrt{5}).\sigma}{4\pi r}$, Period T $= \dfrac{4\pi r}{}$ and $\pm \sigma$, are

the two equal and opposite Centripetal ,F_p , Centrifugal ,F_f forces and Angular velocity $|w| = \dfrac{\sigma}{2r}[1+\sqrt{5}]$.

Energy is $\rightarrow$ E = h.f $= \dfrac{(1+\sqrt{5}).\sigma h}{4\pi r}$ and exists as Stationary Wave *in Zero Wave-node* , of cave $l = \lambda/2$ and of wavelength , λ . If the same Energy is *Obliged to enter a smaller cave* then this cave is the length of the Stationary wave for wavelength , $\lambda = l$, which is separated

into *Two Half-lengths* $\dfrac{l}{2}$, $\dfrac{l}{2}$, with *One-Wave-node* . Thus Energy is Split into the two lobes.

The Momentum-Energy-Ellipsoid $\bar{B} = \dfrac{h}{2\pi} = \text{SPIN}^{SD-G}$ is of , *Straight Direction in Great circles.*
In (**1**) The Glue-Bond pair of opposites $[\ominus \oplus$] in the , ↰, *Left Direction in Small circles* , creates rotation

on circle of radius , R , with velocity v = w.2r $= \dfrac{2\pi}{T}.r = 4\pi r. f = [\dfrac{\sigma}{2}].(1+\sqrt{5}$), where frequency f $= \dfrac{(1+\sqrt{5}).\sigma}{8\pi r}$, Period T $= \dfrac{8\pi r}{\sigma(1+\sqrt{5})}$ and $\pm \sigma$ are the two equal and opposite
Centripetal , F_p , Centrifugal , F_f , forces .

The Angular momentum $\bar{w}$ is Anti-Clockwise , that is to say Negative [-] ≡ [↶].   The Obliged Energy E = h.f = $\dfrac{(1+\sqrt{5}]).\sigma h}{4\pi r}$ of the , ⊕ , constituent to rotate in a circle of   radius R < r , is Split into two lobes following the ***Stationary-Wave-Nodes Principle*** .

Energy is → E = h.f = $\dfrac{(1+\sqrt{5}]).\sigma h}{8\pi r}$ *in **One** Wave-node , and*

Momentum-Energy-Ellipsoid $\overline{\mathbf{B}} =\dfrac{\mathbf{h}}{\mathbf{4\pi}}=-\mathbf{SPIN}^{\mathbf{LD-S}} =\dfrac{1}{2}\mathbf{SPIN}^{\mathbf{SD-G}}$ is for **Left *Direction- Small circles.***

In **(1)** The Glue-Bond pair of opposites [⊖ ⊕] in the , ↻, ***Right Direction in Small circles***   creates rotation on circle of radius , R , with velocity v = w.2r = $\dfrac{2\pi}{T}.r =$ $4\pi r.$ f = [$\dfrac{\sigma}{2}$].$(1+\sqrt{5}$) ,   where frequency f = $\dfrac{(1+\sqrt{5}]).\ \sigma}{8\pi r}$, Period T = $\dfrac{8\pi r}{\sigma(1+\sqrt{5})}$ and ± σ are the two equal and opposite

Centripetal ,F_p , Centrifugal , F_f , forces .

The Angular momentum $\bar{w}$ is Clockwise , that is to say Positive [+]≡ [↻].

The Obliged Energy E = h.f = $\dfrac{(1+\sqrt{5}]).\sigma h}{4\pi r}$ of the , ⊕ , constituent to rotate in a circle of   radius R < r , is Split into two lobes following the ***Stationary-Wave-Nodes Principle*** .

Energy is → E = h.f = $\dfrac{(1+\sqrt{5}]).\sigma h}{8\pi r}$ *in **One** Wave-node* , and   Momentum-Energy-Ellipsoid $\overline{\mathbf{B}} =\dfrac{\mathbf{h}}{\mathbf{4\pi}}=+\mathbf{SPIN}^{\mathbf{RD-S}} =\dfrac{1}{2}\mathbf{SPIN}^{\mathbf{SD-G}}$ is of **Right *Direction-Small circles.***

This is **The How** → (by following the Stationary-Wave -Nodes Principle) and ,   **The Where**   (In the first Energy Stationary-monad of Material-Geometry cave) .

The How this (Practically can be succeeded , is left to Laboratory Nuclear Physicists .

For Zero Static - Moment $\bar{M} = 0$, the Energy-monad is supported through center of mass and is ,

$$J_1 \frac{dw_1}{dt} - (J_2 - J_3).\, w_2 w_3 = M_{1=0}$$

$$J_2 \frac{dw_2}{dt} - (J_3 - J_1).\, w_3 w_1 = M_{2=0} \qquad ……….. (21a)$$

$$J_3 \frac{dw_3}{dt} - (J_1 - J_2).\, w_1 w_2 = M_{3=0}$$

and for rotation through Principal axis of Inertial-Ellipsoid [for ,z, axis $w_1 = w_2 = 0$]

then w_1 = constant (= 0) w_2 = constant (= 0) w_3 = constant . *i.e. the rotation*

is continued through this axis with constant angular velocity $\overline{w} = \dfrac{\overline{v}}{r} = \dfrac{\sigma}{2r}[\,1+\sqrt{5}]$ *and of that of the material-point* , of radius , r , *and of the three Free - axis .*

1.2. *The Interference Pattern or , The System of Fringes* .

We can regard Standing waves in Figure.21 as Resonance phenomenon , i.e. the String ds = l = 2r has certain Natural frequencies and when it is forced to vibrate at one of these then a large amplitude vibration

occurs . From velocity $\bar{v} = \sqrt{\dfrac{\text{Tension}=\sigma}{\text{mass}=J}} = \sqrt{\dfrac{2\sigma}{\pi r^4}}$, the natural frequency $f_o = f_n = \dfrac{1}{2r}\sqrt{\dfrac{2\sigma}{\pi r^4}} = \dfrac{1}{2r^3}\sqrt{\dfrac{2\sigma}{\pi}}$

It was shown [49] that equation of a space wave is →

$$A_{x,t} = y = A_o.\sin(kx - wt + \varphi) = A_o.\sin[2\pi(\frac{x}{\lambda} - \frac{t}{T}) + \varphi)] = A_o.\sin[\frac{2\pi}{\lambda}.(x - ct) + \varphi]_{(\ )}$$

Where , A_o is the Amplitude of displacement , φ is the phase and **T** the period of the wave .

Wave's velocity $\bar{v} = \dot{y} = (-wA_o)\cos[\left(\frac{2\pi}{\lambda}\right).x - wt] = (-wA_o)\cos[\left(\frac{2\pi}{\lambda}\right).(x - ct)]$ and the

Energy of wave is , → $E = m.\dot{y}^2 / 2 = (m/2).(-wA_o)^2$, and $m = \dfrac{E}{2r.w^2}$ ......(1)

By definition → Pressure (p) = Intensity of a Force (/ per) area ,
Density (ρ) = Intensity of a mass (energy) / volume , and
Intensity of waves is *Intensity* (I) = Power delivered / unit area so, ***Intensity of a Wave is*** , I = $\dfrac{\text{Power}}{\text{Area}} = \dfrac{\text{Energy.Length}}{\text{Time.Volume}} = \dfrac{(\text{Energy}).\text{Length}}{(\text{Volume}).\text{Time}} = \dfrac{\text{Energy}}{\text{Volume(speed)}} = (m/2).(-wA_o)^2.\bar{v}/ \text{volume} = (\dfrac{\rho.c}{2}).(wA_o)^2 = \dfrac{[2\pi^2.\rho.c^3].A^2}{\lambda^2}$

→ since $w = (2\pi/T) = 2\pi.c/\lambda.$, and in case of the tiny volume $V = \dfrac{4\lambda^3}{3\pi}$, then

$A^2 = [\dfrac{\varepsilon.E^2}{2} + \dfrac{\mu.H^2}{2}]^2 = [\varepsilon E^2 + \mu H^2] / 4$, and mass/volume = $\rho = \varepsilon,\mu$,of inner cycloidal structure and intensity

$I = (m/2)(-wA_o)^2 \bar{v} / \text{volume} = \dfrac{\rho\pi^2 c^3}{2\lambda^2}$ $[\varepsilon E^2 + \mu H^2] = \dfrac{\rho^2\pi^2 c^3}{2\lambda^2}$, *and for* $\rho = [\varepsilon E^2 + \mu H^2]$, *and also* $\lambda = (wr)^2$,

The pressure Amplitude $P_d = \rho.c.w.A_o = \rho.c.w.[\varepsilon E^2 + \mu H^2] / 2 = \rho^2.c.w / 2$

Intensity of Dark-Fringes $I_d = \dfrac{\rho^2\pi^2 c^3}{2\lambda^2}$

The Impedance (Resistance is attributed to resting bodies and Impetus to moving bodies) of the medium is defined by the product of density and wave speed as $z = \rho.c$ with a unit of → $Pa.s.m^{-1}$ and Pressure amplitude $P_o = \rho.c.w. A_o$

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 radius of the cave , $l = r = A_o$, then velocities as angular velocity ,**w**, and velocity , **v** , under the condition $y(2r,0) = 0$, then leads to the Energy-equation

$\sin\dfrac{2rw}{v} = 0$, or $w_n.\dfrac{2r}{v} = \dfrac{4\pi r}{\lambda} = n.\pi = \dfrac{4\pi r f}{v}$, where n = 1,2,3 , and $\lambda = \dfrac{c}{f}$ 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 equation → $f_n = \dfrac{n.v}{4r} = \dfrac{n\sigma}{8r}[1+\sqrt{5}]$ .... (n)

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 as in Figure 21-22 .

Considering rotation as a grating having ,N, lines per ,r, then maximum values of ,n, is n < Nλ , i.e. the biggest whole number less than $\dfrac{1}{N\lambda}$ *which is always integer. On Stretched-Strings Energy* $\bar{B}$ *is not transmitted , but trapped in the 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 .*

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≡⊖ s² ↻↺ K_1≡⊕s²] .

This is the How and Where Energy $\bar{B} = \dfrac{h}{2\pi}$ = Spin is becoming Halve and in a changing Direction .

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* $\bar{B}$ *, becoming from the Rotational vibration of String ,* 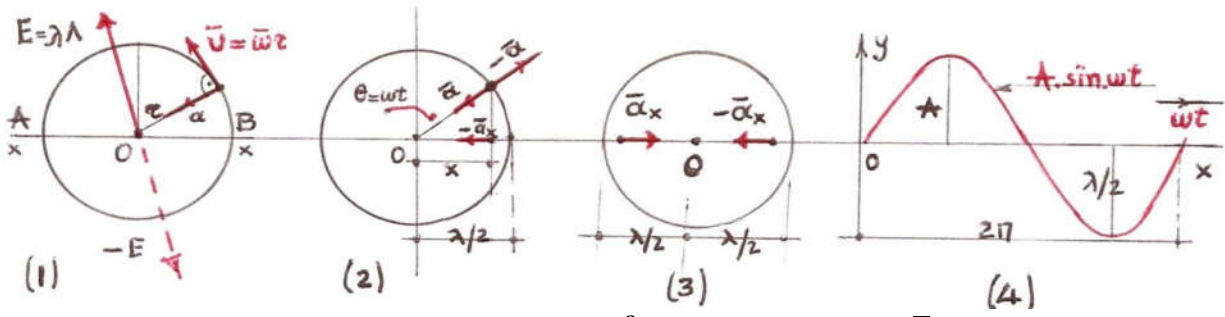**Spin** ≡ $\dfrac{E}{w}$ = $\bar{B}$ = [r.σ.(1 + √5)] and **Natural-Frequency** $f_n = \dfrac{n.v}{4\pi r} = \dfrac{n\sigma}{8\pi r}[1+\sqrt{5}]$ becomes

Spin ≡ $\bar{B}$ = [r.σ.(1 + √5)] = $(\dfrac{8r^2}{n}).f_n$ and , $\dfrac{\bar{B}}{f_n} = (\dfrac{8r^2}{n})$ = Constant for each cave , and

Frequency ≡ $f_n = (\dfrac{n\sigma}{8r^2}).\bar{B} = \dfrac{1}{2}[\dfrac{\bar{B}}{4\pi r^2}]$ = →

i.e. Energy-caves are Stationary Wave-Fringes and frequencies are the , energy part of waves .

1.3. *The Wave nature of Monad* $\overline{AB}^{=}$.

Figure.23. In (1) , are shown *Velocity* , $|\overline{v}| = w.2r = \frac{2\pi}{T}.r = 4\pi r.$ $f = [\frac{(1+\sqrt{5}).\sigma}{4\pi r}$ $\frac{\sigma}{2}].(1+\sqrt{5}$) , *Angular velocity*

$|w| = \frac{\sigma}{2r}[\ 1+\sqrt{5}$] and *Frequency* , $f =$ in cave , r .

In (2) , are shown Centripetal , $\overline{a}$, and Centrifugal ,$-\overline{a}$, acceleration in cave , r .

In (3) , are shown the *Projections* on AB axis of Centripetal , $\overline{a}_x$, and Centrifugal ,$-\overline{a}_x$ acceleration in cave , $r = \lambda$.

In (4) , is shown the *Sinusoidal - motion* of the Centripetal , $\overline{a}_x$ and Centrifugal ,$-\overline{a}_x$ acceleration in cave , $r = \lambda/2$.

Following Analysis in [33] then , Monad $|AB\_\_|$ = r = $\lambda/2$ is the ENTITY $\equiv$ Space , and [**A , B $-$ $\overline{P_A},\overline{P_B}$**] is the CONTENT $\equiv$ Energy which is the LAW , so Entities are embodied with the Laws . Entity is quaternion $\square i = [$ s $+\overline{v}\ \square i$] , with *Real* part |AB| = The length r = s = $\lambda/2$ between points A , B and *Imaginary* part the equal and opposite forces $\overline{P}_A$, $\overline{P}_B$ such that $\overline{P}_A + \overline{P}_B = 0$. [18] .

In Primary-Neutral - Space [PNS] , [23] The Dipole $|\overline{A}\ \cup\cup\ \overline{B}| = [\lambda , \Lambda]$ in [PNS] are composed of the two elements λ , Λ which are created from points A , B only , where *Real* part $|AB| = \lambda/2$ = wavelength (*dipoles*) and from the embodied

Work $\overline{B}\overline{w} = 2L$, *where the Imaginary part* $\overline{B} = (r.dP) = \overline{r}x\overline{p} = I.w = [\lambda.p] = \lambda . \Lambda = k2 = \overline{B} = \frac{h}{2\pi}$, the momentum $\Lambda = \overline{B}$ and the Forces $dP = \overline{P}_B - \overline{P}_A$ are the stationary sources (*the excitation sources*) of the Space -Energy field . [22-25] . *The moving charges is velocity ,* $\overline{v}$ *, created from the eternally rotated main stresses ,* $\square\ \sigma$ *, forming* the *dipole momentum vector ,* $\pm \overline{\Lambda}$, *when is mapped on the perpendicular to* Λ *plane as $\rightarrow$* $\overline{v}$ E $\parallel$ dP and $\overline{v}$ B $\square$ dP) . Since (dP $\square \pm \overline{\Lambda}$) the work occurring from momentum $\overline{p}$ is $\overline{p} = m\overline{v} = \Lambda$ acting on force **dP** . $\overline{d}P$ is zero , so ***momentum*** $\overline{\Lambda} = m\overline{v}$ ***only , is exerting the velocity vector*** $\overline{v}$ ***, to the dipole ,*** $\lambda/2$ ***,*** with the generalized mass **m** (*the reaction to the change of velocity* $\overline{v}$) which creates the component forces , $F_E \parallel$ dP. $\overline{v}$ and $F_B \square$ dPx $\overline{v}$. Dipole momentum { $\Omega = (\lambda . \Lambda)$ = Spin } is the rotating total Energy on dipole $\overline{AB}$ and mapped on the perpendicular to Λ plane as , *velocity* $\overline{v}$, *mass* **m** , *on radius* , **r** , *to* AB/2 = $\lambda/2$ From F.1 velocity $\overline{v}$ is created from the Centrifugal force $F_f = - \sigma$ and from the equal and opposite to it Centripetal force $F_p = + \sigma$ with acceleration $\overline{a}$, and the *mete*r of **x** , component equal to $a.\sin\theta = a.(x/A) = (a/A).x$. The equation of motion then becomes m.(d²x/dt²) = - (a/A). x with the general solution , $x = C_1 \sin\theta + C_2 \cos\theta = C_1 \sin.wt + C_2 \cos.wt$, *where* $w^2 = (a/Am)$ **,** C_1, C_2 constants and for $\theta = 0$ then $v = v_o = w.r = w. \lambda / 2 = (w\lambda) / 2$ and $x_o = A = \lambda/2$, where A = The amplitude of oscillation and when , x = 0 then A = $\lambda / 2$. Above equations define the wave nature of inner motion of monads . Considering motion from time t = 0 where motion passes through O , (x = 0) with velocity

v_o// Ox , *then Displacement* x = v_o . sin wt = A . sin $[\sqrt{(a/Am).t} + \pi_{/2}]$,

Velocity $\dot{x}$ = dx/dt = v_o .w. sin (wt + $\pi/2$) = A. $\sqrt{(a/Am)}$. sin $[\sqrt{(a/Am).t} + \pi/2]$ .... (3.1)

Acceleration $\ddot{x}$ = d²x/dt² = - v_o .w². sin (wt + π) = (a/m). sin $[\sqrt{(a/Am).t} + \pi]$ = -(a/Am) . x = - (2a/λm). x , or $\ddot{x}$ =- (2a/λm). x i.e. The amplitude of oscillation ($x_{maximum}$) is equal to the constant v_o / w while the period **T** of a complete oscillation , to the constant 2π /w is as , w = 2π /T = 2π f = $\sqrt{(a/Am)}$ where f = frequency and solving for , a , then

$a = (2\pi / T)^2. (Am) = w^2.(Am) = w^2.(\lambda m) / 2$, ... (3.2) And for the material point where , m =

$\frac{2E}{a_a} = [\frac{\overline{B}.\overline{w}}{\overline{B}x\overline{w}}]$. J , then **a** $= w^2. [\frac{\overline{B}.\overline{w}}{\overline{B}x\overline{w}}]. \frac{\pi r4}{2}$ .... (3.3)

i.e. Monads $|AB\_\_|$ ***are Waves or , of Wave nature*** . A.. *The Binomial nature of Monad* $\overline{AB}$.

According to the Binomial **theorem** it is possible to expand on the power , **d** , or $1/d \equiv$ **d** of monad AB = (s + $\overline{v}\ \square i$)^d into a sum involving terms of the form as $(^d_k).(s)^{d-k}. (\overline{v}\ \square i)^k$ (*binomial formula*) and each (^d_k) is a specific positive integer known as *binomial coefficient* . On

Monad AB with power $d = 1 \to \infty$ are created infinite Spaces and infinite Anti-Spaces (monads) **on and in the same monad** . i.e Spaces , Anti-Spaces and Sub -Spaces *on and in the same monad* are differing , *on the binomial coefficient , the successive decrease of powers on* **s** *and increase of power on* ($\Box i$) *which are also the infinite monads in monads* . Since also Sub-Spaces are of *wave nature* then infinite Spaces and infinite Anti -Spaces differ only in angular velocity $\overline{w}$, the velocity $\overline{v}$, and the wavelength , λ . [27] , [29] . **The Spaces - Sub-Spaces of monad AB are** ,

$AB = (s + \overline{v} \Box i)^d = (^d_0).(\mathbf{s})^\mathbf{d}.(\overline{v}\Box i)^\mathbf{0} + (^d_1).(\mathbf{s})^{\mathbf{d-1}}.(\overline{v}\Box i)^\mathbf{1} +....(^d_k).(\mathbf{s})^{\mathbf{d-k}}.(\overline{v}\Box i)^\mathbf{k} +(^d_{d-1}).(\mathbf{s})^\mathbf{1}.(\overline{v}\Box i)^{\mathbf{w-1}}+(^d_d)$,

$(s+\overline{v}\Box i)1/d=(d0).(\mathbf{s})1/\mathbf{d}.(\overline{v}\Box i)0+(1/d1).(\mathbf{s})1/\mathbf{d}\text{-}1.(\overline{v}\Box i)1 +...(1/dk).(\mathbf{s})1/\mathbf{d}\text{-}\mathbf{k}.(\overline{v}\Box i)\mathbf{k}+(1/d1/d\text{-}1).(\mathbf{s})\mathbf{1}.(\overline{v}\Box i)\mathbf{1/d}\text{-}\mathbf{1}+(dd)$

i.e *Spaces or Sub-Spaces of any monad* , AB *maybe* , **Scalar or Imaginary or both parts** . [14]

QUESTION ??

