

# QUANTIZATION OF POINTS AND ENERGY ON DIPOLE VECTORS AND ON SPIN

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*This article presents unification of **quantized** Space and Energy through **Primary Vector** interconnected with the universal Principle of Virtual Work . Dipole is the Mould that creates all matter , Spin of particles , Energy Range Scales and Forces as is shown with Classical and Quantum Mechanics .*

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## INTRODUCTION

Quantization of Points *becomes through Vector Unit*  $d\mathbf{s} = \tilde{\mathbf{A}}\mathbf{B}$  , and of Energy *is done in bound States ( loops )* which *withhold diffusion ( flow )* . The two fundamental dimensions ( *quanta of Points ( ds ) and quanta of Energy ( dP )* ), *are connected on Primary dipole* and on any dipole  $A_iB_i$  . The position of dipole in the equilibrium Space , Anti-Space creates *charge = momentum* and *Angular momentum* ( Spin = *the intrinsic twist of Space , Anti-Space* ) which inextricably unify geometry of Space and motion . The resolution of the Russian theory of micro-world *is verified* with the Photos of grapheme (  $1,4 \cdot 10^{-10}$  ) . A Concentrated analysis for Point in Euclidean geometry follows .

- 1a.. **Point** is nothing , has not any Position and Dimension , and may be anywhere in Space *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 ]
- 2b.. **Straight line** is 0 , Positive , Negative  $\pm \infty$  points , and since is composed of infinite points which are filling line , *then nature of line is that of Point ( the all is one for Lines and Points )* .
- 3c.. **Plane** is Positive , Negative ,  $\pm$  Neutral and  $\pm$  Complex points and since is composed of infinite Straight lines which are filling Plane , *then , nature of Plane is that of Line and that of Points ( the all is one for Planes , Lines and Points )* .
- 4d.. **Space** is Positive , Negative ,  $\pm$  Neutral and  $\pm$  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 )* .

## FUNDAMENTAL PRINCIPLES .

1.. **The first dimensional Unit AB** of two points A , B not coinciding is the geometrical Shape that has as Position ( the direction  $\hat{A}B$  ,  $\hat{B}A$  ) and as Magnitude ( the length  $AB = 0 \rightarrow N \rightarrow \infty$  )  
**AB is a straight line** through points A , B . ( F.1b ) , [ 6 ]

$$CA + CB = AB \quad , \quad \text{where ,} \quad \begin{array}{ccc} A & C & B \\ \square & \square & \square \end{array} \quad \begin{array}{ccc} A & C & B \\ \text{---}\square & \square & \text{---}\square \end{array}$$

F.1(a) F.1(b)

$d\mathbf{s}$  = An Infinitely small increment of length AB in the direction  $\tilde{\mathbf{A}}B$  or  $B\tilde{\mathbf{A}}$  .

$\infty$  = An Infinitely great magnitude AB in the direction  $\tilde{\mathbf{A}}B$  ,  $B\tilde{\mathbf{A}}$  .

Any point C is on Straight line AB , only when exists equation  $CA + CB = AB$  , i.e.

The Whole AB is equal to the Parts CA and CB . ( *equation* ) . ( F 1.b )

In case  $CA + CB > AB$  then point C is not on line AB , and this is the main difference between Euclidean and Non-Euclidean geometries . In Definition 2 ( *a line AB is breathless length* ) is altered as , *for any point C on line AB exists*  $CA + CB = AB$  . [ 6 ]

Edge points A , B not coinciding on Monad **AB** , keep the properties of Complex numbers with Imaginary part which differs between the infinite points. [11] – [13]

Unit AB creates Spaces with two basic Elements , **the Position** ( which are the three directions  $AB \rightarrow , BA \leftarrow , AB \leftrightarrow$  ) and **the Dimension** ( which is the Magnitude  $N$

$N = 0 \rightarrow AB \rightarrow \infty$  ) , when

$A = B$  = Principle of the Equality .

$A \neq B$  = Principle of the Inequality .