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

Since monad (AB) = *quaternion* = **z** , and the ,**d** , Spaces and , $1/d = d^{-1}$ Sub - spaces are monads in ,**d**, power and , $\mathbf{d^{-1}}$, root which represent the *Regular - Circumscribed* and the *Regular - Inscribed* Polygons in monad , AB , then quaternion $\mathbf{z^d} = \overline{\mathbf{z}} = s + \overline{v} = s + \overline{v}.\mathbf{i} = \mathbf{s} + [v_1+v_2+v_3].\Box\mathbf{i} = s + \overline{v}\,\Box i$, where , **s ,** is the Scalar part and $\overline{\mathbf{v}} = [v_1+v_2+v_3]$, the Imaginary part of it , equal to $\overline{v}\,\Box i$, [25] and ,

$\to \mathbf{z^d} = (s + \overline{v}\,\Box i)^\mathbf{d} = [z_o.(\cos\varphi + i.\sin\varphi)]^\mathbf{d} = |z_o|^\mathbf{d}.\{\cos(d\varphi) + \varepsilon.\sin(d\varphi)\} = |z_o|^\mathbf{d}.\ e^{i(d\varphi)}$, *where*

$\to |z_o| = \sqrt{s^2 + v^2_1 + v^2_2 + v^2_3}$, $\varepsilon = [v_1.i + v_2.j + v_{3.k}] / [\ \sqrt{v^2_1 + v^2_2 + v^2_3}]$, $\cos\varphi = s\ /|z_o|$

And ,

$\to \mathbf{z^{1/d}} = (s+\overline{v}\,\Box i)^{1/\mathbf{d}} = Z|o|^{-\mathbf{d}}.\ [\cos(\varphi+2k\pi)/w + i.\sin(\varphi+2k\pi)/w] = |z_o|^{-\mathbf{d}}.\ e^{i(\varphi+2k\pi)/d}$, i.e.

      In Planck`s length , the Rotational Energy $\overline{\mathbf{B}} = $ Spin , or $E = \Lambda = \overline{B} = (m\overline{v}).\ \lambda_P/2 = (m.w\lambda_P/2).\ \lambda_P/2 = (mw).\ \lambda_P^2/4 = (m.2\pi f).^2/4 = f (m\pi.\ \lambda_P^2/2)$.

Total Energy $\mathbf{2L} \equiv \overline{\mathbf{B}w} = $ h . f $= \Lambda.\lambda_P/2 = (m\overline{v}\ \lambda_P^2/4 = (m.w.\lambda_P^2/4).\ \lambda_P = (mw).\lambda^3{}_P$ $/4 = (m.2\pi f).\ \lambda^3{}_{P}/4$

$= f (m\pi.\ \lambda^3{}_P/4)$, or , $\mathbf{2L} \equiv \overline{\mathbf{B}}\overline{w} = \overline{B}\dfrac{v}{r} = \dfrac{v}{(r.m.v)\overline{r}}$ $= mv^2$, which agrees with total energy of cave $\lambda_P/2$.

From equation of Work = Energy $E = P.d\overline{s} = P.\ \overline{v}.dT = P.\ \overline{v}.(2\pi/w) = P.\ \overline{v}.(2\pi/2\pi.\lambda) = P.\ \overline{v}/\ \lambda = hf = h(\overline{v}/L)$, i.e. during diffraction , **d$\overline{\mathbf{s}}$** , frequency , **f** , doesn't change and only the velocity , $\overline{v}$, and wavelength , λ , changes $\leftarrow$ the direction $\to$ Diffraction , **d$\overline{s}$** , maybe on any Quantized Space monad (*quaternion*) **as this is in Planck Length** L_p **but how ?**

Work is embodied in the three regions L_{up} , L_p , L_{ap} as the **Rotating Energy Λ** on dipole $\overline{A}\overline{\overline{B}} = d\overline{s}_{Lup}$, $d\overline{s}_{Lp}$, $d\overline{s}_{Lap}$, in the Configuration of co variants , Λ , $ds \Box$, with the constant $C = 4.\Lambda ds/\Box (\pi w\lambda^2)$, *which exists simultaneously as the Equation of* $\to$ *Quaternion* = Space . $d\overline{s} = $

$\overline{z} = [s \pm \overline{v}.\nabla i] = [s \pm \overline{v}_{.i}] = $ Work = Total Energy = ET $= [\Lambda\nabla + \Lambda \times \nabla] = \sqrt{[m.\ v^2{}_E E]^2} + [\Lambda.v.\mathbf{B}_+ \quad \Lambda x\ v.\mathbf{B}]^2$

$\sqrt{[m.\ v.\ E^2]^2} + T^2 = \sqrt{[m.\ v.\ E^2]^2} + |\sqrt{p_1.\ v.\ B_1}|^2 + |\sqrt{p_2.\ v.\ B_2}|^2 + |\sqrt{p_3.\ v.\ B_3}|^2 = (\overline{z}_o)^\mathbf{d} = $ =

$(\lambda , \Lambda.\Box I)^\mathbf{d} = | \overline{z}_o|^\mathbf{d}.\ e^{v - d\vartheta} = | \overline{z}_o|^\mathbf{d}.\ e^\wedge \{ [\overline{\Lambda}\Box i /\sqrt{\Lambda'\Lambda}].\ [\text{Arc}$ $\text{Cos} (\mathbf{d}|\lambda/2|.|\sqrt{\overline{z}}`_o.\ \overline{z}_o|\}$ **i.e.**

Nature has not any < meter > *to measure quantized quantities (of Space and Energy) except these of Geometry constants , one of which is number ,* π , (*Archimedes number ,* π) , *so the quantization of Points* (as 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* **d**.*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* $\mathbf{W_d}$ *as ,*

$\mathbf{W_d} = (mw)\ \lambda_P^2/4 = (2m\pi f).\ \lambda_P^2/4 = (m\pi.\ \lambda_P^2/2).f = C.f.$ i.e

From above monads $(s+\overline{v}\,\Box i)^{1/\mathbf{d}} = | z_o|^{-\mathbf{d}}.\ e^{i(\varphi+2k\pi/d}$, where $\cos\varphi = s / |z_o|$, and for Rotated energy case , where , **s = 0** , and also for , $\cos\varphi = 0$, exists for angle $\varphi = \pi/2$, quaternion $(s+\overline{v}\,\Box i)^{1/\mathbf{d}}$

as dimension power $e^{i.\left(\frac{\pi}{2}+2k\pi\right).1} = e^{-i.\left(\frac{5\pi}{2}\right).b} = e^{-i.\left(\frac{\pi}{2}+2k\pi\right).b} = e^{i.(-5\pi/2).10}$ *where is as* [26] ,

$L_p = e^{i.(-5\pi/2).10}$ is the basic Geometrical interpretation of the < **Planck - scale - meter** > based on the two **Geometry constants e ,** π where **k = 1** , and *base* **b = 10** , and this from logarithm properties with different bases on the same base **e** , as $e^\mathbf{d} = (b^{\log_b (e)})^\mathbf{d} = b^{d.\log_b (e)}$ and $^\mathbf{d}\sqrt{e} = e^{1/\mathbf{d}} = e^{-\mathbf{d}} = x^{1/d.\log_b (e)}$ which are monads in monads , *and is therefore of Wave motion* with the angular velocity $\mathbf{w} = 4W_d / (\pi.\ C_o.\ \lambda^2)$, and this because is quantized in the finite-space λ , 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 exists* $\to$

Planck's Length $Lp = e^{-i.\left(\frac{\pi}{2}+2k\pi\right).b} = $ e i . (- 5π/2) .10 = e i . (-5π/2) .10 = e $\overline{)(78,5398)}$ = **8,906 . 10 $^{-35}$** m , **or**

For base e = 2,71828 and base b = 10 then $e^{-78,2879} = 1 .10^{-34}$ m
For base e = 2,71828 and base b = 10 then $e^{-78,5398} = 1 .10^{-34} = $ **8,906 .** 10^{-35} **m**
For base e = 2,71828 and base b = 10 then $e^{-80,5905} = 1 .10^{-35}$ m

Since cave is a versor then *Planck's Length* [**8,906** $.10^{-35}$] is divided by $\pi.\sqrt{3}^{-}$ and is $=1,616199.10^{-35}$m

$$L_p = e^{i.\left(\frac{\pi}{2}+2k\pi\right).b} = e^{-i.\left(5\frac{\pi}{2}\right).b} = e^{i.\left(-5\frac{\pi}{2}\right).10} = e^{-.(78,5398).} = \mathbf{8,906}.10^{-35} \text{ m} = \{\sqrt{3}.\pi.\ \mathbf{1,616199}.10^{-35} \text{ m }\}.$$

which are the Energy - caves , and the Answer to the above question .

B.. *The Geometrical explanation of the Binomial Monad* $\overline{A\overline{B}}$. [31]

According to the Binomial theorem and for , $w = 4$, *which may be any monad* , then monad is composited as ,

$(s + \overline{v}\square i)^4 = s^4 + 4.s^3 .(\overline{v}\square i)^1 + 6.s^2 .(\overline{v}\square i)^2 + 4.s .(\overline{v}\square i)^3 + (\overline{v}\square i)^4$ i.e.

s^4 = The pure Massive part of monad which is the regular Tetrahedron in Space forming the *Massive - Matter* . $(\overline{v}\square i)^4$ = The pure Energy part of monad which is the regular Tetrahedron in Space forming the *Energy – Quanta* .

$4.s^3 .(\overline{v}\square i)^1$ = The mixed massive Trihedral (cube) with *Positive or Negative* linear - energy part forming *Fermions and Bosons* .

$6.s^2 .(\overline{v}\square i)^2$ = The mixed massive regular Plane (square) with *Positive or Negative* energy part in Plane *forming the Antimatter* .

$4.s .(\overline{v}\square i)^3$ = The mixed massive regular Linear (on straight line) with *Positive or Negative* energy Cube part in Space *forming Energy - fields* .

A more extend explanation in [14 - 29 - 31] . Summary :

a).. From definition $\mathbf{Spin} \equiv \dfrac{E}{w} = \dfrac{h}{2\pi}$ = The Total Energy , E , in Particles .

From Mechanics , Physics the Total energy $2L \equiv \overline{B}\overline{w} = h . f$, and $\overline{B} = \dfrac{h.f}{w} = \dfrac{h}{2\pi}$, where ,

$\overline{B}$ = The Angular –Momentum – Ellipsoid . $\overline{w}$ = The Angular –Velocity – Ellipsoid .

meaning that $\rightarrow$ Spin $= \dfrac{h}{2\pi}$ is identical with the Angular –Momentum –Ellipsoid $\overline{B} = \dfrac{h}{2\pi}$ of the Material Point .

b).. The Rolling of the [$\oplus$] constituent , on the *Great-Circles* of the [$\ominus$] constituent in the Material-Point , creates the + *or* – Bosons with *Angular-Momentum-Vector* $\overline{B}$ = Spin $=\dfrac{h}{2\pi}$ = 1

c).. The Rolling of the [$\oplus$] constituent , on the *Anticlockwise Small-Circles* of the [$\ominus$] constituent in the Material-Point , creates the–Fermions with *Angular-Momentum-Vector* $\overline{B}$ = Spin $=\dfrac{h}{4\pi} = -\dfrac{1}{2}$ d).. The Rolling of the [$\oplus$] constituent , on the *Clockwise Small-Circles* of the [$\ominus$] constituent in the Material-Point , creates the +Fermions with *Angular-Momentum-Vector* $\overline{B}$ = Spin $=\dfrac{h}{4\pi} = +\dfrac{1}{2}$ e).. Material-Point is a monad with Pure Massive part , a *Regular - Polyhedron* in Space and with Pure Energy part , the *Work in the Regular - Polyhedron* in Space and with mixed massive Polyhedron with linear – Plane and Cube Energy parts .

1.4. Spin , and the Magnetic - moment.

Magnetic Dipole - moment ($\overline{\mu}$) , *or the Torque on a current loop* , is a ***vector - quantity*** arising from the rotation of a current (I) in a circular loop of radius ,r, and area $A = \pi r^2$. The magnetic moment generated by this circular current is the current times the area of circle .

Its direction is perpendicular to the area , A , and is determined by the right-hand rule and is ,

Magnetic – moment . $\overline{\mu} = I . A$ ......(a)

From material point (page 48) $2L \equiv \overline{B}\overline{w} = h . f$, $|w| = \dfrac{\sigma}{2r}[1+\sqrt{5}$] and f $= \dfrac{(1+\sqrt{5}).\sigma}{4\pi r}$

Angular momentum $\overline{B} = \dfrac{2L}{\overline{w}} = \dfrac{2L}{2\pi f} = [\dfrac{L}{\pi}].[\dfrac{1}{f}] = \dfrac{4r.L}{(1+\sqrt{5}).\sigma} = [r\,\sigma\,(1+\sqrt{5})]$ ....(b)

From (a) , (b) the Angular – velocity - Ellipsoid $\overline{w}$, is the analogous to circular current ,**I**, and Angular - Momentum-Ellipsoid $\overline{B}$, is the analogous to the Torque ,$\overline{\mu}$, on this circular loop so, $\overline{\mu}$ = I . A =

$\overline{B} = \dfrac{4r.L}{(1+\sqrt{5}).\sigma} = \dfrac{2r.(hf)}{(1+\sqrt{5}).\sigma} = [\dfrac{h}{2\pi}]$ = SPIN i.e. .... (c) ***The Magnetic – moment of Material***

$-point = [\dfrac{h}{2\pi}] \equiv$ **SPIN** , and also equal to the *Angular–Momentum –Vector* $\overline{B} = \dfrac{\pi r^3 \sigma}{8}[1+\sqrt{5}] \equiv [\dfrac{h}{2\pi}]$.

The effect of Magnetic-moment on an External magnetic field $\overline{P}$ is the Torque acting on the Dipole $\overline{\tau} = \overline{\mu} \times \overline{P}$, representing the lowest Energy configuration , and has a Potential energy $U = -\overline{\mu}.\overline{P}$ with force in the loop $\rightarrow$ $F_{loop} = \square(\overline{\mu}.\overline{P})$ and for Dipole $\rightarrow F_{dipole} = (\overline{\mu}.\square).\overline{P})$ or $\rightarrow$ $F_{loop} = F_{dipole} + \overline{\mu}.(\square \times \overline{P})$.

The Potential energy associated with the magnetic moment is $U = -\overline{\mu}.\overline{P}$ so that the difference in energy aligned and anti-aligned is $\Delta U = 2\overline{\mu}.\overline{P}$.

From Physics ,The intrinsic magnetic moment ,$\overline{\mu} = \dfrac{g_s.q}{2m}. S$, where g_s= a dimensionless quantity q = the charge , m = the mass , S = the Spin of particles and from (c) , $L = Bw/2$, and $B = S$ then ,

$\overline{\mu}$ *intrinsic* $= \dfrac{4r.L}{(1+\sqrt{5}).\sigma} = \dfrac{2wr.B}{(1+\sqrt{5}).\sigma}$ and $\overline{\mu} = \dfrac{g_s.q}{2m.S}$, or $g_s = 2(\dfrac{m.\overline{\mu}}{q.S})$, and because charge is equivalent

to angular velocity vector , $\overline{w}$, then $\mathbf{g_s} = 2 . (\dfrac{m.\overline{\mu}}{\overline{w}.S}) = 2 . [\dfrac{m.(\overline{\mu}=2L`)}{\overline{w}.S=2L}]$ ....(d)

i.e. Dimensionless quantity $\mathbf{g_s}$, is related to $\rightarrow$ mass **m** , charge **q** , Spin **S** , and Intrinsic magnetic   moment $\overline{\mathbf{\mu}}$, or $\rightarrow$ analogous to mass **m** , Angular velocity **w ,** and Glue-bond **σ** .

   This Intrinsic Angular-momentum $\overline{\mathbf{w}}$, of *Material-point* allows Spin **S** , to be quantized as to
(a)   Straightly in Great-circles , [S = $\square$ 1] by rotation Up or Down to the circles ,
(b)   either anticlockwise in Left-Small-circle , [S = -1] , by rotation Up or Down to the circles , or (c) clockwise in the Right-Small-circle [S = +1]   by rotation Up or Down to the circles .
All particles Fermions or Bosons are becoming from above three states just by ***Adding the Spins*** , so Complex structure would have a spin of , $-\dfrac{1}{2}$, 1 , $+\dfrac{1}{2}$, or $+\dfrac{1}{2}$, -1 , $-\dfrac{1}{2}$ only .
The specific rotational velocity v = wr $=|w|r = \dfrac{\sigma}{2r} [1+ \sqrt{5}].r = \dfrac{\sigma}{2} [1+ \sqrt{5}]$ is related to Glue-bond , σ , only , meaning the ***Granularity of Spin in all depths of Energy-caves*** .

The nature of , + Spin , is exactly the same to , - Spin , because is the Angular-momentum ***Vector*** $\overline{B}$ of opposite direction and has nothing to do with Spinors .
Space is a ***Quaternion ,*** having discrete quantized Energy boundaries those of the two , $(\oplus)$, $(\ominus)$, constituents eternally rolling on Great or Small circles and accordingly ,Clockwise or Anticlockwise *Originating* the ± Spin or (+) , (-) Spin . It is the first ***Quantized – Energy – monad .***
Charge in Physics is the physical properties of matter that causes it to experience a Force when   placed in an Electromagnetic field , In contrast to ***Material-Point*** , where Force , $\overline{B}$, is originated from the Glue-bond , ±σ , of any two opposite constituents in Energy - caves .
Since current , I , is the net outward current through a closed surface and , Q , is the Electric charge contained within the volume defined by the surface , then Electric charge is equivalent to Magnetic moment , or $\overline{Q} \equiv \overline{\mu}$, and current equivalent to angular velocity , or I $\equiv$ w .
Mass in Physics is a property of a physical body , it is a measure of an object`s resistance to the acceleration , a change in its state of motion when a net force is applied , while in ***Material-Point*** , from its Angular acceleration , $a_a = \dfrac{\overline{B}x\overline{w}}{J}$,
where J $= \dfrac{\pi r4}{2}$ = The polar moment of inertia and from
Newton equation 2E = m.a_a then   m $= \dfrac{2E}{a_a} = [\dfrac{\overline{B}.\overline{w}}{\overline{B}x\overline{w}}]. J =$ which is the reaction to Angular-velocity changes in direction ,a Scalar magnitude ,and since *Inertial mass* is equal to *Gravitational mass* then ,

Mass of Material - point $= m = \dfrac{2E}{a_a} = [\dfrac{\overline{B}.\overline{w}}{\overline{B}x\overline{w}}] . J =$ a number

For an inclination of 45° then the ***Dot Product of*** $\overline{B}$. $\overline{w}$ is $\rightarrow |\overline{B}|. |\overline{w}| = |\overline{B}|. |\overline{w}|$.cos 45° and the ***Cross Product of*** $\overline{B}x\overline{w}$ is $\rightarrow |\overline{B}|x|\overline{w}| = |\overline{B}|x|\overline{w}|$.sin 45° ***equal to Dot Product ,*** and   ***In Planck`s – length - cave*** r = 4,453. 10^{-35} and then $\rightarrow$
mass becomes   m $= \dfrac{1}{1} . J = \dfrac{\pi r4}{2} = 617,63.10^{-140} = 6,1763. \ 10^{-138}$ Kg .

From Figure 19 , the Ellipsoid of Angular-velocity is $\dfrac{w_1^2}{2} + \dfrac{w_2^2}{2} + \dfrac{w_3^2}{1} = \dfrac{2L}{J_3}$

Since also w $= \dfrac{\dot v}{r}$, and since in small circles the radius R < r , the radius of the Great circles ,   then , Angular velocity vector and frequency increases while Period ,T, decreases . This *Precession in Material point* is the analogous to *Nutation of Earth and other Planets* indicating the relation of Microcosm and the Macrocosm to the same laws of Mechanics .