$A \rightarrow \leftrightarrow \leftarrow B = \infty$  Principle of Virtual Displacements .  $W = \int P.ds = 0$  ,  $ds = \partial W / \partial P$

$PA + PB = 0$  Principle of Stability

**Monads = Quantum = ds = AB / ( n =  $\infty \rightarrow 0$  ) = [ a  $\pm$  b.i ] = 0  $\rightarrow \infty$**  , are simultaneously ( *actual infinity* ) and also ( *potential infinity* ) in Complex number form , and this defines , infinity which exists between all points which are not coinciding (  $ds > 0$  ) , and because **ds** comprises any two edge points with Imaginary part then this property differs between the infinite points. Plank length is a Monad **ds =  $1,62 \times 10^{-35}$**  , for two points A , B , and for the moment is accepted as the smallest possible size . This Monad is also infinitely divided because edge points A , B are not coinciding i.e. ... **ds =  $1 \times 10^{-N}$**   $< \infty$  , where N is any number .

**2.. Spaces of Unit AB** are ( in Plane ) the Infinite (+) Regular Polygons inscribed in the circles **with AB as Side** , ( repetition of Unit AB ) , the Nth Space , the Nth Unit Tensor of the N equal finite Elements **ds** , and for the  $\infty$  Spaces , the line  $AB \leftrightarrow$  . ( F.2 )

The diameter of this circles extends to infinity ( *it is of potential nature* ) . [11]

**3.. Anti - Spaces of Unit AB** are ( in the three dimensional space ) the Symmetrically Infinite (-) Regular Solids inscribed in the Sphere **with AB as side** of the Solid , ( The Harmonic Repetition of Unit BA , symmetrical to AB ) , the Nth Anti-Space , the Nth Unit Tensor of the N equal finite Anti - Elements and for the  $\infty$  Spaces , the Plane through line  $BA \leftrightarrow$  . ( F2 ) ,

The diameter of this Spheres extends to infinity ( *it is of potential nature* ) . [11]

**4.. Sub- Spaces of Unit AB** are ( in Plane ) the Infinite Regular Polygons inscribed in the circle **with AB as diameter** , ( Harmonic Repetition of the Roots in Unit AB ) and in Nth Sub-Space, the Nth Unit Tensor of the N finite Roots and in case of  $\infty$  Elements are the points on the circle , and for 3DSpace , the points on Sphere AB ) . ( F.2 ) The Superposition of Spaces , Anti - Spaces and Sub-Space Layers of Unit AB is shown in F.2 . Remark : (+) Spaces , (-) Anti - Spaces , ( $\pm$ ) Sub-Spaces , of a unit AB are between magnitude ( Point = 0 = Nothing ) , and the Infinite magnitude (  $\leftrightarrow = \pm \infty =$  Infinite ) which means that all Spaces are in one Space . ( F2 ) Because in Spaces and Anti-Spaces , the  $\infty$  Spaces of **Unit AB** is line  $AB \leftrightarrow$  , and in Sub-Spaces the  $\infty$  Sub-Spaces of **Unit AB** are the points on the circle with AB as diameter , then this ordered continuum *for points on the circle* of Unit AB and on *line AB* shows the correlation of Spaces in Unit AB . i.e.

**Monads ds = 0  $\rightarrow \infty$  are Simultaneously, actual infinity (because for  $n = \infty$  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 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 infinite points . [11]**

**4a. The Superposition of Plane Space , Anti-Space Layers and Sub-Space Layers ( F.2 ) :**

The simultaneously co-existence of Spaces , Anti-Spaces and Sub-Spaces of any unit AB , **Unit AB = 0  $\rightarrow \infty$**  , (  $A \equiv B$  ) i.e. , Euclidean , Elliptic , Spherical , Parabolic , Hyperbolic , Geodesics , Metric and Non-metric geometries , exists in Euclidean Model as an Sub-case within . The Interconnection of Homogeneous and Heterogeneous bounded Spaces Anti-Spaces and Subspaces of the Universe. The Unity of Opposites . This is also the *Quantized* property of Euclidean geometry *< all is one >* as it is , Discrete ( for Monads AB ) and Continuous ( for Points A , B ) . F.2 [13] . For Primary Point A , it is the only Space [ 17 ]