From equation $\overline{B}$ = r.m.v = m.r.wr = m.w.r² , mass m $= \dfrac{B}{wr^2} = \dfrac{2B}{\sigma.r(1+\sqrt{5})} = \dfrac{2h}{[2\pi r]\sigma(1+\sqrt{5})}$ ..... (m)
Equation (m) is the mass of Material point related to the cave and its Principal stresses ±σ .
Applying above to *Under Planck`s length* (that what is called virtual particle-antiparticle pairs and fields) { The Spin $\equiv$ the ***Angular – Momentum -Vector*** $\overline{B}$ in the Self rotating ***Material point*** [+s² $\leftrightarrow$ - s²] } it explains the Why galaxies , and clusters of galaxies remain stable . In the tanks of $(\oplus \equiv$ +s²) , $(\ominus$ $\equiv$ - s²) , ***emerge Spin as The Automobile Force*** in energy vacuum. This energy vacuum is further analyzed .   **In *Gravity- length - cave*   r = 3,969. 10^{-62} $\rightarrow$ mass becomes

$\qquad$ m $= \dfrac{1}{1} . J = \dfrac{\pi r4}{2} = 248,156.10^{-248}$ $\qquad\qquad = 2,482. \ 10^{-246}$Kg .

1.5. *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$\overline{v}$ / dt equal to *acceleration due to gravity* , **g** . [39]
Gravity is the Stationary force $\rightarrow$ [$\square$i = 2(wr)²] $\leftarrow$ on the base for all motions , which is the $\rightarrow$ Medium – Field – Material - Fragment, |±s²| = (wr)² = [MFMF] $\leftarrow$ in all universe and so , Newtonian theory of gravity , acting instaneousley between two separated masses is correct .

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 10^{-62} and the beyond Planck`s length 10^{-35}.

Let call this in between distance $\rightarrow [10^{-62} -- 10^{-35}] \equiv$ Vacuum.

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

During Intrinsic Diffraction ,$d\overline{s} = \lambda$, of isochronous motion of vectors , *frequency* ,f, *doesn't change* and only velocity , $\overline{v}$, and wavelength ,λ, changes so from equation $\rightarrow \lambda = \overline{v} T = \overline{v} / f$, $\rightarrow \overline{v} = \lambda f$ and Acceleration $a = d\overline{v} / dt = (d\lambda/dt).f + \lambda(df/dt)$ then $\rightarrow \mathbf{a = g = d\overline{v} / dt = (d\lambda/dt).f}$ *since* f = *constant* , *or* ,

Let $\lambda \rightarrow$ be the wavelength of a moving monad , $t = \lambda / c \rightarrow$ is the needed time to cross length , λ, $\mathbf{s = at^2 / 2} \rightarrow$ Deflection due to acceleration ,a,

$H = gt^2 / 2 \rightarrow$ Deflection due to acceleration of ,g, and $\rightarrow t^2 = 2. H / g$ ……. (1) For monad $s = \lambda$ then $\mathbf{s = at^2 /2} = c.T$ where , T is the period of Isochronous displacement and , $t^2 = 2. cT / a$ …..(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 $\mathbf{a = g}$ **Therefore , *all particles have the same acceleration , g , in our gravitational field with frequency unchanged , and $\rightarrow$ velocity , $d\overline{v}$, 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 $\equiv$ Gravitational mass* $\rightarrow$ $m = \dfrac{2E}{a_a} = [\dfrac{\overline{B}.\overline{w}}{\overline{B}x\overline{w}}] . J =$ a number , meaning that mass is a Number only , which measures the

Magnitude of any two charges $q_1 \equiv m_1$, $q_2 \equiv m_2$, or reactions to any change of motion .

In C $\rightarrow$ *The Energy Stores in the Material point* , is proofed that Energy is stored in the , **n** , loops of Monads $\equiv$ Energy Vectors $\equiv$ Quaternion and , **NOT** *in mass* , with the current concordance model .

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

***Total Energy in* n = n *loops* $\rightarrow$** $W_{n(n+1)} = [\dfrac{4\pi r^2 f1}{3}] . n.(n+1)$ where $n = 1,2,3,4… n .... \infty$

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

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

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

Remarks :

1.. Since mass is dependent on $\overline{B}$ 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* $\rightarrow$ are counterpart to $\rightarrow$ *Mass , Matter* ,** i.e. with opposite electric charge.

2.. Since also , $\square$ $\overline{B}$ vector , 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 $\overline{z} = s + \overline{v}.i = s + \overline{v}.\square i$ on itself is a Binomial type ,

$(s + \overline{v}.\square i)$(©)$(s + \overline{v}.\square i) = [s + \overline{v}.\square i]^2 = s^2 + |\overline{v}|^2 .\square i^2 + 2|s|.|\overline{v}|.\square i = s^2 - |\overline{v}|^2 + 2|s|.|\overline{w}\overline{r}|.\square i = s^2 - V|_-|^2 + [2\overline{w}].|s|.|r|.\square I = s^2 - S|_-|^2 + 2|s|^2.\square i$ { for s = v = w.r } where , $s^2 \rightarrow$ is the real part , *Matter* , of the new quaternion and is *a Positive Scalar magnitude* . $- |\overline{v}|^2 \rightarrow$ is the always negative part , *Anti-matter* , which is always *a Negative Scalar magnitude* .

$[2\overline{w}].|s| |\overline{r}|.\square i \rightarrow$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 $\rightarrow s^2$, $-V|_-|^2$, $[2\overline{w}].|s| |r|.\square i$. 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 $2|s|^2.\square i$.

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.. $[\pm\overline{v}.s^2] \rightarrow$ Fermions and $\rightarrow [\overline{v}.\square i] \rightarrow$ Bosons , ***which are Particles*** , *with Inherent Vibration* B.. $[\pm s^2] \rightarrow$ [MFMF]-Field = ***The Energy - Chaos*** , and the binder Energy-Field [$\square i$] called Gravity force , *without Vibration* .

C.. $[\pm\overline{c}.s^2] \rightarrow$ Dark matter and the binder Gravity-Force [$\square i$] , ***The Expanding Dark-Energy*** [$\overline{c}.\square i$] constituents which are moving with light velocity ,**c**, causing the universe to grow.

Since galaxies travel with light velocity then after a collision of galaxies , Dark–matter{DM}≡[±$\overline{c}$.s²]   is left behind and by bumping into regular matter is get destroyed .

Because Dark–matter {DM} , Dark–energy{DE}≡ [$\overline{c}$.□i] , travel with light velocity it cannot be seen using light ,*while* {DM} interacting gravitationally can be seen through its gravitational effect on other matter and   {DE}≡ [$\overline{c}$.□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 = $\frac{F}{2m}$ [$\frac{1}{f^2}$]

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 [⊕s² ↔ ⊖ s²] or   Rotational [⊕s² ↻↻ ⊖   s²]*** in any manner , is the solution will contain many of the normal modes and the equation (10) for the displacement can be written as ,

$$y(x , t) = \sum_{n=1}^{\infty} C_n \sin(w_n t) + D_n \cos(w_n t) . \sin(n\pi \frac{x}{l}) \quad and \quad w_n = \frac{n\pi c}{l} = \frac{n\pi c}{2r}$$ ...(10)   where ,   by fitting equation to the initial conditions of y(x,0) and ý(x,0) , the C_n , 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

The difference between , ***Vacuum - Energy [$W_{n(n+1)}$] and Dark - Energy [$\overline{c}$.□i]*** , is that Vacuum [**r**] ***is a Stationary Wave*** with Energy **W_n** in the , **n** , Loops of the Material point , while Dark - Energy is a ***Pushing Kinetic Energy*** {DE}≡ [***$\overline{c}$.□i***] , travelling with the → DM-DE ≡ [± s²] , Field ← with the light velocity , **c** , and the binding Gravity-Force [□i] *as* , [$\overline{c}$.□i] (©) →{ (□i),(+s²),(-s²),(+cs²),(-cs²) }   *i.e.*
The Cause Expansion of the Universe , is the continuous and simultaneous effect ion of Dark-Energy
DE = [$\overline{c}$.□i] *on all Five Energy-Fragments with light velocity $\overline{c}$, as [$\overline{c}$.□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 [±$\overline{c}$.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 Material world*

 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. It was shown also that the Quality of monads depends on frequency , so all monads can be immediately other monads with different frequency (f) , by following the Breakage rule → s² - |$\overline{s}$|² + 2|s|².□i ←   Since this Infinite Vacuum is **, a Lattice – Granular - Space , connected by Energy** , i.e. *an Energy Space Universe* , therefore is shown , The Way of penetration and The How this is succeeded . [39]

4.. *Gravitational redshift and Time Dilation* : [39]
Gravitational redshift 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 |$\overline{v}$| , *which is a Stationary wave in Photon`s*

wavelength λ , *as →* $\overline{v}$ = λ / T = λ.f and $$f_1 = \frac{(1+\sqrt{5}) . \sigma}{4\pi r} = \frac{E}{h} \quad then \quad \overline{v} = \lambda \frac{(1+\sqrt{5}) . \sigma}{4\pi r} ,$$
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 [(**σ_1**- **σ_2**) = J.k/d or as Isochromatic surfaces , depending on the direction of force (pressure) which is the same in gravity field as length-contracted and length-expanded in a given piece of quantized space .
Streching Removal of λ creates , - **σ_1** , while , Compressed Removal of λ creates , + **σ_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 = 400-484 THz , long λ = 620 -750nm and (**Blueshift)**→ high f = 606-668 THz , short λ= 450-495 nm and High energy since E = h.f at Blue .
In this way Light as cave **r = s = Particle is Photon** , 2s = λ = 380 -780 nm = (3,8-7,8). 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 = $\overline{v}$ = λ.f = λ/T , since Light is 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 Redshift 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 $\mathbf{Spin} \equiv \bar{\mathbf{B}} = [r. \sigma. (1 + \sqrt{5})] = (\frac{8 r^2}{n}).f_n \equiv$ $[\varepsilon E^2 + \mu H^2]/2 = 2rc.\sin.2\varphi$, or as
Matter (+ **E**) , as *Antimatter* (- **P**) *and as Energy part* , $2L = \bar{B}.\bar{w}$, *and always to its constituents , either to all or separate* following $\rightarrow$ Total Energy as $L = (\bar{B}.\,\bar{w}\,/2)$.
Since also frequency f = 1/T and energy $\bar{v} = E = h.f$, then Cycloidal motion Controlls constancy of Energy by changing velocity $\bar{v} = \bar{w}\,r$, and period , $T \equiv \frac{1}{f}$, of monads .
Relativity failed to explain this reality and to explain the **WHY** $\rightarrow$ **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 .*
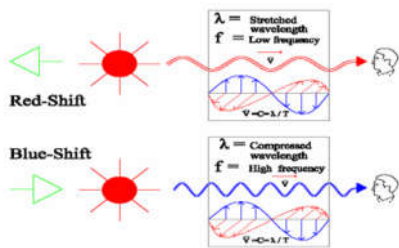
Fig-24. Proton Intrinsic Stationary Wave   of a Removal Source F(f) .

Since During Intrinsic Diffraction , $d\bar{s} = \lambda$, of isochronous motion of vectors *, frequency ,*f, *doesn't change* and only velocity , $\bar{v}$, and wavelength ,λ, changes , so from equation $\rightarrow \lambda = \bar{v}\,T = \bar{v}\,/\,f$, then $\bar{v} = \lambda f$ and Acceleration $a = d\bar{v}\,/\,dt = (d\lambda/dt).f + \lambda(df/dt)$ i.e. $\rightarrow$ **a = g = $d\bar{v}$ / dt = (dλ/dt).f** $\leftarrow$ 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 f_1 , f_2 ,… ,f_n of , *cave $\equiv$ recession* $\lambda = 2.r \equiv n$ 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 $E = h.f = \frac{hc}{\lambda}$, λ , is increasing , i.e. *corresponds to an increase in light`s wavelength* $\lambda \equiv [f_1 , f_2 ,, ,f_n \equiv n$ loops $\equiv$ $\equiv$ lobes following the *Stationary-Wave-Nodes Principle*] . In this way Total-energy is conserved as the   hedgehog in its shell because differently *< 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.
4a.. Numeric Analysis :
Planck constant , h = $6,62606957.\,10^{-34}$ joules , 1 eV = $1,602 .\,10^{-19}$ J
Light velocity c = $2,998.10^8$ m/s , 1 THz = 10^{12} Hz , 1 nm = 10^{-9} m , 1 μm = 10^{-6} m
Total-Energy E = h.f $= \frac{hc}{\lambda} = \frac{6,62606957.10^{-34}.2,998.10^8}{\lambda} = 1,99.10^{-25}$m .(10^6 $_{\mu m/m}$) $= \frac{1,2398}{\lambda.(\mu m)}$ (eV)
and for redshift $\rightarrow$ f = 400 THz = 400. 10^{12} Hz = 4. 10^{14} Hz then corresponds a light`s wavelength

$\lambda = \frac{c}{f} = \frac{2,998.10^8 \text{ m/s}}{4.10^{14} \text{ Hz}} = 7,495. \,10^{-7}$ m.(10^6 $_{\mu m}$) = ,07495 μm ,and Total-Energy $E = \frac{1,24}{\lambda.(\mu m)}$ (eV) ,
$E_R = \frac{1,24}{0,7495} = 1,6542$ eV = $2,65. \,10^{-19}$ Joules , *which maybe considered and as Electron-charge* .
Because Photon may have any wavelength and also that of Planck cave $1,616. \,10^{-35}$ m , then
Energy $E_P = \frac{1,24}{1,616.10^{-35+6}} = 7,673.10^{29}$ eV = $1,229. \,10^{21}$ Joules . The differenc*e* in Energy is
E = E_P - E_R = $7,673.10^{29}$ eV = $1,229. \,10^{21}$ Joules ,
 i.e The Energy - Stores of Photon are always full of Energy $\equiv$ Motion   following on wavelength , The Stationary Wave - Nodes Principle.
Extending quantization of Space and Energy according to exponential formula for acceleration ,
 Planck's Length **L S** = $e^{-i.(-\pi+k\pi).b}$ = **e - i . π (k -1) .10** *, then , $e^{-(29,933606)}$,*
For base e = 2,71828 and base b = 10 then $e^{-(29,933606)}$ = 1 .10^{-13} m *Particles length*
For base **e = 2,71828** and **k = 0** then **L$_S$ = e$^{i.(-\pi).b}$ = e$^{-i(-31,41593)}$ = 3,56237 . 10^{-14} m**
For base e = 2,71828 and base b = 10 then $e^{-(32,236191)}$ = 1 .10^{-14} m *Particles length*
For base e = 2,71828 and base b = 10 then $e^{-(92,103404)}$ = 1 .10^{-27} m *Particles length*
For base **e = 2,71828** and **k = 1** then **L$_S$ = e$^{i.(-2\pi).b}$ e$^{-i(-62,83185)}$ = 9,31289 . 10^{-28} m**
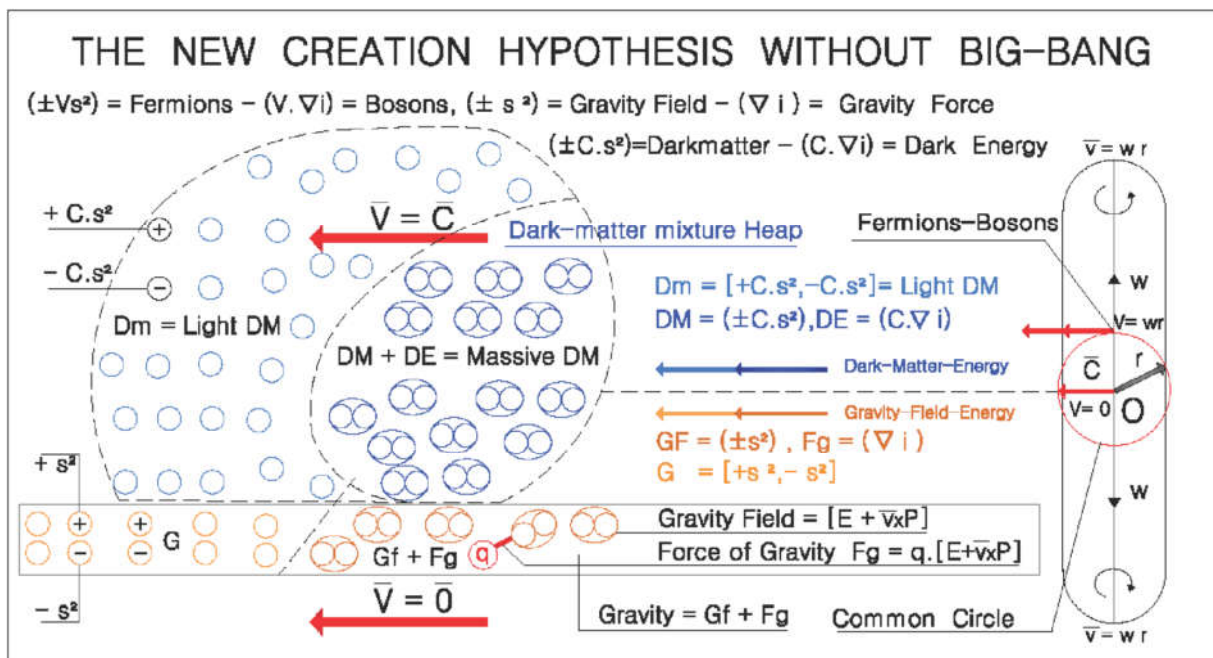For base e = 2,71828 and base b = 10 then $e^{-(94,405989)}$ = 1 .10^{-28} m *Particles length*
Minimum Acceleration happens for Particles in , *Cave $\equiv$ Recession $\equiv$ Wavelength* ,where then Energy ,

Energy $E_a = \dfrac{1,24}{3,56237.10^{-14+6}} = 3,481.10^7$ eV = 5,576. 10^{-10} Joules , while Redshift Energy happens

$E_R = \dfrac{1,24}{0,7495}$ = 1,6542 eV = 2,65. 10^{-19} Joules [Kg.m²/s²]. [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* → s² , -**V**|⌐|² , [2**w**].|s| |r|.□i ← and for , **v̄** ≡ s ≡ r = the cave , then

Because Pure energy happens at s = 0 then 2[**s̄**] ².□i = 0 , i.e. □i = 0 or [□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 loosing Energy. Star - light passing near the Sun is bending because of its refraction in the dense-Sun , and of Newton`s gravitation .

In case of Redshift , Energy is squared as $E_a^2 = E_R$ or [5,576. 10^{-10}] ² = 31,09 . 10^{-20} = E_R 3,109. 10^{-19} Jouls corresponding to a Redshift → f = 404 THz .

1.6. *Dark – Matter , Dark – Energy* : [43]

Dark-matter becoming from the center ,O, of Common-circle where there ,v = 0 , and is (± c.s²) moves with the constant light velocity ,c̄, and is composed of the two opposite signed elements , (+cs²) , (-cs²) , and Dark - Energy [c̄.∇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.*

From Energy , $E = h.f_n = \dfrac{h(1+\sqrt{5})}{4\pi}$. $[\frac{\sigma}{r}] = (\frac{n\sigma}{8\,r^2})$. **B** = $W_d = v^2 [\frac{h}{2\pi}]$, or → $r = \dfrac{n\pi}{2h(1+\sqrt{5})}$ **B** ....(r) .

Because *Gravity-Force* 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 [-s²↻↺+s²] , then for Planck length is ,

Gravity force [∇i] ≡ F_G ≡ $m_G g = g.\nabla[\frac{\sigma}{c^2}]^2.r = m_G \dfrac{v^2}{r} = Jw^2.g_G = \dfrac{v^2}{r} [\frac{\pi r^4}{2}] w^2 = \dfrac{v^2}{r} [\frac{\pi r^4}{2}] \dfrac{v^2}{r^2} = [\frac{\pi r v^4}{2}]$ ....(s)

Substituting (r) in (s) and from relation , Spin $S = \dfrac{h\sqrt{3}}{4\pi}$ then , $F_G ≡ [\frac{\pi v^4}{2}] \dfrac{n\pi}{2h(1+\sqrt{5})}$ **B** $= [\frac{n\pi^2}{4h(1+\sqrt{5})}]$ **B̄**v^4

Gravity-force → $F_G ≡ \dfrac{n\pi\sqrt{3}}{16(1+\sqrt{5})} v^4 = \dfrac{n\sqrt{3\pi}}{(1+\sqrt{5})} (\frac{v}{2})^4$, *which is the Black-hole-gravity - equation related to the Inner velocity v , and to its n lobes* .

$g_G = [\frac{\pi r v^4}{2}] = [\dfrac{3,1415926([\sqrt{5}+1].\sqrt[4]{2}.10^{-35}).(299793458)^4}{2}] e^3 = 6,044981.10^{-35}.80,776078.10^{32}.20,085536 =$

$g_G = $ 9,8075633 m/s² , *where* 1 / m_G = [$\sqrt{5}+1$] .$\sqrt[4]{2}$. e^3

The [*Geometrically Rolling , Moved mixture* **DM-DE**] *Expansion* for constructing universe.

THE NEW CREATION HYPOTHESIS WITHOUT BIG–BANG

(±Vs²) = Fermions – (V.∇i) = Bosons, (± s ³) = Gravity Field – (∇ i) = Gravity Force
(±C.s²)=Darkmatter – (C.∇i) = Dark Energy   v̄ = w r

+ C.s²   V = C   Dark-matter mixture Heap   Fermions–Bosons
– C.s²
Dm = Light DM   Dm = [+C.s²,–C.s²]= Light DM
DM + DE = Massive DM   DM = (±C.s²),DE = (C.∇ i)
Dark-Matter–Energy   c̄   r
Gravity-Field–Energy   V= 0 O
+ s³   GF = (±s²) , Fg = (∇ i)
G = [+s ²,– s²]   w
Gf + Fg (q)   Gravity Field = [E + v̄xP]   V= wr
V = 0   Force of Gravity Fg = q.[E+v̄xP]
– s²   Gravity = Gf + Fg   Common Circle   v̄ = w r

Fig-25. 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 [$G_f + F_g$] as the Base of rolling.

The three properties of Dark-matter [DM]→ [(+c.s²),(-c.s²),(±c.s ²)] and Dark-energy [DE] →[$\overline{c}.\square i$] **:**
Since [DM] = $\pm\overline{c}.s^2$, is of opposite signed ($\pm$) , then consists the Dipole , [|+c.s²|↔|-c.s²|] = |λ| ≡ [|+c.($\overline{w}$.r)²|↔|-c.($\overline{w}$.r)²|]
of Dark matter which is a more massive base than that of gravity , *and this because of ,c*, so issues DM field = [E_m+ $\overline{c}$.P

m] = [c. E_g+ $\overline{c}$².P_g] and as this is also a Stationary field then follows equation E_m= 2.A.c. $\sin(\frac{2\pi}{\lambda}).\cos wt$ where $P_m \square$
E_m . Since also the tiny volume of
|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 . [E_m+ $\overline{c}$.P_m] align with the field , so on [DM] dipole [E_m+ $\overline{c}$.P_m] exist
also a torque (τ) and in this way [DE] repels.

Dark-energy [$\overline{c}.\square i$] 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 , ***DE is influencing as an expansion of the universe*** .
Because [DE] is a stationary force on [DM] , so is exerting a strong gravitational pull on gravity field (participates in
gravity) . Action of Dark matter , Dark Energy is ,
[DE] © [DM] ≡ [$\overline{c}.\square i$] © [DM] → [$\overline{c}.\square i$].(+c.s²) , [$\overline{c}.\square i$].(-c.s²) , [$\overline{c}.\square i$].|(±c.s²)| = [$\overline{c}.\square i$].[|+c.s²|↔|-c.s²|] ,   and Results
to ,
1.. DM → [|+c.s²|↔|-c.s²|] attracts and DE → [$\overline{c}.\square i$] repels and not competing.
2.. DE is exerting a pull and gravitational pull on all visible matter on the largest cosmic scale of universe .
3.. DE by exerting pull on DM → [$\overline{c}.\square i$].(+c.s²) and on [$\overline{c}.\square i$].(-c.s²) *highlights* , and on →   [$\overline{c}.\square i$].[|+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]
4.. DM and DE are not visible because both travel with light velocity and so light is not interacting with   them. Light ,
which is a particle , 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 .

   When Anti-matter annihilates with matter , gamma rays are produced 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
the 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 ,I_g, while of the Moving DE,DM is that of ,   c .I_g , so in this way occurs expansion of the universe . GR
being confined in Planck`s length 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 F_g ,   because both have already passed from the center of STPL
contracted mechanism.
  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 → a Number ,*** the Discrete ≡ Granular **,**

   → ***Infinite → Geometrical Universe ,*** Energy density of base.   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
.Black-hole growth is connected.   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 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 a dual equilibrium system which results to the equality of opposite signed forces.*

1.7. *The New Creation Hypothesis is Summarized as follows* **F-24 :**

a... From Nothing (*i.e. the Point*) to Existence (*i.e. to be 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] as **[□i = 2(wr)²] x [± s²] .**

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 Momentums which equilibrium , *as Work* $W_{n(n+1)}$, *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 $\overline{v},\overline{c}$ 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 Common circle curl Ellipsoid forming the Rest Gravity Field - energy 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 cylindrical volume.

e.. In this cylindrical volume , which are the parallel inertial systems , **is the Rest** Gravity Field – Energy 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.

Mechanically :

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 . 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 Unbalance of Whirling ,*it is a common source of vibration excitation*, the Rotating unbalanced *,* where 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 and Repelling ,* i.e. all moving Particles -Antiparticles and Bosons and all their producing`s , on where laws of Chemistry and Physics are applied and ,

Dark Energy DE $\equiv$ **[$\overline{c}$.□i] (©)** $\rightarrow$ Acting on the Five Constituents $\rightarrow$ **[(□i),(+s²),(-s²),(+cs²),(-cs²)]**

[± s²] $\rightarrow$ MFMF Field   [± $\overline{c}$.s²] $\rightarrow$ DM-DE Field , of , Dark matter and Anti-matter.

[±$\overline{v}$.s²] $\rightarrow$ Fermions   [□i] $\rightarrow$ $G_f = g.\nabla[\frac{\sigma}{c^2}]^2$. r Gravity-Force in DM-DE Field.

[$\overline{v}$.□i] $\rightarrow$ Bosons ,   [$\overline{c}$.□i] $\equiv$ DE $\rightarrow$ Dark Energy   **c** x (©) [. □i] $\rightarrow$ Gravity Force   DE $\equiv$ [$\overline{c}$.□i] $=\overline{c}$ [□i] = The Travelling-Energy with ,**c**, velocity.

Regular Matter. $\rightarrow$ $\ominus$ **s²** $\equiv$ Electron , $\oplus$**s²** $\equiv$ Proton   , $|\ominus$**s²** ʊʊ $\oplus$ **s²**] $\equiv$ Neutron ʊ

Anti - Matter $\rightarrow$ + $\ominus$ $\equiv$ Positron , - $\oplus$ $\equiv$ Anti-Proton   , $[\ominus$ **s²** ʊʊ $\oplus$ **s²**] $\equiv$ Neutron ʊ

Dark - Matter $\rightarrow$ [+$\overline{c}$.s²] $\equiv$ Matter , [-$\overline{c}$.s²] $\equiv$ Anti-Matter , [$\overline{c}.\ominus$**s²** ʊʊ$\overline{c}\oplus$**s²**] $\equiv$ □ Matter

Dark – Energy $\rightarrow$ [+$\overline{c}$.□i] $\equiv$ Energy , [-$\overline{c}$.□i] $\equiv$ Anti-Energy , [$\overline{c}.\ominus$□i ʊʊ$\overline{c}.\oplus$ □i] $\equiv$ □ Spin

Degenerate-Matter [+$\overline{v}$.s²] $\equiv$ D-matter , [-$\overline{v}$.s²] $\equiv$ D-Anti-Matter, [$\overline{v}\ominus$**s²** ʊʊ$\overline{v}\oplus$**s²**] $\equiv$ □ D-matter

Galaxies are accelerated and expanded as equation $\rightarrow$ ds $= \frac{F}{2m}[\frac{1}{f^2}] \equiv \frac{F=[\overline{c}.\nabla i]}{2m}[\frac{1}{f^2}] \equiv \frac{[\overline{c}.\nabla i]}{2m}[\frac{1}{f^2}]$

It was shown that cavities ,**r,** are *Inward a Stationary Wave* with infinite Frequencies $f_1.. f_n \rightarrow f_\infty$, and with Energy , E = h. $f_n = \frac{h(1+\sqrt{5})}{4\pi}.[\frac{\sigma}{r}] = (\frac{n\sigma}{8 r^2}) . \overline{B} = W_d = v^2 [\frac{h}{2\pi}]$, or $\rightarrow$ r $= \frac{n\pi}{2h(1+\sqrt{5})} \overline{B}$ ....(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*** , ⊡ **B̄** , 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 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 . [68] .

D.. The Energy Stores in the Material-Point .

1.. *General* **:**

From the definition of Work , ***Work = Force*** x ***Displacement = Energy*** , results the where this Energy as , *Momentum Vector* $\overline{B}$ ≡ *Spin* ≡ *Energy* ,is stored in **r**, cave of $KK_1 = \overline{q} = [s+\overline{v}\square i]$ → Figure 13.-(3) The ,**r**, cave , **IS** , *Outward a Stationary Box* , *Inward a Stationary Wave* , with infinite frequencies

$f_1 .... f_n \to f_\infty$ and with Energy , $E = h.$ $f_n = \dfrac{h(1+\sqrt{5})}{4\pi} . [\dfrac{\sigma}{r}] = (\dfrac{n\sigma}{8\,r^2}) . \overline{B} = W_d = 8.kf_n A_r$ ......(e)

2.. *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 KK_1 axis . The lateral deflection ,y, of the string KK_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 ,

$$T [\theta + \dfrac{\partial \theta}{\partial x} dx] - T\theta = \rho.dx.\dfrac{d^2 y}{dt^2} \quad \text{or} \quad \dfrac{\partial \theta}{\partial x} = \dfrac{\rho}{T}.\dfrac{d^2 y}{dt^2} \quad .....(1) \text{ and because}$$

the slope of the string KK_1 is $\theta = \dfrac{\partial y}{\partial x}$ equation (1) reduces to $\dfrac{\partial^2 y}{\partial x^2} = \dfrac{1}{c^2}.\dfrac{\partial^2 y}{\partial t^2}$ ....(2) where $c = \sqrt{\dfrac{T}{\rho}} = \sqrt{\dfrac{\sigma}{\rho}}$ 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 $y = F_1(ct - x) + F_2(ct + x)$ where , F_1 , F_2 , are arbitrary functions and regardless of the type of function , the argument (ct ⊡ x) upon differentiation leads to equation $\dfrac{\partial^2 F}{\partial x^2} = \dfrac{1}{c^2}.\dfrac{\partial^2 F}{\partial t^2}$ .... (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 $y(x,t) = Y(x).G(t)$ ......(4) and by substitution to (2)

then → $\dfrac{1}{Y}.\dfrac{d^2 Y}{dx^2} = \dfrac{1}{c^2}.\dfrac{1}{G}.\dfrac{d^2 G}{dt^2}$ .... (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 $-[\dfrac{w}{c}]^2$, are obtained the two ordinary differential equations ,

$$\dfrac{d^2 Y}{dx^2} + (\dfrac{w}{c})^2 = 0 \quad \text{and} \quad \dfrac{d^2 G}{dt^2} + w^2 G = 0 \quad \text{with the general solution ,}$$

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

The arbitrary constants A , B , C , D , depend on the boundary conditions and the initial conditions . When the string $KK_1 = ds$ 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 $y = [C .\sin wt + D .\cos wt].\sin(\dfrac{w}{c}).x$ .....(7)

The condition that $y(l, t) = 0$, leads to the equation $y = \dfrac{\sin(\dfrac{wl}{c})}{c} = 0$ or , $\sin \dfrac{wl}{c} = 0$ and , $\dfrac{w.l}{c} = \dfrac{w_n . l}{c} = n.\pi$

, where n = 1 , 2 , 3 , 4 , ... n ...... ∞ ....(8) and $\lambda = \dfrac{c}{f}$ is the wavelength , f = the frequency of oscillation i.e.

Each , n , represents a Normal - Mode - Vibration with natural frequency determined from equation ,

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

and the sinusoidal mode shape → $Y = \sin(n\pi\dfrac{x}{l}) = \sin(n\pi\dfrac{x}{2r})$ for caves $l = 2r$ i.e. F13-3

The rotating axis KK_1 creates the , ***Linear vibration of string*** , *and the Natural - frequency* f_n ,*in Material – point* K ≡ [⊖] ↔ K_1 ≡ [⊕] *as well the* **Rotational vibration of string** [⊕ s² ꙨꙨ ⊖ s²] .

The more general case of free vibration of Material-point , ***Linear*** [⊕s² ↔ ⊖ s²] *or* ***Rotational*** [⊕s² ꙨꙨ ⊖ s²] in any manner , the solution will contain many of the normal modes and the equation for the displacement can be written as ,

$y(x, t) = \sum_{n=1}^{\infty} C_n \sin(w_n t) + D_n \cos(w_n t) \cdot \sin(n\pi \frac{x}{l})$ and $w_n = \frac{n\pi c}{l} = \frac{n\pi c}{2r}$ ....(10) where , by fitting equation to the initial conditions of $y(x,0)$ and $\dot{y}(x,0)$, the C_n , D_n , can be evaluated.

From Planck's Energy $E = h \cdot f = (h/\lambda).c$ is equal to the Isochromatic pattern fringe-order in monad as $\sigma_1 - \sigma_2 = (a/d).N = (a/d).n.f_1 = (8\pi r^2/3).nf_1$ where , n = the order of isochromatic , *a number* , and , f_1 = The frequency of Fundamental-Harmonic .

This is the why colors exist in fringe-order and are of wave form.

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 $(wr)^2$ as ,

$E = Spin$, *work* $\rightarrow W$ = $\bar{S}.wr = (h/2\pi).2\pi rf = [\frac{8\pi r^3 f1}{3}].[\frac{n(n+1)}{2}] = [\frac{4\pi r^3 f1}{3}].n.(n+1)$ and , ...(11)

$$f_1 = \frac{(1+\sqrt{5}).\sigma}{4\pi r}$$

Represents the Total Energy Stored in cave , r , and of , n , fringes where $\rightarrow$

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 $\varphi = kx-wt$ = Spatial and Time Oscillation dependence , For n = 1 , Energy in the First Harmonic is , $E = 2\pi r.c = [\frac{2\pi r^2}{3}].f_1$, and for n = 2 , Energy in the First and Second Isochromatic Harmonic is , $E = [\frac{4\pi r^2}{3}].f_1$ in threes, and , φ , is trisected with Energy-Bunched variation f_2 , i.e.

Energy stored in a homogeneous resonance , is spread in the First of Seven-Harmonics beginning from the (first) *Fundamental and after the filling with frequency , f_1 , follows the Second - Harmonic with frequency ,* 2.f_1 , and so on .

In this - *way the Energy Space monads are generated from the frequency in caves , or from the slits .*

Also this is the How Spin is 1 or ½ or $\frac{1}{N}$. *The Why Spin is ,* $\frac{l}{2}$, $\frac{l}{3}$, $\frac{l}{4}$, $\frac{l}{5}$, ...$\frac{l}{N}$, in monads *i.e.*

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

Wave-nodes , where Spin $= \bar{B} = f_n.(\frac{8r^2}{n\sigma}) =$ Energy in N wave-node-loops .

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

Since Momentum-Ellipsoid , $\bar{B}$, is perpendicular to , Angular - velocity-Ellipsoid , $\bar{w}$, no Work is produced and the Status is Neutral . This property issuing in Material - point allows ,

Spin $\equiv \bar{B}$ Vector and , Velocity-Magnitude $= \bar{w}$, be conserved as Total Energy $2L = \bar{B} . \bar{w} = J . w^2$.

3.. The Energy loops :

In Material point , *and because of rotation , Stretched - String Energy $\bar{B}$ is not transmitted , but trapped in the , N loops , where 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 $\rightarrow$* the N loops are the N

Energy-stores in M-P . *This is the Why Spin is ,* $\frac{l}{2}$, $\frac{l}{3}$, $\frac{l}{4}$, $\frac{l}{5}$, ...$\frac{1}{N}$, *i.e.* ↺ N^{th}- *loop*

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

The Energy $\bar{B} = \frac{h}{2\pi}$ = Spin = $\frac{h.f_1}{\bar{w}}$ = as velocity , v = (wr) in cave . *l* . is the Spin ½ , while Doubled $\bar{B} = \frac{h}{2\pi}$

= Spin = 2 = $\frac{h.f}{\bar{w}}$ = 2. $\bar{B}$, in the same cave , *l* , then $\rightarrow$ f = 2. $f_1 = f_2$ i.e.

In the same cave , *l* , Energy is quantized as $\rightarrow$ $\frac{1}{2}$ / 2 .$\frac{1}{2}$ =1 / 3 .$\frac{1}{2}$ = 1,5 / 4 .$\frac{1}{2}$ = 2 , ... n $\frac{1}{2}$ = n.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 $\rightarrow W$ = $[\frac{4\pi r^3}{3}].f_1$ *and for the $n^{th} \rightarrow$* W = $[\frac{4\pi r^3}{3}] . f_n = n\frac{(1+\sqrt{5}).\sigma r}{3}$

Total Energy in n = n loops $\rightarrow$ W = $[\frac{4\pi r^3 f1}{3}]$. n.(n+1)   where n = 1,2,3,4... n .... ∞
and by using Summation of series

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

It was proved that Energy of wave is , $\rightarrow E = m.\dot{y}^2/2 = (m/2).(-wA_0)^2$, and $\mathbf{m = \dfrac{E}{2r^2.w^2}}$ i.e.

Mass in cave ,**r**, is $\rightarrow m = \dfrac{E}{2r^2.w^2} = \dfrac{\overline{B}}{2r^2.w^2} = \dfrac{W}{2r^2.w^2} = \dfrac{(1+\sqrt{5})\,4r^2\sigma}{6r\sigma^2\,(1+\sqrt{5})^2} = \dfrac{2r}{3\sigma\,(1+\sqrt{5})} = \left[\dfrac{4\pi r^2}{3}\right].f_1$ ....(12)

i.e. mass is dependent on cave , r , *and 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 motion which   as Work can be stored in the ,n, Energy lobes in loops of the Stationary Wave of cave ,* **r** .   Energy particles are as $z^{1/w} = |z_0|^{-w}.Lv = \rightarrow$ *Energy Monads* and for $\sin.(\varphi+k\pi)/w = 0$ then exists only the Imaginary part of monad , **s=0** ,where $\varphi = -2\pi\pm k.\pi$, and then $z^{1/w}=|z_0|^{-w}.e^{i\cdot\varphi} = e^{i.(-2\pi).b}$ and it is the ***Diffraction Energy mechanism*** for all Space Levels of quantization which are particles with least mass only . Extending cave $Lv = e^i.(-2\pi\,\Box\,k\pi).\,b$ for minimum acceleration [31] then *Energy Balanced tank caves for Regulating Valves* , [*massive – energy , from* 3,56. 10^{-14} *to* 9,31 .10^{-28} m] ,   is for base e = 2,71828 and k = 0 $Lv = e^{i.(-2\pi)\,b}$ and then $e^{-31,41593} = 3,56237.10^{-14}$(m) = **r** ,

The frequency of Photon with light velocity v = c = 2πr.f is $\rightarrow \mathbf{f = \dfrac{v}{2\pi.r}} = \dfrac{3.10^8}{2\pi.3,5610^{-14}} = 1,34.10^{21}$ Hz .

From Photon and (12), mass $\rightarrow m = \left[\dfrac{4\pi r^2}{3}\right].f_1 = 4,18879.[86,73.10^{-56}].(1,34.10^{21}) = 4,868.10^{-33}$ Kg
   i.e. *Photon has a frequency* $\mathbf{f_{Ph}} = 1,34.10^{21}$ Hz *and mass* $\mathbf{m_{Ph}} = 4,868.10^{-33}$ Kg .
   The Wavelength $\lambda = c/f_{Ph} = 2,00.10^{-13}$ m *momentum* mv $= 1,458.10^{-22}$ Kg.m /s

On Natural base ,e, and decimal base b = 10 , the Total Energy is [$z^{\frac{1}{w}} = |z_0|^{-w}.\,Lo$], which is Stored in the quantized Space $L_0 = 3,56237.10^{-14}$, and when passing through the Regulating Valves [the massive energy caves from $3,56.10^{-14}$ *m* to $9,31.10^{-28}$ m] then quantized as 18 Particles (*Fermions and Bosons*) in the Planck's length $L_p = 8,906.10^{-35}$ 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*** , energy - monads in all these energy loops . Point Particles in vacuum is an intermediate State between MP and Particles.   i.e. the infinite monads in one monad .
This is $\rightarrow$ **The How** $\rightarrow$ (by following the Stationary - Wave -Nodes Principle) and **,**
    The Where $\rightarrow$(In the first Energy Stationary-monad of Material-Geometry cave) .
    The How this $\rightarrow$(Practically can be succeeded , is left to Laboratory Nuclear Physicists) .