( Entities = AB ) are the Harmonic repetition of their roots , and since roots are the combinations of 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 Continuous , Impulses  $\mathbf{P}_A, \mathbf{P}_B$  , etc ) , i.e. , *Euclidean geometry is Quantized* . **and ..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  $\rightarrow ds = 0$  ,  $dP = P_B - P_A = 0 \rightarrow \infty$  ) . [ 11 - 12 ] Impulse is  $\infty$  , and may be Vacuum , Momentum , or Potential or Induced Potential .**

Change ( motion ) and plurality are impossible for points of Absolute Space [ PNS ] and since it is composed only of Points , that consist an Unmovable Space , then neither Motion nor Time exists i.e. a constant distance  $AB = ds$  anywhere existing is motionless .  $ds = [AB / n] > 0 = quantum$  and for infinite continuous  $n$  ,  $ds$  convergence to  $0$  . [ 10 ]

Physical world is scale-variant and infinitely divisible , consisted of finite indivisible entities  $ds = AB > 0 \rightarrow$  and infinite points (  $ds = 0$  ) i.e. is Continuous with points and Discontinuous with  $ds > 0$  . [ 13 ] . In PNS  $dt = 0$  , so motion cannot exist at all .

**6.. Motion : Since on Primary point A exists , Principle of Virtual Displacements [  $ds \cdot (P_A + P_B) = 0$  ] and Impulse  $\mathbf{P} = ( \mathbf{P}_A + \mathbf{P}_B ) = \mathbf{0} \rightarrow \mathbf{P} \rightarrow \infty$  may have any Price , then for  $P = 0$  exists PNS . Since points A , B of [ PNS ] coincide with the infinite Points of , Spaces , Anti-Spaces and Sub-Spaces in [ PNS ] , and since also Motion may occur at all Bounded Sub-Spaces then , this **Relative motion** is happening between all points belonging to [ PNS ] and to those points belonging to the other Sub-Spaces (  $A \equiv B$  ) . [ 11 ] . The position of points in [ PNS ] creates the infinite dipole and all quantum quantities which acquire Potential difference and an Intrinsic moment in the three Spatial dimensions (  $x, y, z$  ) and the infinite dimensions of the (  $i$  ) Layers at these points , existing from the other Layers of Primary Space , Anti-Space and Sub-Space , where  $i = 1 \rightarrow \infty$  .**

Motion is Continuous and occurs on Dimensional Units ,  $ds$  , and not on Points which are dimensionless , upon these Bounded States of [ PNS ] , *Spaces and Anti-Spaces* , and because of the different Impulses  $P_A, P_B$  of points A , B and that of Impulses  $P_{iA}, P_{iB}$  , of Sub-Spaces is either on straight line AB ( linear ) or curved for points  $P_{iA}, P_{iB}$  , **not** on line AB . Since all moving Sub-Spaces move in [ PNS ] there are three types of motions , Linear , Curved and Circular depending on direction of motion , occurring relatively to Primary Space and anti-Space .

It will be referred later that this property in [ PNS ] , *the curvature* , is not a property of [ PNS ] but it is of the relative motion of Spaces . Since distance  $ds$  is the mass of the bound State , then [  $dP = P_B - P_A$  ] is the vibrational Bounded State ( Energy ) of a closed String which interact on space . Following Pythagoras theorem on 11/5/2012 has been proved that Energy ( motion ) is conserved *and in two dimensional Spaces* , the Changeable Square HNMC + Changeable Square HPP<sub>1</sub>C<sub>1</sub> = Total Area of Square CADP and so this answers conservation laws in Physics . **Because Total Energy is conserved all interactions are mediated with Energy ( wave motion ) , ( Photons etc. ) .**