4.. The Total - Energy loops :
It was shown in [58] that the maximum velocity in a closed system occurs in Common circle , when the two velocities , $\overline{c}$, $\overline{v}$ 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 = $|(\overline{c}.T)|$

$=\sqrt{v^2 + c^2}$ *and by using Space Vector*   r = $|(\overline{c}.T)| = \sqrt{v^2 + c^2}$ *then , The total Rotating energy is* $\rightarrow \pm\overline{\Lambda}$
$=\overline{p}.r = (M.c).r = (M.c).\sqrt{v^2 + c^2}$ *and squaring both sites then ,*
$[\pm\overline{\Lambda}]^2 = p^2.r^2 = M^2.c^2.(v^2+c^2) = (M^2.v^2).c^2 + M^2.c^4 = (p^2.c^2) + M^2.c^4 = [\,p.c\,]^2 + [\,m_0.c^2\,]^2$ or
$E_T = E_R + E_K \rightarrow$ Total - Energy of Elementary- particle = Intrinsic Rotational + Kinetic Energy,

The velocity of Elementary particles is the light velocity c = v = 2πr. f_e and frequency $\rightarrow \mathbf{f_e = \dfrac{c}{2\pi.r}}$ .....(a)

Rotational Energy $E_R = \overline{B}.\overline{w} = 2L = J.w^2$ and $\rightarrow \mathbf{E_R} = \left[\dfrac{\pi r^4}{8}\right].\left[\dfrac{c^2}{r^2}\right] = \dfrac{\pi c^2}{8}r^2 = 3,534.10^{16}.r^2$ .... (b)
i.e. Energy and frequency of Elementary particles can be found from cave **r** , only since ,c, is constant .

Total - Energy $\rightarrow \mathbf{E_T} = E_R + E_K = \dfrac{\pi c^2}{8}r^2 + \dfrac{1}{2}m.v^2 = \mathbf{3,535.10^{16}.r^2} + \dfrac{1}{2}m.v^2$ ....(c) Mass of elementary

particles is $m = \dfrac{E}{2r^2.w^2} = \dfrac{J.w^2}{2}.\dfrac{1}{2r^2.w^2} = \dfrac{J}{4.r^2} = \dfrac{\pi.r^2}{16}$, i.e. dependent on radius of cave.
Remark :

Bohr Atom - Model ≡ The three Constituents

PROTON ≡ ⊕ ≡ The Positive Space
NEUTRON [⊕⊖] ≡ ∅ ≡ The Material Point [+ -] ≡ 0
ELECTRON ≡ ⊖ ≡ The Negative Anti- Space
Nucleus [⊕⊖] ≡ 0 ≡ The Equilibrium of Space and Anti-space
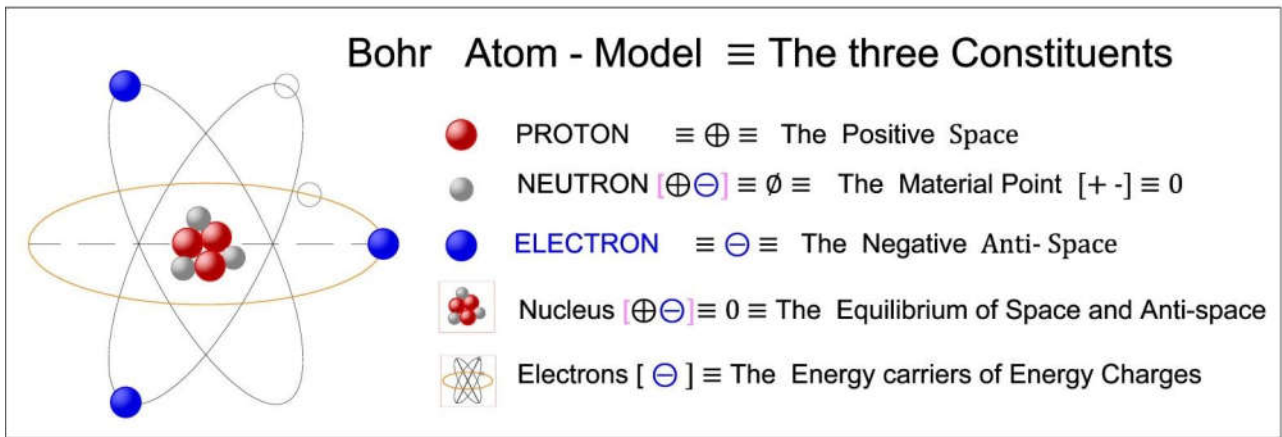Electrons [⊖] ≡ The Energy carriers of Energy Charges

Fig-26. 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 Stores in Atom -Model   Orbital Electron is the → Moving-Charge-carrier of Energy in Atom –Model

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* → s² , -**V**|⌐|² , [2**w̄**].|s| |r|.□i ← where for , **v̄** = s ≡ the cave , [**s²**] → is the Real part , *Matter* , of the new monad , and is *a Positive Scalar magnitude* .

- [**s²**] → is the always Negative part , *Anti-matter* , which is always *a Negative Scalar magnitude* . i → is the double Angular-Velocity Term , *The Energy Term* , which is *a Vector magnitude ,*

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* . Motion is obtained either by Pushing or Attracting . Both cases presuppose NOT the Continuity of points which points are nothing But Discontinuity , *Discrete* , with the dimensional Units as filling as is shown in Zenon Paradox (1).

Elementary Particles and Antiparticles consist the Energy-Stores for a part of the Total –Energy , *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-25. 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 3.10^{-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 Kinetic Energy Part (Energy) is stored in Orbits as bounded orbiting electrons .
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 .
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 .

5.. *Energy in Atoms* .

The Electronic Structure Of Atoms And Molecules , And Energy- Quantization :

1..As prior referred [54-55] for the First-Rotating-Monad , the common point 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 Open-Tube , gives both Odd-and-Even numbered harmonics.

2..Energy of loop or , Energy-Level , become from Rotational-Energy only , therefore issue Mechanical equations of motion , Independently of magnitude as ,

3..Energy of loop or ,Energy-Level ,become from Rotational energy 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 motion , w = The angular velocity. f = The frequency of motion ,

Velocity v = w r , w = $2\pi/T = 2\pi$ f and (1) becomes E_R = (v/w).(mv) = v^2 m/w = $mv^2/2\pi f$ = mv^2 [$T/2\pi$] = v^2 [$mT/2\pi$] = v^2 [h/2π] → because mT = m/f = The stored energy in loop for the fundamental frequency f_o= 1 , or T =1 and becomes from the relation λ = 2L of the Stationary Waves as → f_o= v . λ = v.2L i.e.

The stored energy in the loop is → $E_1 = v^2 [\dfrac{h}{2\pi}]$ depending on velocity , **v** , and Planck`s constant **h** .

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*** → $E_1 = [\dfrac{4\pi r^2}{3}]. f_1$

As prior referred the Planck length L_P , i.e. *The minimum distance ≡ Granular Space* , can be defined from the fundamental Physical constants , Speed of light , Planck constant , and the Gravitational constant as ,

$L_P = \sqrt{\dfrac{hG}{2\pi c^3}}$ =1,616229.10^{-35} m   *= which agrees with one of the Energy - caves* $L_p = e^{i.(\frac{\pi}{2}+2k\pi).b}$ =

$= e^{-i.(5\frac{\pi}{2}).b} = e^{i.(-5\frac{\pi}{2}).10} = e^{-.(78,5398).} = \textbf{8,906}.10^{-35}$ m = { $\sqrt{3}.\pi. \textbf{1,616199}.10^{-35}$ 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 = 10^{-9} m , 1A° = 10^{-10} m and h/2π = 1,616.10^{-35} eVs , Velocity light is 2,9979.10^8 m]

For a single photon of Red-light with λ = 700 nm = 700.10^{-9} m , then fundamental frequency f_o is , f_o= v/λ = c / λ = 2,9979. 10^8 m / 7. 10^{-7} m .s = 4,283.10^{14} Hz , and the Energy of the first loop is

$E_1 = v^2$ [h / 2π] = (2,9979) $^2.10^{16}$. [1,616. 10^{-35}] = 14 , 524 eV. s …………..(1)

The How many Negative breakages, *Units = Positions*, can be filled, is dependent on the Possible Repetitive Permutations of *Moulds= Orbitals* =R_C , Positive $\oplus$ breakages ,and Units which are 2 Units it is the maximum number in a Point , i.e..

The Possible Repetitive Permutations for Moulds = Orbitals and Units which are **2.Mould**^{Units} = 2.M^2 , 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 →

2.4^2 = 32 Position - Units which are the Electrons in each orbital. All these happen because in Fig.26 *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,

E_1 = v^2 [h/2π] / R_1^2 = 1^2 = 1

E_2 = v^2 [h/2π] / R_2^2 = 2^2 = 4 , and for the , c , Space Number ,

E_C = v^2 [h/2π] / R_c^2 = R_C . R_C

Because any Next-Atom Energy , is equal to Prior + the distributed $[\dfrac{E1}{Rc^2} . \dfrac{1}{2.Rc^2}]$ then in , c , cave Energy in ,**c**, cave

orbital is $E_c = v^2 [\dfrac{h}{2\pi}]$ / R_c^2 where R_C = Number of Spaces.   Energy of **Hydrogen W-Rim..**

1 $E_1 = \dfrac{E1}{1^2}$= 14 , 524 eV.s   of **Helium W-Rim..2** $E_2 = E_1 +[\dfrac{E1}{1} . \dfrac{1}{1.2^2}] = E_1+\dfrac{E1}{4}$

of **Lithium W-Rim..3** $E_3 = E_1 + \dfrac{E1}{4} +[\dfrac{E1}{2^2} \dfrac{1}{2.2^2}] = E_1+[\dfrac{E1}{4}] . \dfrac{1}{8}$ and so on .

For c W-Rim $E_c = E_{c-1} +[\dfrac{E1}{Rc^2} . \dfrac{1}{2.Rc^2}]$ ……….. where , W-R $_c$ = 1,2, … c , Number of W-Rim . [55-59]

Following above logic all Particles or Atoms are formulated in this Geometrical formula of Moulds , [Space – Anti space - Energy]≡ [$\oplus\leftrightarrow\ominus$]-[$\overline{v}.\Box i$] *, without any Assumptions , or Axioms , or Exclusion Principles , or any other Starting Points .*

Using Energy in loop 1 → $E_1 = [\dfrac{4\pi r^2}{3}] f_1= v^2 [\dfrac{h}{2\pi}$] ← then $8\pi^2.r^2.f_1=3v^2.h$, and $r^2 = \dfrac{3v^2h}{8\pi^2 f_1}$, where

for Planck Length $r^2 = \dfrac{3.3^2.6,626.10^{-34}.10^{16}}{8.\pi^2.4 283.10^{14}} = 2,2658.10^{-32}$, the corresponding cave of Photon is ,   **r =**

1,505.10^{-64} m → *a cave in Gravity length* → 3,969. 10^{-62} – 2,295. 10^{-48} m

6.. The Why Theory of Material Geometry and article [70]   **is the Beacon for Future Technologies** .

Energy is the motion of Opposites ,or the [$\ominus \leftrightarrow \oplus$] $\equiv$ [Space $\leftrightarrow$ Anti-space] charge in all Levels, *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 of M-P ,** and *mass the Reaction* to this *Up - Down oscillatory motion in Loop* of each wave Segment at frequency , f_n , which describe each *mode* and characterized by a different λ , and , f . This happens because of charges alternation as [+ , - to - , +] , i.e. (AC) which exists on Antinodes amplitude of this local *Inverse* oscillation .

All monads can immediately be other monads with different frequency ,f, following the *Breakage rule* $\rightarrow$ s² - $|\overline{s}|$ ² + 2|s|².$\square$i $\leftarrow$ i.e. **matter** (+) , **antimatter** (-) , **energy** (+ -) or , *Material Point* A - $K_R \equiv$ monad $\equiv$ The Dipole $\equiv [\oplus \ominus]$ = $\square$ = K_r A $K_{R=r}$ *where* $\rightarrow$ { $K_R \equiv [\oplus]$ } $\leftrightarrow$ { $K_r \equiv [\ominus$] } $\rightarrow \equiv 0$.

Since *Energy is motion* and , *Total-Energy of Elementary - Particle* is equal to the $\rightarrow$ *Intrinsic Rotational + Kinetic Energy from velocity or cave r*, then according to the conservation law of Energy and **Breakage Principle** , *this energy is stored into these* **Neutral caves as Stationary Lobes in wavelength ,** λ , and thus producing the *Space and all the Anti-Space Particles* , *with velocity vector the remaining of Energy Term. The Trapped - Energy into these Stationary Energy - Lobes of monads , is the SPIN , and becomes their Outward Stationary-Wave , and when in cave is followed the Cycloidal-motion exists also Kinetic Energy for those monads ,* **the Photons** *, where there wavelength λ is the moving Energy-store , and from energy as EM-radiation the* **Electric- field** *is the* **Matter** *and the* **Magnetic - field** *is the equilibrium* **Anti-matter** *of this* **Energy**-*monad -Photon* .

From page 76 Angular – Momentum – Vector $\overline{\mathbf{B}} = \dfrac{\pi r^3 \sigma}{8} [1+ \sqrt{5}] \equiv [\dfrac{h}{2\pi}]$ and , $\sigma = \pm \dfrac{4\pi r}{(1+\sqrt{5})} . f_1$

Energy $\mathbf{E} = h.f_n = \dfrac{h(1+\sqrt{5})}{4\pi} . [\dfrac{\sigma}{r}] = (\dfrac{n\sigma}{8\, r^2}) . \overline{\mathbf{B}} \rightarrow$ i.e. **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 , $\mathbf{r}$. *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 it holds for the Breakage-Principle , While the Short range forces exist on Primary and Neutral Particles only.*

From page 77 ,The First harmonic is $\mathbf{f_1} = \dfrac{(1+\sqrt{5}\,) . \sigma}{4\pi r}$, mass **m** $= \dfrac{E}{2r^2 . w^2} = \dfrac{(1+\sqrt{5}\,)\, 4r^2 \sigma}{6r\sigma^2\,(1+\sqrt{5})^2} = [\dfrac{4\pi r^2}{3}].f_1 \dots (12)$
i.e. **Mass is dependent** , on fundamental frequency $\mathbf{f_1}$, and on the square of cave $\mathbf{r}$, or a number measuring the time-rate of changes in cave , *so Energy ,* the motion , **and Mass ,** a number , **are not equivalent** .
The all Clashed and all The –Un - clashed Material-Fragments exist in *Chaos* [$\pm$ s²] $\equiv$ [MFMF] .   **The Geometries** :
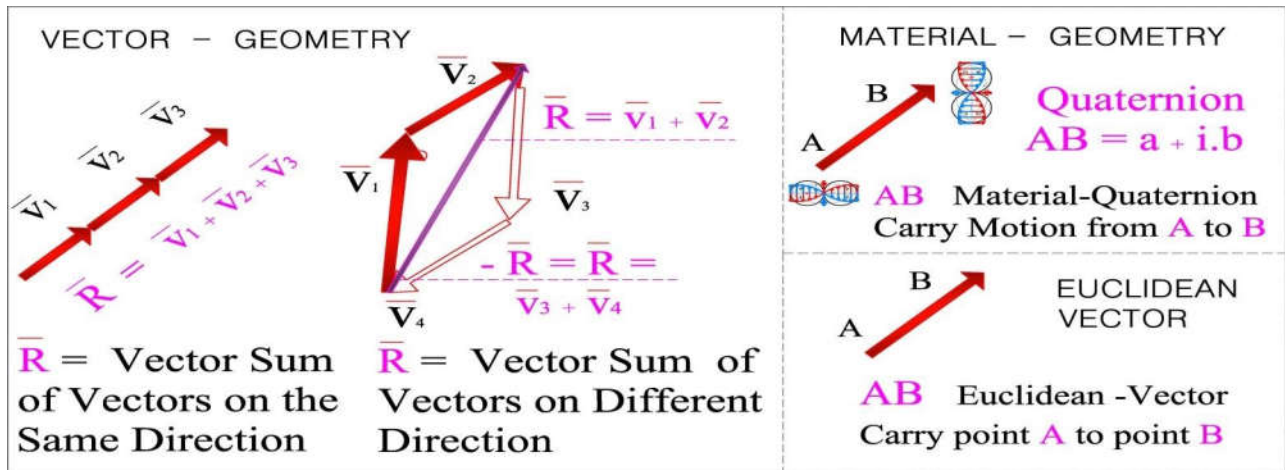

Figure-27.. In Euclidean-geometry , *Point* is nothing possessing Zero-magnitude and Infinite-directions.

Two Points consist the Straight-line-segment , possessing |AB| - magnitude and the |A→B| Directions . Euclidean-vector $\overrightarrow{AB}$ carries Point A to point B , possessing |AB|-magnitude and the two opposite directions $\overrightarrow{AB}$, $\overleftarrow{BA}$ respectively .
This is *the Euclidean Quantization* of points A , B in geometry.
Three Points A , B , P, consist the Plane ABP , i.e. the line AB and point P , not on AB . *N - Points* A , B , ,,,, $P_{,,,}$ P_N , consist the Regular-N-Edges shape , ABPP $_N$, i.e. The Regular N - Edges - Polyhedrons , where points , P , P_N , do not coincide with the others.
In Material-geometry , *Point* is the Glue-Bond [$\oplus \ominus$] of opposite caves , $\mathbf{r}$, 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 $\overline{\mathbf{B}} = \dfrac{\pi r^3 \sigma}{8} [1+ \sqrt{5}] \equiv \dfrac{\pi^2 r^4}{2} f_1 \equiv [\dfrac{h}{2\pi}]$ where $\sigma = \pm \dfrac{4\pi r}{(1+\sqrt{5})} . f_1$

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 **NO** *Direction* .   ,b, is a vector quantity that has both **Magnitude and Direction** .

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

Since also from [33] Action (©) of a quaternion $\overline{z}$ = s + $\overline{v}$.i = s + $\overline{v}$.□i on itself is a Binomial type   (s + $\overline{v}$.□i)(©)(s + $\overline{v}$.□i) = [s + $\overline{v}$.□i]² = s² + |$\overline{v}$|² .□i² + 2|s|.|$\overline{v}$|.□i = s² - |$\overline{v}$|² + 2|s|.|$\overline{wr}$|.□i = s² - **V**|_|² + [2$\overline{w}$].|s|.|r|.□I = s² - **S** _|² + 2|s|².□i { for s = v = w.r and s □ v }   where , **s²** → is the real part , **Matter** , of the new quaternion and is *a Positive Scalar magnitude* . - **s²**   → is the always negative part , **Anti-matter** , which is always **a Negative Scalar magnitude** .

2.**s²**□i → is the double Angular-velocity term , **Energy** , which is **a Vector magnitude ,**   or → z² = s² - s² + **2.s.s** = 1 , the same from (a) s ² + (iv) ² = 1 or → **s² - v² = 1** so , **Breakage – Principle of Material-Geometry is identified with Euclidean-Geometry Principles.**   In Mohr circle , page 48, was proved that ($\overline{\rho}$) ² + ($\overline{a}$) ² = ($\overline{M}$ = 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 the Ellipsoid of motion

 Rotational-Momentum Ellipsoid ≡ Work   ≡ $\overline{\rho}$, → **The Energy-vector Angular-Velocity–Inertial-Ellipsoid ≡ Force   ≡ $\overline{a}$,** → **The Space - vector Reaction to velocity-change-motion ≡ Mass- scalar M ≡ J$_a$,** → **The Mass – meter**   This 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 → z² = s² - s² + **2.s.s** = 1 , and from Unit-quaternion s ² + (iv) ² = 1 or → **s² - v² = 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 Velocity-vector-energy-tank the Potential .   Above relation of squares is one way of Energy-transferring from one system to another [68].