Following the dialectic logic of ancient Greeks ( Αναξίμανδρος ) « τό μή Ον , Ον Γίγνεσθαι » ‘ The Non-existent , Exists when is done ’ , ‘ The Non - existent becomes and never is ’ and the Structure of Euclidean geometry [ 6 ] in a Compact Logic Space Layer , as this exists in a known Unit ( *case of 90 ° angle* ) , then , we may find a Geometrical Mechanism that produces all Spaces and angles . **Since Non-Existent may be at a point A ( Primary point ) and also everywhere , then how Existence of Space is found and is done everywhere ?? [ Answer : Because Primary Point is the only Space and from this all the others , how ?? follows ] .**

In Euclidean geometry points do not exist , but their position and correlation is doing geometry . Since Geometry is consisted of Real (  $ds$  ) , ( *the quantization of points* ) and Imaginary Parts (  $\mathbf{P}_A, \mathbf{P}_B$  ) , ( *the quantization of Energy* ) the universe cannot be created , because becomes by quantization of the one point which is nothing i.e. **Monads =  $ds = AB / (n = \infty \rightarrow 0) = [ a \pm b.i ] = 0 \rightarrow \infty$  .**

**Since all Points in [ PNS ] may exist with  $P = 0$  and also with  $P \neq 0$  , (  $PA + PB = 0$  for points in Spaces and Anti - Spaces ) , therefore [ PNS ] is self created , and because at each point may exist  $P \neq 0$  this [ PNS ] is a Scalar Field with infinite points which have a Charge  $P = 0 \rightarrow P \rightarrow \infty$  , i.e. a Dynamic Tensor with absolute dimensions  $X_o, Y_o, Z_o$  and Charges  $P_i = 0 \rightarrow P_i \rightarrow \infty, i = x, y, z$**

**On Monad  $AB = 0 \leftrightarrow AB \leftrightarrow \pm \infty$  exists < a bounded State for each of the Infinite Spaces and Anti-Spaces > and the [ Dipole  $AB = \text{Matter}$  ] is the communicator of Impulse [ P ] of Primary Space , with the Bounded Impulses (  $P_A, P_B$  ) of Dipole or [10]**

$$\begin{array}{ccc}
 [ P ] & \leftrightarrow & [ \text{FMD} = AB - P_A, P_B ] \rightarrow P_A, P_B. \\
 \text{on} & \downarrow & \text{Communicator} = \text{Medium} \quad \downarrow \\
 \text{Impulse } P & \rightarrow & [ \text{Bounded Primary Space- Anti-Space} ] \rightarrow \text{Bounded Impulse } P_A \\
 & & P_A \quad \quad \quad = \quad \quad \quad P_B \\
 & & A \rightarrow \dots \leftarrow O \rightarrow \dots \leftarrow B
 \end{array}$$

Since motion occurs on Dimensional Units ,  $ds$  , and not on Points which are dimensionless and because of the different Impulses  $P_A, P_B$  of points  $A, B$  and that of Impulses  $P_{iA}, P_{iB}$ , of Sub-Spaces , it is on straight line  $AB$  or on tracks of Spaces , Anti -Spaces , and Sub-Spaces of  $A_iB_i$  . [10-11] . All particles act as wave ( wave-particle duality ) because of the Total energy conservation law of Pythagoras . [ 16 ] In Particular Physics , every particle is a wave ( vector ) .

The range of Relative velocities is bounded according to the single slices of spaces (  $ds$  ) . The Bounded Spaces , Anti-Spaces , Sub-Spaces , of the First dimensional Unit  $AB = a + b.i$  are composed of the two Elements  $\rightarrow$  the [ Dipole  $AB = \text{matter}$  ] which is the communicator  $AB$  , and the Impulse [ P ] of Primary Space , with the Bounded Impulses (  $P_A, P_B$  ) of Dipole or is , Forces at points  $A, B$  of [ PNS ]  $\Rightarrow [ P ] \leftrightarrow [ \text{FMD} = AB - P_A, P_B ] \rightarrow P_A, P_B$

When the difference of Impulses  $dP = P_B - P_A > 0$  then Dipole  $AB$  is of + (deficit quality)  
 When the difference of Impulses  $dP = P_B - P_A < 0$  then Dipole  $AB$  is of - (deficit quality)

A point in [ PNS ] , where exists  $P_A + P_B = 0$  , is that of the equilibrium of symmetrical Primary Space and Anti-Space , and when  $P_A + P_B > 0 < \infty$  is that of Space , and when  $P_A + P_B < 0 < -\infty$  is that of Anti-Space .

**Points  $A, B$  of  $AB$  ( $A \equiv B$ ) carry the bounded Impulses  $P_A, P_B$  which achieve Stable State so this allows other Primary Spaces to exist differently in the same Space . ( Charges  $P_A, P_B \rightarrow$  Electric field  $\rightarrow$  Magnetic field  $\rightarrow P_A, P_B$  ) and for every dipole  $ds = AB$  ,  $dP = P_B - P_A$  , a property called  $\pm$  charge of  $ds$  .**

**Question 1 :** How geometrical constructions are able to connect such Properties as , Mass Energy and the conservation laws of Physics ? answer 14 / 3 / 2012

Let us clarify what is , Geometrical Construction and Properties such as , Mass , Energy and laws of Physics . All Principles are holding on any Point  $A$  . For two points  $A, B$  not coinciding , exists Principle of Inequality which consists another quality . These Points consist the monad  $AB$  with all [ Spaces , Anti-Spaces , Sub-Spaces ] and has steady boundaries , which exist in their Position under the Principle , **Equality and Stability in Virtual displacement which presupposes Zero Work in a Restrained System** ) . [11] . Page 2,3 , i.e.

A 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 , so then this primary point  $A$  to exist at a second point  $B$  somewhere else , point  $A$  must move at point  $B$  , where then  $A \equiv B$  .  $\rightarrow$  **Since Spaces , Anti - Spaces and Sub - Spaces are created from the first Unit  $AB$  , and are Property of this Unit only , therefore these are also a Restrained System (  $S$  ) .** Presupposition for Unit  $AB = ds$  ( the displacement  $ds$  ) is the Point  $A$  to move at the New position  $B$  , where (  $A \equiv B$  ) , and this means **an IMPULSE (  $P$  ) removes point  $A$  to  $B$  .** Since in each Restrained System (  $S$  ) the Work done (  $W$  ) by Impulse (  $P$  ) on a Virtual displacement (  $ds > 0$  ) is zero , or

$$W = \int_{A-B} [ P.ds ] = 0 \rightarrow [ ds . ( P_A + P_B ) = 0 ] \rightarrow \text{Points in Space[S] and Anti-Space[AS]}$$

[  $ds \cdot (P_A + P_B) = 0$  ], Therefore , Each Unit  $AB = ds > 0$  exists , by this Inner Impulse (  $P$  ) and so  $P_A + P_B = 0$  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 , on the contrary should be one point only ( Primary Point  $A = \text{Black Hole} \rightarrow ds = 0$  and  $P = \infty$  ).

Black Hole may happen anywhere in Universe when Points of [PNS] coincide ,  $A \equiv B$  ,  $ds = 0$  and  $P = \infty$  . The fact that on every point in [PNS] exist infinite Impulse  $P = 0 \rightarrow P \rightarrow \infty$  , grows the idea that Matter was never concentrated at a point and Energy was never  $< \text{very high energy} >$  i.e. Bing Bang has never been existed .

Impulse is  $0 \rightarrow \infty$  and may be Vacuum , Momentum or Potential or Induced Potential and it is one Type of Effect , of Push nature ( Impulse  $\rightarrow$  Motion = Energy ) .

This Equilibrium presupposes Homogenous Space and the Symmetrical Anti-Space .

For two points A , B which coincide , exists Principle of Superposition ( $A \equiv B$  ) which is a Steady State containing Extrema for each point separately . i.e.