The two Forces **Newton`s Inertia Force** → ma = m$\ddot{x}$ and **Glue-Bond Force** of opposites are F$_p$= F$_f$ as m.v²/R = σ = m.c² / r and m = [σ r] / c² or , Force F = m.v²/R = □(σ².r²) / (c⁴r) = □$\left[\frac{\sigma}{c^2}\right]^2$. r and for Gravitational Force becomes → a constant.□(m$_1$.m$_2$)/(x$_1$-x$_2$) = g.□$\left[\frac{\sigma}{c^2}\right]^2$. r   markos 30 / 1 / 2018

The *Energy Quantization* States in all Levels :

State 1.. In the equilibrium Space-cave of radius ,**r**, the equilibrium opposite rotating velocities □ $\overline{v}$ collide resulting to the three Fragments , s² - |$\overline{s}$| ² + 2|s|².□i , where s² = [$\overline{v}$=$\overline{w}$.r]² . [26-29] **State 2**.. The constant maximum velocities , $\overline{c}$ and $\overline{v}$, as *Thrust* in cave , **r** , acting On the three Breakages { [s² = ± ($\overline{w}$.r)² , [□i] = 2(wr)²] and through **Geometrical Mechanism** [STPL] are becoming , **Fermions → [±$\overline{v}$.s²]** and **Bosons** → [$\overline{v}$.□i = [$\overline{v}$.2($\overline{w}$.r)²] = **[v.2s²]** , [35] which become Waves { *Distance* ds = |AA$_E$| *is the Work embedded in monads and it is what is vibrated* } and are Particles , with Inherent Vibration .

The Un-clashed Breakages [± s² = ± (wr)²] and [□i = 2(wr)²] , *Outward* [STPL] *Mechanism* , consist the Medium-Field-Material -Fragment [MFMF] = [± s²] ≡ **The Chaos** , as base for all motions , and Gravity as force [□i] , while the Clashed with the constant velocity ,$\overline{c}$, consist the Dark matter [± $\overline{c}$.s²] and the Dark Energy [$\overline{c}$.□i] ≡ [□i = 2(wr)²] . The difference between , *Vacuum - Energy* [W$_{n(n+1)}$] *and Dark - Energy* [$\overline{c}$.□i] , is that Vacuum [r] *is a Stationary Wave* with Energy W$_n$ in n , Loops of the Material point while Dark-Energy is a *Pushing Kinetic Energy* {DE}≡ [$\overline{c}$.□i] , travelling with the → DM-DE ≡ [± s²] , Field ← with the light velocity , c , and the binding Gravity-Force [□i] *as* , [$\overline{c}$.□i] (©)→{ (□i),(+s²),(-s²),(+cs²),(-cs²) }   *i.e. The Cause Expansion of the Universe , is the continuous and simultaneous effect ion of Dark-Energy* DE = [$\overline{c}$.□i] *on all Five Energy-Fragments with light velocity* $\overline{c}$ *, as* [$\overline{c}$.□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* [± $\overline{c}$.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 Material worlds.*

State 3.. The **Quantized Energy-levels , *States , result*** from the relation between a particle`s energy E , and its wavelength , λ, because by following the *Breakage-Principle* where **The - Energy-***part* ≡ E = $\frac{h.c}{\lambda}$, then → in Planck Scale **h , c** , constituents are both constants.

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 = $\overline{q}$ = [s+$\overline{v}$□i] ,*with* **s** ≡ the real part ≡ wavelength λ , and $\overline{v}$□i ≡ The Energy-part consisted of the frequencies f $_n$= n.f $_1$= E/h   in Energy-loop of Lobes where , **n** represents

a **Normal mode vibration** with natural frequency   f $_n$ determined by the equation → f$_n$= $\frac{\dot{n v}}{4r}$ = $\frac{n\sigma}{8r}$ [1+$\sqrt{5}$] ← and *is an Energy-cave* (the n , modes of f $_n$)

in where , Energy ≡ Spin is stored . Above relation 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 . **Only stationary states** , [the eigenvectors with the eigenvalues   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 $\overline{B}$] **while** *for other states the Waves , **Interfere -***

Destructively , resulting   in zero wavelength λ =s= **0** , and then is remaining the Energy-part , $\overline{v}\Box i$ only , *the said probability 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 10^{-13} m $= 10^4$ nm , then in Hydrogen-atom for , $\lambda = 2\pi r_1 = 6{,}28.\ 10^{-13}$ m

corresponds to an Energy E(eV) $= \dfrac{hc}{\lambda} = \dfrac{19{,}8645\ 10^{-24}}{\lambda 1{.}1{,}60218\ 10^{-19}} = 1{,}9744.\ 10^8$ eV. $\lambda = 2\pi r_2 = 12{,}57.\ 10^{-13}$ m corresponds

to an Energy E(eV) $= \dfrac{hc}{\lambda} = \dfrac{19{,}8645\ 10^{-24}}{\lambda 2{.}1{,}60218\ 10^{-19}} = 0{,}9862.\ 10^8$ eV. $\lambda = 2\pi r_3 = 18{,}85.\ 10^{-13}$ m corresponds to an Energy

E(eV) $= \dfrac{hc}{\lambda} = \dfrac{19{,}8645\ 10^{-24}}{\lambda 3{.}1{,}60218\ 10^{-19}} = 0{,}6579.\ 10^8$ 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 .
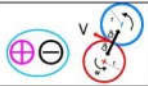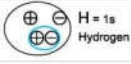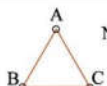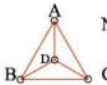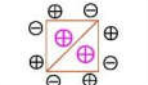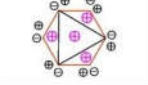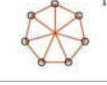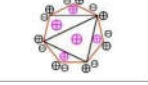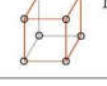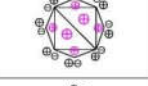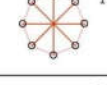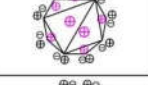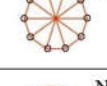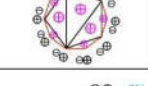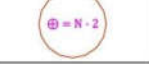
Microscopically , atoms and molecules of Crystal , are in a near-perfect ***Periodic-or -Not*** arrangement following the ***Breakage – Principle of Material-Geometry*** , where Crystal- lattice – Position consist the Space and Anti - space equilibrium , and Energy part is the binding amorphous solid in order the whole to be a monad. In case Crystal-lattice is ***Non-equilibrium*** then consist a new moving monad for The-New Future-technology. [68]

From above is seen that the quantized Grouped-Crystal-Systems , *either these are in Equilibrium or Not* , follow the Material-geometry Principles showed in Figure - 27 .

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 MG the 3D-link CH_4 methane , which consists the simplest organic compound in chemistry .

State 6.. The combination of Inorganic-Compounds , *as the Crystals* , and Organic Compounds , *as the   methane and benzene* , is the evolutionary cosmos .

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 P²	
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	H₀ = 1s Helium
4	Volume Reg.4gon	N = 4		The First THREE Dimention Volume - Space	8	8	N₀ = 2p Neon
5	Space Reg.5gon	N = 5		The First FOUR Dimention Volume -Space	10	18	A₀ = 3p Argon
6	Space Reg.6gon	N = 6		The First FIVE Dimention Volume - Space	12	32	K₀ = 4p Krypton
7	Space Reg.7gon	N = 7		The First SIX Dimention Volume - Space	14	50	X₀ = 5p Xenon
8	Space Reg.8gon	N = 8		The First SEVEN Dimention Volume - Space	16	72	R₀ = 6p Radon
9	Space Reg.9gon	N = 9		The First EIGHT Dimention Volume - Space	18	98	U₀₀ = np Ununoctium
10	Space Reg.10gon	N = 10		The First NINE Dimention Volume - Space	20	128 / 162	P = Number of Positives = N-2 and N=Spaces = The Number of Points
N	Space Reg.Ngon	N = N		The First N - 1 Dimention Volume - Space	2 N	2 N²	

Figure -28. The Uniform Circular motion is the First Possible Position of Monads.

The Number of Neutrons in Space represent Isotopes in Nucleus.

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 is consisted of two Points ,The Triangle is consisted of three Points , The regular Tetragon is consisted of four Points in , The regular Pentagon is 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 the Electron Positions. **In 4.** Are shown the Number of Neutrons in Space and the satiation states of electrons .The different types of Damping-forces are from the internal-molecules-friction to sliding friction and to any fluid-resistance. The Dissipation of energy is determined under conditions of cyclic oscillations , becoming from the Geometry of Spaces which is , *the monad in monad.*

Some *Future Technologies* :
a.. In *Engineering Physics* :

Mechanics and classical Physics ,*are the Bases describing reality* ,without any interest to the *Essence* of Euclidean-geometry elements , *which are Position and Magnitude* ,beginning from Point which has only the Position and not any magnitude . All Physical laws and those of nature , *it is the objective reality* , are explained by the **Classical - mechanics** which describe the motions of , macroscopic objects , *either as Particle or as Wave* , from atoms to molecules and to Astronomical objects , by considering the whole Space **as a Continuum** .

Relativistic - mechanics , describe events , the Position and the Magnitude of Atoms and Subatomic as Continuous called **Spacetime being deterministic** , meaning that every cause matches up to a specific . It considers also Spacetime a dynamic and an elastic entity without defining of what is this entity ,and mass and energy without defining the essence of mass and energy . The fabric of Spacetime is called *speed of time* , and are the undoubtedly boundaries of Space , and the beginning of Big bang in order to justify Black holes .

Quantum - mechanics , describe Atoms and Subatomic Particles with the , *Wave-mechanical model* , separating the Position and the Magnitude as , **a Continuum or the Quantized** , compact $\equiv$ *periodic* , and accordingly to , if it is a Point or infinite . Is also dealing with the behavior of matter and light on the atomic and subatomic scale and the interactions with one another , and both with Electromagnetic radiation .
Material –Geometry , or **Granular -Geometry** ,describes the Essence of elements in Geometry which are the Magnitude and the Position of Euclidean Points, giving their nature and equations , *so much of* **The Lattice–Energy - Space**, { These *are the Stationary* Primary and compound Particles , *are all the*
Moving Primary and compound Particles , and *are all the Stationary and the Moving* Energy-Stores **}** **The Continuous - Energy - Space** , { This is the Granular-Gravity-field and the Gravity - Force } **,** **The In - Continuous - Absolute - Vacuum** , { This is the in-between the Gravity field Energy-caves **}** **The Out - Continuous - Granular - Vacuum** , { This is the Granular Travelling-Gravity-field }. **The Out - Continuous - Absolute - Vacuum** , { This is the MFMF field *so match* relating the **Und**er-Granular-Stationary-Gravity-field , *as* for the Under-Granular-Travelling-Gravity-field }.
Breakage-Principle $\rightarrow$ s^2 , $-|\overline{s}|^2$, $2s^2 \cdot \square i \leftarrow$ where is , $\overline{v} = s \equiv r \equiv$ the cave , for any-monad and level **[s^2]** $\rightarrow$ is the Real part , *Matter* , of Any New monad , and is **a Positive Scalar magnitude** .

- **[s^2]** $\rightarrow$ is the always Negative part , *Anti-matter* , which is always **a Negative Scalar magnitude** .
2 $s^2 \cdot \square i$ $\rightarrow$ is the double Angular-Velocity Term , **The Energy Term** , which is **a Vector magnitude ,**
Without staggering implications is explaining , *The where the laws of nature are coming from* , *The where this cosmos is built ,*surely not on Uncertainty and not fundamentally deterministic , *without every event linked definitively to a cause* and this because is proofed of maxima . Question , **Why , Motion is continuous in time and , Energy is Quantized in caves** ???
Motion is the action of changing location or position in a finite or infinite time . Energy is the Work , the **motion** in One - Two and Three directions , and which is executed in time . In order that this **Motion is conserved** as *Displacement* , then must be **Quantized** in a **Finite Space** , differently is annihilated .
In Mechanics the only-possible motion in a **Finite-Space** is , $\rightarrow$ **the Periodic excitation** , *Oscillatory* , which is repetitive and fluctuates between two locations and $\rightarrow$ **the Revolving motion** , *the Rotation* . Motion is determined as the displacement of a point A to another position B . This displacement presumes
Work production **i.e. a force P , acting on Point , A , transfers this at B** . Because Points are nothing Material point which is cave AB , is the quantization of these two nothing points .Since the action of the force P on A is continues therefore motion of point A to point B is eternal in time . **This eternal motion in cave AB** is called **Quantization** of **motion** $\equiv$ **Energy in cave AB** . Motion in a finite-space as cave , **AB** $\equiv$ **r** can be realized only when point , A moves to point , B and Point , B moves to , A and so on , or by revolving of point A , round point B . In Mechanics this motion is called **Periodic excitation** , while in Material-point was proved that force P , is produced on the *Stress – common - curve* **, where the Positive** $\oplus$ **constituent , is Eternally self rolling on the Negative** $\ominus$ **constituent .**It was proved that this motion is

either **Circular** with Sinusoidal-Harmonic force P , or **Cycloidal with** Harmonically Excited Vibration . Because **motion** $\equiv$ **Energy and is Quantized in a finite Space** AB , and **because is conserved** , then both cases of motion **are of** $\rightarrow$ **Wave–Energy-Pattern** , and Not of $\rightarrow$ **Particle–Energy-Pattern** .
Motion in a finite-space , **r** , can be realized only when this is Periodic where there exists an
Eternal-Quantized-motion . **Motion is thus continuous in time and Energy Quantized in caves** i.e.
The Work W , from the Wave–Energy-Pattern and of , n , wavelengths λ_n **,** which is eternally created from all Points of the Periodic Oscillation in any Cave *, r , is Stored into the , n , Integer and Energy - Lobes of this cave* **r .**
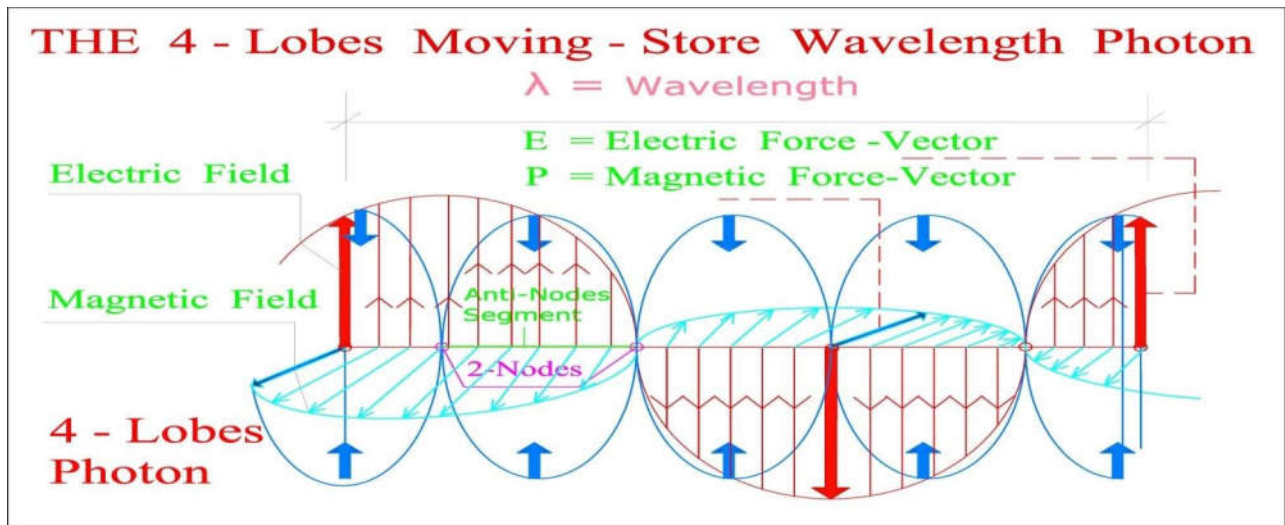
Fig-29: **The inner structure of an , 4 - lobe Moving-Store ,** *executes a Free Vibration ,* **and is under an Outward light motion of Electromagnetic - radiation E □ P .** *Wavelength ,* **λ ,** contains 3 all lobes plus 2 halve lobes and **, is the moving Energy** *tank* and because of the Closed-end-Nodes executes the **Material-Point-motion.**

b.. In *Acoustics* : Because acoustics is based on the fluctuation of Two-Stages , that of Microscopic
Properties of the , **Initial single particle wave level** , related to the vibrations of the , Macroscopic
Properties , *the* **Final raw data wave level** , these follow the equations of conservation of mass and Energy ,
momentum , as $\dfrac{p}{\partial t} + (\rho.c^2)$ $\dfrac{\partial}{}$ □.u = 0 , $\rho \dfrac{\partial u}{.\partial t} +$ □.p = 0 where from fluid dynamics , p , ρ = the pressure
and density of the medium , and u (x , y , z , t) = the flow velocity vector . **Sound is a vibration** , a Signal , *linear as* K
≡ [⊖] ↔ K$_1$ ≡ [⊕] , that typically propagates by following the
Breakage principle , as an audible wave of pressure converted to E-Voltage , *it is the conservation law of Energy* through
a transmission medium , which are the *material monads-composition of opposites , again by following the Breakage*
Principle , such as gas , liquid or solid . The Signal is converted , *following the Breakage Principle* , then transmitted to
receiver , *following the Breakage Principle* , and then reconverted *following the Breakage Principle* and Damping -
Force-equation $F_d = c \dot{x} = □ c.w \sqrt{X^2 - x^2}$ (page 37) **Photon is a vibration** , *Rotational vibration* [K≡⊖ s² ʊʊ K$_1$≡
⊕ s²] , that typically Radiates , *Breakage principle is consisted of the Energy tank in wavelength*, as an
Electromagnetic Radiation-Wave , following *the Conservation law of Energy* , through a Radiated medium which is *the
Electric-field and the transverse*
Magnetic-field as the composition of opposites , or *following the Breakage Principle* , such as tobe Particle , λ , and tobe
Wave as f$_n$. [68]

c.. In *Astrophysics , Geophysics* :
Spacetime in Relativity is a dynamic and elastic entity both influencing and influenced by the distribution of mass
and energy that it contains . As a consequence ,the accelerated motion of mass and energy can generate ripples of
gravitational waves in the fabric of Spacetime , propagating at the speed of light .These ripples encode unique
information about the source that has generated them .

For *Material-Geometry* Page 82 , Dark-energy DE = [c̄.□i] is a Force acting on the three constituents of Dark-
matter → [DM] = [(+c.s²) , (- c.s²) , (±c.s²)] separately , and being also a non-uniform field is not canceled because is
a pushing force , so **DE is influencing as the expansion of the universe** .
Because [DE] is a stationary force on [DM] , so is exerting a strong gravitational pull on gravity field (participates in
light moving-gravity and at the Back – remaining -Heap) . [58]
Astronomy measures Positions , Luminosities , the motions and the other characteristics of Planets using the Galileo -
Newton - mechanics .
Astrophysics is based on the observing Electromagnetic Radiation we interact with distant objects and the deducing
theories explaining the mechanism producing this radiation . Electromagnetic- Spectrum produced from EM Radiations
and the Theoretical-mechanical knowledge of , Stellar Radiation , the Radio and X-ray sources , Pulsar and cosmic
rays , Interstellar dust , nucleosynthesis in stars , Cosmic rays , Supernovae , Gravity in all above and the Expanding
universe ,are also explained from the Energy stores in Particles which are the Harmonics , f$_n$, in every energy loop .
Geophysics : In the moving Heap happen all Physical Phenomena as those of all the remaining and leaved – behind
the Heap – Stationary settled universe and all this of the above .

d.. In *Computation Physics* : Computation - Physics must be based on a rigorous theoretical Base of what is mass , and what is Energy , and Not on Axioms , i.e. The in-depth understanding on the underlying theory behind experiments , and interpreting the outcomes in context of the theory .

The Rigorous Quantitative Theory of → Material Geometry and Material point ← of article [65-70] , is the needed Framework for this purpose . **e.. In *Condensed matter Physics*** : *According to Big-bang theory* , at the beginning of it , Pure-Energy created all the mass of the entire universe . *In nucleus fusion* , when fuse a proton and a neutron together to make a Deuterium nucleus is by slamming them at some great speed . The measured mass of the Deuterium nucleus is less than the sum of the two parts . That difference in mass goes into the kinetic energy gained by the outgoing nucleus . *For the Reaction* , of a Proton and an Anti-proton ,then happens a Total annihilation of their mass where these convert 100% of their mass into Energy as gamma ray photon ,with energy equal to that predicted by Relativity .

According to Material Geometry , Energy is the Work produced by a Force when executes displacement from point A to point B , and this Work exists on all points of this cosmos . The mechanism called STPL converts the Breakages of an Equilibrium-Torsional-opposite-vector *cave* → $\mathbf{s} = \overline{\mathbf{v}}$ as , $[\mathbf{s}^2]$ → tobe the Real part , *Matter* , of the new monad , and which is *a Positive Scalar magnitude* .
- $[\mathbf{s}^2]$ → tobe the always Negative part , *Anti-matter* ,which is always *a Negative Scalar magnitude*, $2\,\mathbf{s}^2.\square\mathbf{I}$ → tobe the double Angular-Velocity Term , *The Energy Term* , which is *a Vector magnitude , The Breakage Principle is the way of Energy conservation* , *which Energy never annihilates and which is always reverted into* → the *two Opposites* (±) *and an Neutral Part* $2 . \mathbf{i}$ ← or the *Matter* , the *Antimatter and the Energy part* , *and always to its constituents , either to all or separate .*

From above mass $\mathbf{m} = [\frac{4\pi r^2}{3}].f_1$, a number related to the cave ,r, and f_1, the fundamental frequency of it showing *the reaction to the change of angular velocity* ,**w**, in cave . The angular velocity of a particle is the time rate of change of its angular displacement relative to the origin as → $v = wr = \lambda/T = \lambda . f_1$. The Reaction , *of a Proton and an Anti-Proton* , creates a Total annihilation because the $[\oplus]$ Proton coming in contact with the , $[\ominus]$ Anti-proton becomes the Material point because both are primary particles and issues → *Material Point* A - $K_R \equiv$ monad $\equiv$ Dipole $\equiv [\oplus\ominus] = \square = 0$, because is due to the eternal , $\square\,\sigma$, stresses of opposites, i.e.

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 . When above follow , **Breakage-Principle** , to Particles as → **Position and configuration** ← then issues Partially the $(+ , - , \overline{v}\square i)$ for *Position-monad* and $(+\cdots,-\cdots,\ddot{v}\square i)$ for *Configuration-monad* in all levels of *Energy Quantization* where then exist $3.C_1^3 = 9$ combinations for the three constituents $(+\cdots,-\cdots,\square\square i)$.
A combination to produce other particles with *the Process of Annihilation* for two exactly the same , *Particles , Antiparticles* , is as $(+ \leftrightarrow -\cdots) \equiv (- \leftrightarrow +\cdots) \equiv$ **[S*pace* – A*nti space* - E*nergy*]** $\equiv [\oplus\leftrightarrow\ominus$ $] - [2\square i]$ ………….. (p)
Equation (p) is the **Breakage - Principle** , and can be used generally for controlling energy . In devices *producing electricity* from the temperature-difference is needed to develop materials that can *conduct electricity* , but block the motion of Photons producing heat .
In chips energy is the heat of Photons so are needed *material or configurations* which manipulate Photons . i.e. Is always needed the manipulation of Conduction of Photons either for electricity or for heat . The meeting of Particle-Antiparticle is a Type of Resonance with the same constituents Partly or All , so Annihilation follows the Energy-Type-Damping-Force equation $F_d = c\,\dot{x} = \square\,c.w\sqrt{X^2 - x^2}$.
Energy ,*as motion* ,in Photons is conserved in their , *Neutral Energy lobes consisting the moving-energy Stores* . Total Energy $E_T = E_R + E_K$ → Total - Energy of Elementary- particle = Intrinsic Rotational + Kinetic Energy , issues primary and totally . [68-69] **f.. In *Free Electron Physics*** :

The so called Free Electrons gain some speed through some solid bodies and since they have a negative charge , they move in the direction opposite that of the Electric-field . Since some Metals are also good Conductors of electricity , these possess free or valence electrons that do not remain permanently associated with the atoms of a solid , but instead , form an , *electron cloud* , or Gas around the limbs .
Because Energy is Motion of Opposites [+] and [-] , and for all moving Particles motion is transferred through EM Radiation , so a High energy dived in a Compound element, as water is , *and since issues the conservation law on Breakage-Principle* , the slow electrons are released . This Radiation damages the organic tissue . It is known that *Potential-energy ≡ motion* results from *Position or Configuration* . Free electrons are called these electrons which are free to leave their respective atoms , causing them a Negative potential (-) . Electrons having little freedom to move around and between atoms within that material are the NON – Free – Electrons causing them a Positive potential (+) . The Above operation , *electric conductivity* ,is a way of transferring energy. By applying *Breakage - Principle* to this electric Conductivity is seen the How the current flowing becomes the Ionization energy . *The Positive Scalar*

magnitude is → The NON-Free-Electrons as a ***New-Chemical-Identity*** position   ***The Negative Scalar magnitude*** is → The Free-Electrons   as a ***New-Chemical-Identity*** position   ***The Energy Part magnitude*** is → The Electromagnetic-Radiation **as** *Ionization-Energy* .   The above application of , *Breakage - Principle* , to Electrons as ***Position and configuration*** , issues   for all levels of *Energy Quantization* .

g.. In *Laser and Quantum Electronics* :

  A Laser is a device that emits light through a progress of Optical amplification . An optical-cavity   theory , at the beginning , resonating cavity , or optical resonator is an arrangement of mirrors that   forms a , Standing-Wave-Cavity .

  In a Standing wave , Total energy as Work is equal to Spin and exists as the Fundamental frequency   of the cave which is the first harmonic f_1, and the , **n** , amplified harmonic $f_n = n.f_1$, which is , **n** ,   times more energetic , i.e. ***Work ≡ Energy as motion in a Standing wave is Stimulated because of   the Stationary – lobe – Principle for energy*** .

h.. In *Medical Physics and molecule Dynamics* :

  Molecules to medicines : Pharmacologists want to design and be able to produce in sufficient   quantity , drugs that will act in a specific way without too many side effects . To afford this one   must know about the How drugs work.

  A way for transporters into Cells are Membranes which are constructed to permit the entry of only   small nutrients and hormones .The case of tumors ,is strictly guarded and process is kept in control   by a protective-gate called the plasma-membrane. A signal transduction is done by a signal and makes   conduct with a molecule on the surface called receptor . A switch molecule passes the message inward.   The signal is amplified prompting the Cell to do something and which this executes.

  The mechanism issues in Cell presupposes Protein to be the Signal-transducing molecules , another   molecule as the switch from outside a cell to its interior located Proteins . In this way Cell reacts by   spanning the cell membrane and regulates metabolic-enzymes , ion channels , transporter proteins and   other parts of the Cell-mechanism .

The Outside-Signal $\bar{O}$, *through a Transductor* ,is in-Phase with the Inside-Signal $\bar{I}$,i.e. in *Resonance*.
From Forced vibration under the excitation of external forces in a system , and if the frequency of excitation coincides with one of its natural frequencies , < ***a condition of resonance*** > is encountered , resulting to any oscillation.
Periodic motion is when motion is repeated in equal intervals of time T (period of oscillation) and is designated by the time function $x(t) = x(t+T) = x = A.\sin(2\pi.t/T) = A.\sin(wt – \varphi)$, …where
A = the amplitude of oscillation measured from equilibrium position and motion is repeated when t =T. Quantity $(2\pi/T)$ = w = circular frequency , f = 1/T= frequency .
Velocity $\dot{x} = wA.\sin(wt+\pi/2)$ and $\ddot{x} = w^2A.\sin(wt+\pi)$, the Acceleration which is also Harmonic with the same frequency of oscillation , and when evaluated lead to the displacement ,x, by $\pi/2$ and , π , radians respectively and the system reveals at $\ddot{x} = - w^2A$, so that *In harmonic motion acceleration* to be proportional to the displacement and directed to the origin , and because also Newton`s second law of  motion states that the acceleration is proportional to the force , then ***Harmonic-motion*** can be expected  with force varying as kx. (which is ***Hook`s law*** F = k .x and k , the stiffness coefficient , directed in centrifugal velocity vector $\bar{v}$ r , *on radius r*) .Vibrations of several different frequencies exist simultaneously by their fundamental frequency ,f, and its harmonics 2f, 3f, ,,,, n f ,,,,, ***Since Periodic motion is the particular solution of a free damped vibration*** where , A is the amplitude of oscillation and ,φ, is the phase of the displacement with respect to the exciting force ***then the phases*** of the velocity and acceleration , *force* , are ahead of the displacement by 90º and 180º respectively.
This difference in phase is the Trojan–Horse to enter the Cells.
Another way is , Instead of entering the Cell , *to change Cell`s Chemical - Identity using ,  the Breakage – Principle* , in Position and Configuration for any Cell`s level .

Another way is , *to change Cell`s Chemical-Identity using ,* Equation (p) which can be used for controlling Energy in Cell , by using another one equivalent Cell.
Photon , $[S \equiv f_{1=N} , f_2 , f_3 , f_n = w^2]$, is the Master-Key-frequency-Store that can Resonate with all particles so can be used for common-resonate in Cells .
In case of a Birefringent-Cell , Resonance-Passage happens as *EM-Radiation ,*S, ***can travel in Cell*** through Cauchy-stress-tensor where , in-where Energy Propagates along Directions , *without Birefringence* , and carries Energy-Storage , **r** ,which **is *The conveyer*** in Cell. **i.. In *Optical Physics*** :

  Optics is divided into *Geometrical-optics* when the wavelength of the light used is much smaller   than the size of the optical elements in the system being modelled and *Wave -optics* .
Both optics describe the Propagation of light in terms of Rays , using Reflection and Refraction laws using the *Refractive -Index* ,**n**, tobe a constant of any two materials , ***the waveguides*** ,and a given color   , *a concrete frequency* , Because light is Quaternion , *i.e. of Scalar and Energy = motion , term ,and which moves as Electromagnetic-Radiation* , then is needed the in-depth knowledge of its properties.
Electromagnetic Spectrum contains all known types of Electro-Magnetic Radiation and which is ,   Energy that travels and spreads out as it goes , and are in quantum treatments the →   Radio $\lambda=1.10^3$ m , Microwave , Infrared , Visible , Ultraviolet , X-ray , Gamma-ray $\equiv \lambda=1,5.10^{-20}$ m M_1-ray $\equiv \lambda = 8,9.10^{-35}$, M_2-ray $\equiv \lambda = 2,3.10^{-48}$,, M_7-ray $\equiv \lambda = 4,5.10^{-171}$,M_n-ray $\equiv \lambda =1.10^{-n=\infty}$,   It was shown that , Short or Strong - range forces $E = h.f_n$ are dependent , on Principal stresses

, **σ** , the Spin vector $\overline{\textbf{B}}$, and the inverse square of 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 this holds for the Breakage-Principle , While the* **Short range forces** *exist on* ***Primary and Neutral Particles*** *only.*

i.e. **If *EM radiation with , λ - f$_{Ir}$* ,** of the ***molecule*** cave [$λ =1.10^{-5}$ m , $f_{Ir}= 1.10^{12}$ Hz =s/mm] and *of   Infrared-radiation* [$λ= 1.10^{-8}$ m , $f_m = 1.10^{16}$] *is absorbed* by Stretching and Bending , *by atoms   of Ultraviolet–radiation , 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 $λ= 1.10^{-8}$ *to cave* $λ= 1.10^{-5}$ *of Infrared - vibration by following the Breakage-Principle and because of Waves - Resonance ,   consists one way of transportation of Energy* .

The generation of ***Electromagnetic–Radiation is the in-monads frequency-equation*** $\sin\dfrac{w.l}{c} = \sin\dfrac{2rw}{v} = 0$ satisfied by $\dfrac{2rw}{v} = π$,2π ,3π , , **n**π , where ***Each , n , represents a Normal -Mode –Vibration - in monads*** with natural frequency determined from equation ,

Natural frequency → $f_n = \dfrac{n}{2.l}c = \dfrac{n}{2.l} \cdot \sqrt{\dfrac{T}{ρ}} = \dfrac{n}{2.l}\sqrt{\dfrac{σ}{ρ}} = \dfrac{n}{4r}\sqrt{\dfrac{σ}{ρ}} = \dfrac{n}{4r^3} \cdot \sqrt{\dfrac{(1+\sqrt5)^2σ^2}{4π^2r4}} = [n\dfrac{σ(1+\sqrt5)}{π(2r)^3}]$ – an index

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 3.10^{-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 . Supersymmetry stating that every particle has a super partner with a quantum mechanical spin   that differs by ½ - ½ , is a piece only of above concept.

Above presence of Quaternion monads , *Space –Anti-space – Energy* , is the way of manipulating light in optical devices . Because Space Anti-space are phase-match therefore Wave ,light, can pass from one waveguide to others , and since wave is Motion ≡ Energy quantized in , λ , in , **n** , lobes as frequencies

with Total Energy { in , λ , massless n loops} → W = [$\dfrac{4πr^2f1}{3}$].   n.(n+1) where $f_1= \dfrac{(1+\sqrt5)).σ}{4πr} = \dfrac{E}{h} = \dfrac{W}{h}$, then → this is the How can be exploited to selectively filter specific modes of light from a wave-packet and the way of remaining only the , *Principal* , Fundamental mode f_1.

Since by Polarization exists only the Principal mode and do not suffer from modal dispersion to first order of frequency variation this is the right way for Input-Output guides . Since Energy follows , for Refraction *Refractive - Index* , then Optical waveguides as , *Fibers, Strips, Planar, 3D Spaces or Ribs* , are exploited. Since above properties are found in the structure of compound elements , then Waveguides may designed by configuring the in 3D space provides between Input → *electronic-components on a chip* and Output → the *optical fibers* . Using Photorefractive effect , *by maximizing or lowering the increase of the refractive index* , the focal spot translated through a bulk transparent material , then the waveguides can be directly written . Optical Fibers by ***maximizing the refractive index*** , is succeed → ***long –distance applications*** , and by ***lowering the refractive index*** , is succeed → ***short-distance applications*** .

Since for Primary and compound elements as Atoms are , *or Discrete Energy - monads , is followed the logic for Primary Particles or Atoms ,and was formulated the Geometrical formula of all* ***Moulds*** *as* { [Space ↔Anti space] – Energy = motion**] }** ≡ [⊕↔⊖   ]-[$\overline{v}$.□i] *the Linear* , Or, [⊕∪∪⊖]-[$\overline{v}$.□i] *the Rotational* , *angular* , momentum-states , Spin vector $\overline{\textbf{B}}$.   In this case as Input is used an *optical-Vortex - beam* causing a rotation of the excitation axis , and as Output the simulation capability. In Quantum-level , in Under-Planck-level and in Primary-Particles-level Wave-motions , for turbulences issues all the above and Energy *as motion of vortices* , *Linearly* is → [⊕↔⊖   ]-[$\overline{v}$.□i] *Rotationall*y is → [⊕∪∪⊖]-[$\overline{v}$.□i] . The Under-Planck-Scale-Caves controls interactions follow fundamental f_1.

Also monads created by a phase-stabilized-series-pulses can develop new Subatomic-devices of a quantum system being in Resonant-state , so much for Ultra-long and Ultra-short interactions . Energy page-70 , ***Kinetic Energy*** , *motion* , in Primary -2 Particles becoming ***from Cycloidal rotation*** of ⊕ to ⊖   is ,

Total Energy is **Spin** ≡ $\overline{\textbf{B}}$ =[r. σ. $(1 + \sqrt5)$] =$(\dfrac{8r}{n})$.$\textbf{f}_n$ ≡ **[εE²+μH²]/2 = 2rc.sin.2φ** , and $\textbf{f}_n = (\dfrac{nσ}{8r^2})$.$\overline{\textbf{B}}$,where

Energy ≡ W = $\dfrac{1}{2}$[εE²+μH²] is spread as the First Harmonic and equal to the outer Spin $\overline{S}$ = E / w = 2πr.c .

From above Energy ≡ Spin is related to the Inner Electromagnetic-wave and the Outer one and light-matter interactions can be transmitted from the microscopic medium description into macroscopic Energy-Space . In page 57-(3) are shown Polhode , *circle PT* , Herpolhode , *PS circle in plane E* . Polhode-Cone POT is rolling on the Fixed- Herpolhode-Cone POS , with the constant velocity $|\overline{v}| = \dfrac{σ}{r}[1+\sqrt5]$ dependent on Pressure ,σ, of two material constituents .

On this hollow-Cone of 90°, when illuminated by a circularly polarized light beam, then any changes in Spin angular momentum of 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 Poynting-vector in the cross-sectional plane.

The Stationary-Wave-Nodes-Principle for Energy issues only for the trapped - energy → *the motion*, in the primary particles wavelength, where the integer modes are the ***increasing in light`s wavelength*** $\lambda \equiv$ [f_1, f_2 ,,, ,$f_n \equiv$ the loops $\equiv$ n lobes]. [68] **j..** **In *Semiconductor Physics*** :

A Semiconductor material has an electrical conductivity value falling between that of Conductor *copper*, and an Insulator, *glass*. Their conducting properties when controlled is what is needed to *Energy*, requires the flow ,*motion*, of electrons then is dependent on the valence bonds of materials and their occupied holes, and as these can be modified, *by doping*, then these can be used for the *Amplification*, *Switching*, and *Energy-conversion*.

Most of the processes are based on doping and integrated circuits ICs. If the state is always occupied with an electron, then it is inert because is blocking the passage of others electrons via that state. By increasing its temperature, heating provides energy to promote some electrons across the band-gap inducing partially filled states. Conductivity can be increased and controlled by doping with impurities and gating with electric fields. Energy as Ionizing radiation striking a semiconductor it may excite an electron out of its energy level a consequently leave a hole especially from thermal energy in the absence of any external energy source.

Atoms which are a miniature solar system Normal the number of protons in the center of the atom equals the number of electrons in orbit. An Ion is any atom or molecule that does not have the normal number of electrons Ionizing radiation, is any form of radiation that has enough energy to Knock electrons out of atoms or molecule creating ions. Primary particles or *alfa, beta, and gamma radiation* and neutrons when expelled from atoms nucleus and travelling as a form of radiation, are types of Ionization. Semiconductor`s holes pairs recombine by using conservation of energy demands in which an electron loses an amount of energy larger than the band-gap, be accompanied by the emission of thermal energy in the form of photons. In sheath region method where, n = the quasi-density of the confine -plasma d = the scale length of the gradient □▁, then control density becomes from equation □▁² d² = □² . Application of, *Breakage - Principle*, to Electrons as ***Position , -*** electron holes and + electron filling is the equilibrium Space, Anti-space***, and as configuration*** for Semiconductors Ionization-energy-part. When Electron combines with a Positive Proton of the same level attract each other, [⊖⊕], and when combines with a neutral atom of a different level then is created a *negative-charged-Ion* as principle → **[** Space –Anti-space – Energy **]** $\equiv$ [⊕↔⊖] + {[v̄.□i] $\equiv$ |⊖⊕| }, agreeing with *Breakage – Principle*.

The generation of electron-holes pairs by, *Ion Implantation*, is the method to make microchips. Raw Silicon is neither perfect *Insulator* nor a perfect *Conductor*. Inserting a smattering of Boron or Phosphorus atoms into the → Silicon - Crystal - Lattice, {*the* □ **[s²]** → ***Matter***, - **[s²]** → ***Anti-matter*** *part* → is Lattice plus the smattering }, allow us to control the flow of the Electricity { 2 **s².**□i →***The Energy Term*** → is the flow of electricity as Ionization}. **k..** **In *Solid State Physics*** :

Solid state physics is the study of that state of matter in which the atoms or molecules, *the unit constituents*, of which the matter is composed are, ***Not -Free -to move***, relative to each other to any significant degree (*the units of the matter are bound to each other by any of a number of forces*).

The study encompasses the understanding of the organizational, *mechanical*, *magnetic and electrical properties of the substance*, as well as the forces that bind the units into the solid state, concerning Crystal - structure, the stresses and strains between units and groups of units and movement. Also for the storage and orientation of charges and magnetic - moments, is the use of the semi - classical electromagnetic, statistical and quantum mechanical principles as well the new Material - geometry concepts for Granular mechanics.

Because ***Interaction of two monads***, *quaternion* ,with each other *happens in all quantization - states therefore is needed a deep knowledge in each State and for all them*. The New acquisition in science *that of **Material-geometry** ,* is the suitable theoretical instrument for studding the objective reality. The Recent conclusions for using, ***Breakage - Principle***, to monads for ***Position and Configuration***, and this because issues for, ***all levels of Energy Quantization as combinations***, is of grate use.

EIGEN –VALUES ≡≡ RESONANCE

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*** $f_{N=1}$ ***of the System*** S, then exists a condition of ***Resonance***, i.e. Oscillatory-Excitation → f_E [S $\equiv$ f_1, f_2, f_N ,$f_n = w^2$] ← $f_E \equiv f_N$. 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.ẍ (t) + K$x_{(t)}$= 0 for initial conditions x(0) = x_o and ẋ(0) = ẋò, 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 [-w²M +K] **u**.e^{iwt} = 0 where **u**, is the constant scalar displacement-vector and w = 2πf, the frequency of the system.

The solution of the above equation determines the *Real or Complex numbers* , λ_1 , λ_2 , ... $\lambda_n = w_n^2$ called **Eigenvalues** , which satisfy the **Characteristic equation** det $K=[A-\lambda I]$ **x** = $[A-w^2I]$ **x** = 0 where **x** , is the eigenvector associated with the eigenvalues $\lambda = w^2$, and the corresponding Non-zero vectors .

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 , λ up to λ^n , and therefore when it set equal to zero has , **n** , roots called eigenvalues , and factorized in the form (λ -λ_1).(λ-λ_2) ... (λ-λ_n) = 0 and for λ = 0 then $\rightarrow$ det A = λ_1 . λ_2 ... λ_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. For more in [68] **Systems with N-DOF ,** *Degrees Of Freedom* **:**
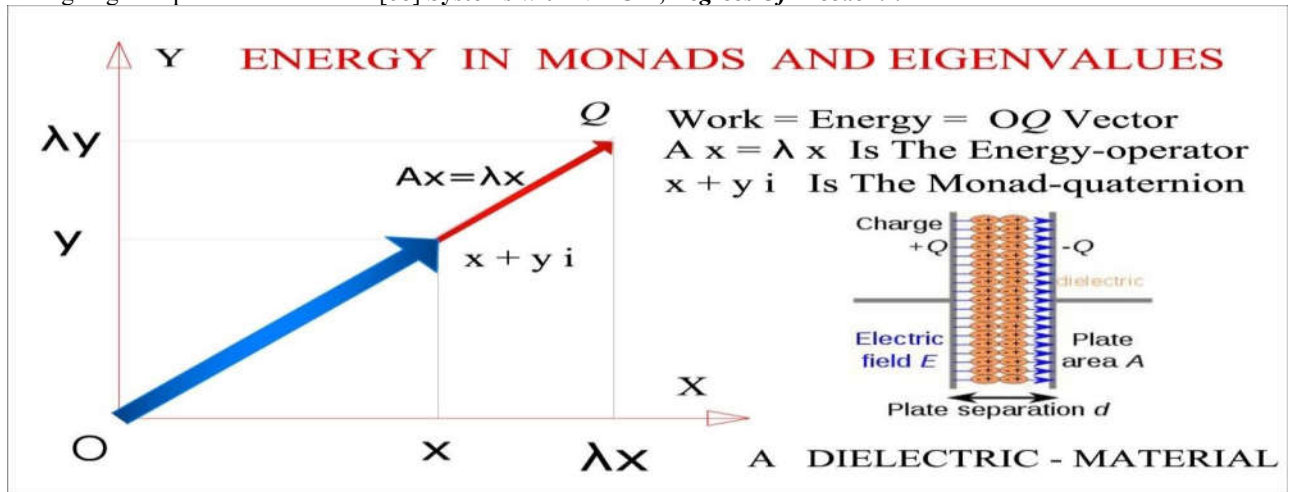

Fig-30 : ***Eigenvalues*** λ *, in Energy monads* **:**

a.. Monad is Quaternion [x + iy] and Energy the Vector $\overrightarrow{OQ}$ = {λ}.X

b.. Energy is the Work produced in monads and equal to W = 2L = $\overline{B}$. $\overline{w}$ = J . w^2

c.. The Configuration of a Stationary-System is expressed by the matrices M.$\ddot{x}$ (t) + $Kx_{(t)}$= 0

d.. The Characteristic matrix K = [A – λ I] gives the , **n** , roots such that det. A = λ_1. λ_2 .. λ_n = 0

e.. Energy in Store 2λ = r = h/p $\equiv$[f_1 ,f_2, $f_n\equiv$ 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 $f_N = n \dfrac{(1+\sqrt{5})\sigma}{4\pi \, r}$ and a New wavelength as

$\lambda_N = \dfrac{2\,r}{n} = \dfrac{4\pi \, r \, c}{n\sigma.(1+\sqrt5)} = \dfrac{8\,r^2\,c}{n\sigma\overline{B}}$ following relation λ = c / f , $f_N = n \dfrac{(1+\sqrt5)\sigma}{4\pi r} = \dfrac{n\sigma.\overline{B}}{8\,r^2}$ and

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(q_1 , q_2 , q_N .. $q_1^{\cdot}$, $q_2^{\cdot}$, $q_3^{\cdot}$, Potential energy U(q_1 , q_2 , q_N) , and ***Work expressed in***

terms of Generalized-coordinates as Lagrange- equation , $\dfrac{d}{dt} \left(\dfrac{\partial T}{\partial \dot{q_i}}\right) - \dfrac{\partial T}{\partial q_i} + \dfrac{\partial U}{\partial q_i} = Q_i$ ..(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 $\rightarrow$ dT = dW_P + dW_{nP} $\leftarrow$ and thus Lagrange`s equation (1) is the q_i component of the energy equation d(T+U) = δW_{nP} . The right side   of this equation is as δW = $\sum$ Qi. δq_i = $Q_1\delta q_1$+ $Q_2\delta q_2$ + ... , where Q_i is the Generalized-force . Quantity Q_i can have Any-unit as , *Unit of forces , of Geometry , of Physical-coordinates* , and everything that can be considered as Work from relation $Q_i\delta q_i$.

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 .

The Geometry and The Physical Configuration - Structure of Systems .

.   (3) $\cdot \cdot$ (4) $\cdot \, \cdot \cdot$

A.. The Point-Line-Plane-Volume : E-Geometry : (1) **.**   (2) **..**

B.. The Material-Point   : M-Point   : [$\oplus\cup\cup\ominus$] , | $\ominus\leftrightarrow\oplus$ |

C.. The Forced-Material-Point : M-Geometry : $f_E [S \equiv f_{1=N} , f_2 , f_3 , f_n = w^2] \leftarrow f_E \equiv f_N$

D.. The Forced-Nodes -Structure : Mechanics : $[-\lambda M + K] X = 0$ $[\bar{A} - \lambda I] Y = 0$

<div align="right">® ®
® ®</div>

E.. The Valence-Bond-Particles : Chemistry : ® ® ® Θ® ® ☼ Θ₀₀ᴼᴼ® Θ ® ®

In Euclidean-Geometry are shown the different Stationary-Shapes that Points maybe formatted .
The Points on Shapes are called *Vertices* . Fig-104.
In Material-Point are shown the two Stationary-Shapes that Material-Points maybe formatted.
The Points on Shapes are called *Spaces* , $\oplus$, *Anti-spaces* , $\ominus$, or (+) , (-) charge.
In Material-Geometry are shown the different Stationary-Shapes that Material-Points maybe formatted.
The Points on Shapes are called *Spaces* , $\oplus$, *Anti-spaces* , $\ominus$, 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 - eigenvalue-form $f_E [S \equiv f_{1=N} , f_2 , f_3 , f_n = w^2] \leftarrow$ where then $f_E \equiv f_N$.
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 $z \equiv s + \bar{v} \square i$, **ACTING** , another Quaternion $z` \equiv s` + \bar{v} \square i$ with Real and Imaginary parts **OCCURS** , *a Relationship* , *a Resonance* , between these , and is described by their common ***Natural - frequency*** f_N ,while motion in response to ***Imaginary parts.*** b.. Since monads are of Quaternion and of Wave-nature-Pattern Resistance is the mass , i.e.

a ***Measure of any Reaction to motions*** and of , *Real* and of *Imaginary Part* as $R_z = R_s + R_{\bar{v}}$ If the Reaction to motions 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

Inductance in electric circuit , In Material-point $m = \overline{c^2}$ $(wr)^3 = \frac{h.w}{2\pi.c^2} \equiv \frac{2E}{a_a} \equiv [\frac{\bar{B}.\bar{w}}{\bar{B}x\bar{w}}] . J$ Since also monads are internally as *Storage-modes* $f_n = w_n^2$, 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 $= [\frac{4\pi r^2}{3}].f_n = n \frac{(1+\sqrt{5}).\sigma r}{3} = 2L = \bar{B}. \bar{w}$ $= J.w^2$, is split into the , n , finite numbers of Energy-lobes dependent on the angular-momentum-vector $\bar{B} \equiv$ Spin . Reorientation of Spin creates a New Nutation-Period $f_N = n \frac{(1+\sqrt{5})\sigma r}{3}$ as in Fig-30. a New wavelength $\lambda_N = \frac{2 r}{n}$, and $\lambda = 2r$.

Since frequency $f_N = n \frac{(1+\sqrt{5})\sigma r}{3} = \frac{\lambda_N}{c}$ then $\lambda_N = \frac{8.r c}{n\sigma^2.(1+\sqrt{5})} =$ 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 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*** .

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 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 details of the structure of molecules .

Above procedure can be used in Cells , where cells are cases of an Birefringent material and the Resonance-Passage happens as the Force , *EM-Radiation in **Two** directions , **can travel in Cell*** through Cauchy-stress-tensor where the two Conveyers E ⊡ B ⊡ r ≡ σ₁ ⊡ σ₂ ⊡ σ₃ ,can carry the Energy-Storage ,**r** , in Cell ,and change the Inner-Structure of Shell to another desirable Property.

In Momentum-Paradox of light , **MP-*Light-Resonance*** occurs , when the Photon as System , S , as

$$\left\{ \left[S \equiv EM\text{-}R \equiv f_{1=N}, f_2, f_3, f_D,, f_n \right] \text{ and } \lambda_N = \frac{8.r\,c}{n\sigma^2.(1+\sqrt{5})} = \frac{8\,r^2 c}{n\overline{B}} \right] \right\}$$

, *and which is a moving Energy -tank as EM-Radiation and ,* **DRIVE** the System of the Dielectric-Medium [$S_D \equiv f_D$] to oscillate with a common amplitude , *the Dielectric-Polarization frequency* f_D , with a → New-mass Density-Wave , becoming from *the Reaction to the New Reorientation of Spin* . It was proved that when Spin = $\overline{B}$ vector changes direction , then frequency is between [$f_1,.., f_n = w^2$] and becomes another Particle . More [68] .

A light-Pulse , Driven forward , in a sort of Optoelestic shock-wave , E.M-R ≡ $f_{1=N}$, f_2 , f_3, f_R ,,,,,,,f_n ,

Electromagnetic-Radiation ,then Photon`s momentum is $\overline{B} = \dfrac{r\sigma.(1+\sqrt5)}{n} = \left[ \dfrac{\sigma.(1+\sqrt5)}{2} \right] \dfrac{2r}{n} = v_R.\dfrac{2r}{n} = \dfrac{2rc}{n.N_R}$ i.e. Photon`s momentum follows the Inverse-dependence of Radiation-pressure on the Refractive-Index .

From equation $f = \dfrac{\sigma\,(1+\sqrt5\,)}{4\pi r} = \dfrac{n.\pi\sigma.\overline{B}}{8\,r^2} = \dfrac{n.\pi\sigma.}{8\,r^2} \dfrac{2rc}{n.N_R} = \dfrac{\sigma.\pi c}{4r.N_R}$ arises that , Energy propagating with a *light -Pulse* in a Medium is carried by the field , so *optical-force-field* of the light-pulse would Drive forward an atomic mass density-wave inversely dependent on the Refractive-Index $N_R = \dfrac{c}{v}$.

The ***Kinetic-Energy*** E_K of a moving Material-point , *as this is the Photon* , is stored as motion in its Storage , $r = [\,n.\lambda/2]$ with the , **n** frequencies $f_n = n.f_1$, with **n** lobes and fundamental frequency 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 ≡ σ₁ ⊡ σ₂ ⊡ σ₃ , in-where Energy Propagates along 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 , *EM-Radiation in **Two** directions , **can travel in Cell*** through Cauchy-stress-tensor where the two Conveyers E ⊡ B ⊡ r ≡ σ₁ ⊡ σ₂ ⊡ σ₃ , 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.f_1 r , wavelength λ= cT = c /f_1 ,cave r = n.[λ/2] , then r = n.(c /2f_1) and **v** = 2π.f_1.[n.c/2f_1] = **n.π.c** or **v = n.π.c** …..(4) showing that velocities in lobes are , **n.π** , times that of light .These are the Point-particles in vacuum . Analytically in [68] . **Epilogues .**

The origin of Space [S] *becomes , through the Principle of Virtual Displacements* $W = \int_A^B P.ds$ *= 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 is transformed in every Energy Space level .*

*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 {D_A- P_A}≡ [R] (x', y', z', t') moves with velocity ,$\overline{v}$, parallel , to x-x', axis with respect to the fixed and Absolute System {D_A- O} ≡ [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** , 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 $\overline{w}$ in a cave , velocity $\overline{v}$=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
$$\mathbf{m} = \frac{2}{c^2(wr)^3} = \frac{h.w}{2\pi.c^2}$$, *analogous to Energy w* , → then **mass is a factor measuring energy** ,

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 $\overline{P_A} = - \overline{P_B}$ 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
$\{[s^2 = \pm (\overline{w}.r)^2 , [\Box i] = 2(wr)^2]$ of [MFMF] Gravity , under thrust $\overline{v} = \overline{c} \}$, where become **Fermions** $\to [\pm \overline{v}.s^2]$ and
Bosons $\to [\overline{v}.\Box i = [\overline{v}.2(\overline{w}.r)^2] = [\overline{v.2s^2}]$.

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 $\oplus_\|$ Space on $\ominus$ Space producing the physical angular velocity ,w , and dissipation under conditions of cyclic oscillations in monads .
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 , and thus unify all physics .
Considering the Material-point as a closed system , and according to the Second law of Thermodynamics 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 , $\bar{v} = \dfrac{d\psi}{dt}$ and Angular velocity , $\bar{w}$, becoming from Stress ,σ , from the two Opposite Constituents [$\oplus \leftrightarrow \ominus$], and which is the Force applied on lever-arm , $\bar{r}$, 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 $\oplus$, constituent on the Negative $\ominus$, 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 and an Angular-momentum . *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 $\bar{B}$ is identical to the Spin , S , and analogous to the Magnetic moment

$\bar{\mu} = \dfrac{4r.L}{(1+\sqrt{5})\,.\sigma}$ and $\bar{B} = \dfrac{\pi r^3 \sigma}{8}[1+ \sqrt{5}\,]$, both depended on Glue bond σ .

Th*e Angular -Velocity Vector* $\bar{w}$ is identical to The current-loop Torque and analogous to the charge

$\bar{q} = \left(\dfrac{m.\bar{w}.\bar{\mu}}{L_{gs}} \right) = [r\,\sigma\,(1+\sqrt{5})\,]$ *In Under-Planck cave* [64] is proved and shown ,

The Angular - momentum Vector $\bar{B}$ is identical to $\mathbf{Spin} \equiv \dfrac{E}{w} = \dfrac{h_m}{2\pi} = \bar{B} = [r.\sigma.(1+\sqrt{5})\,]$ and analogous to cave , r , and Glue-bond ± σ .

Th*e Angular -Velocity Vector* $\bar{w}$ is analogous to the Principal Stress σ , as $|w| = \dfrac{\sigma}{2r}[\,1+\sqrt{5}\,]$ and is causing the mass of monads , which is the meter of , *the reaction to the change of velocity vector* .

9). The Where Energy , produced through a 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 K K_1 to a Space –Monad K K_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* .

It was shown in [58] that the free rotation is so happening because of the eternal rotation of the $\oplus$ constituent on the $\ominus$ 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 $\sin\dfrac{2rw}{v} = 0$, or

$w_n \cdot \dfrac{2r}{v} = \dfrac{4\pi r}{\lambda} = n.\pi = \dfrac{4\pi rf}{v}$, $\lambda = \dfrac{c}{f}$ 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 equation → $f_n = \dfrac{n.v}{4r} = \dfrac{n\sigma}{8r}[1+\sqrt{5}\,]$ ………………..… (n)

i.e. Normal mode vibration is an Energy - cave (the ∞ modes of f_n) in where , Energy $\equiv$ 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 as in Figure 21 .

The rotating axis , l = 2r = KK_1 in Material – point , creates the **Linear vibration of string** *, l , which is* $K \equiv [\ominus] \leftrightarrow$ $K_1 \equiv [\oplus]$ *and the Natural - frequency* f_n *, in points , K , K_1 , or the* **Rotational vibration of string** *which is* [$K \equiv \ominus$ $s^2 \cup \cup K_1 \equiv \oplus s^2$] .

In cave of radius , **r** , the correlation of $\rightarrow$ *Natural frequency f_n* , *becoming from the Linear vibration of string ,* and $\rightarrow$ *Spin equal to the Angular - momentum Vector* $\overline{B}$, *becoming from the Rotational vibration*

of string , $\textbf{Spin} \equiv \frac{\overline{E}}{w} = \overline{B} = [r.\sigma.(1+\sqrt5)]$ and **Natural-Frequency** $f_n = \frac{n.v}{4r} = \frac{n\sigma}{8r}[1+\sqrt5$] , becomes

$\textbf{Spin} \equiv \overline{B} = [r.\sigma.(1+\sqrt5)] = (\frac{8r^2}{n}).\textbf{f}_n$ and , $\frac{\overline{B}}{\textbf{f}_n} = (\frac{8r^2}{n\sigma})$ = Constant for each cave , and

$\textbf{Frequency} \equiv \textbf{f}_n = (\frac{n\sigma}{8r^2}).\overline{B} \rightarrow$ i.e. Energy-caves are Stationary Wave-Fringes .

In Material point , *and because of the Eternal rotation of the* [$\oplus$] *constituent around* [$\ominus$] *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 , $\frac{l}{2} , \frac{l}{3} , \frac{l}{4} , \frac{l}{5}$, …….. $\frac{l}{N}$, *i.e.*

One , Half ,Third …$\frac{1}{N}$. - Lengths $\rightarrow [\frac{l}{2},\frac{l}{2}],[\frac{l}{3},\frac{l}{3},\frac{l}{3}], , ,[\frac{l}{N},\frac{l}{N}]$, 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 .

Th*e 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.π.c** or **v = n.π.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* $\rightarrow$ s² , $-|\overline{v}|^2$, [2$\overline{w}$].|s| |r|.□i $\leftarrow$ where for , $\overline{v}$ = s $\equiv$ the cave ,

[**s²**] $\rightarrow$ is the Real part , *Matter* , of the new monad , and is *a Positive Scalar magnitude* .

- [**s²**] $\rightarrow$ is the always Negative part , *Anti-matter* , which is always *a Negative Scalar magnitude* . 2 s².□i $\rightarrow$ 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 $\rightarrow$ *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* $\rightarrow$

the *two Opposites* (± **w**) *and an Neutral Part* 2 .□i $\leftarrow$ or as *Matter* (+ **w**) , as *Antimatter* (- **w**) *and as Energy part* , 2L , *and always to its constituents , either to all or separate* following $\rightarrow$ 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 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] $\equiv [\oplus \leftrightarrow \ominus]-[\overline{v}.□i]$, *without any Assumptions , or Axioms , or Exclusion Principles , or any other Starting Points .*

In a few words Energy $\equiv$ Motion $\equiv$ 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 $\equiv$ { Stationary Waves $\equiv$ The monads} , Is getting Out the cave in case of the Skin-effect $\equiv$ {Formulated in the three Moulds of $\rightarrow$ **[** Space –Anti space - Kinetic Energy]}, Never vanishes , But continuously changes to above three Moulds , formulating the Primary and Compound elements of this cosmos .

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