In three dimensional Space , the infinite points exist as Space because of the Equal and Opposite Impulses ( *Opposite Forces* ) which is a new *Notion , for Mass and Energy in AB distance* ( Points A , B are embodied with Opposite Forces ) . Dipole AB on the infinite others Spaces in [PNS] carry all quantum quantities and from this point , laws of Physics start .

Remarks :

1.. Spaces and Anti-Spaces are continuous and represent Real numbers as on line ,  $\sqrt[2]{1} = \pm 1$  A Continuous Function is a Static Completed Entity , while  $ds$  is a quality existing Entity conveyed through [PNS] as above . Equilibrium of Spaces exists with their Anti-Spaces.

2.. The Model of nature is not built on Complex numbers because Complex numbers *spring out of Spaces* , Anti-Spaces and Sub-Spaces of the FDU (  $ds = 0 \rightarrow AB = [a \pm b.i] \rightarrow \infty$  ) and represent reality. The roots of Monads are the *same Monads* in Space and Anti-Space as well as Imaginary Monads in Sub-Space .

Since Binomial  $ds^n = [a \pm b.i]^n = r^n \cdot [ \cos n\phi + i \cdot \sin n\phi ]$  is a complex number and  $n$ th root of  $ds$  is also complex then , the Harmonic repetition of the roots ( Principle of Equality ) composes units with , *no need to be Image or real dimensions* .

Image or Real dimensions exist in Euclidean Geometry as the vertices of the Regular Polygons ( and Anti-Polygons ) on any First dimensional unit AB . The geometrical Visualization of Complex numbers , springs from formula  $\sqrt[2]{1} = \pm 1$  ,  $\pm i$  ( d ) and since  $\pm 1$  is the one dimensional *real Space* ( *the straight line* ) the vertical axis is on ( *Harmonic repetition of Spaces* ) the other one dimensional *Imaginary Space* which is conveyed . Since dimension needs ( N-1 ) points then ( d ) is representing the Space with the three dimensions ( x , y , z ) which is Natural , Real and Complex numbers and it is not four dimensional Space as it is in "Space-Time" theory. A point in [PNS] exist with three Spatial dimensions ( x , y , z ) and the infinite *Impulses*  $\partial P_i = \partial W_i / \partial S_i$  of the Layers at this point existing from Infinite Spaces where  $i = 1 \rightarrow \infty$  .

Position and Momentum are incompatible variables , because any determination of either one of them , leaves the other completely undetermined , ( Zero matrices ) i.e.

The Eigenvalues of Spation Position are Incompatible with the Eigenvalues of Momentum ( motion ) , and so , any  $ds$  in PNS has a definite Position and Momentum simultaneously. This is the Relative motion of Spaces in PNS .

3.. Natural Numbers with their discrete nature Symbolize Discontinuity of Spaces , because Physical World is Continuous with Points ( *motion* ) and Discrete with Numbers = *Monads* =  $ds$  This is , *The Dual property of Physical World* , also in Physics , When Motion passes from every point of line AB , which is then as , passing from the starting point A , where  $ds = 0$  then Velocity also is  $v(A) = ds/dt = 0$  . The same also happens for Motion at point B where Velocity  $v(B) = ds/dt = 0$  . On the contrary , Motion passing on points A , B which consist the dimensional Unit ,  $ds = \text{quantized}$  , then velocity  $v(AB) = ds/dt > 0$  i.e. For points A , B not coinciding are as below , [ 13 ]

$$A \quad ds = (AB/n = \infty) = 0 \quad B$$

.....

*Continuous (.)*

$$A \quad ds = \rightarrow = AB/n = 11 \quad B$$

$\rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow$

*Discrete (ds =  $\rightarrow$ )*

Since in PNS,  $v = \infty$ ,  $T = 0$ , meaning infinite velocity and Time not existing, then any length AB in [PNS] is constant because  $AB = ds = \text{Constant} = v \cdot 0 = \infty \cdot 0$ . Straight line AB is discontinuous (*discrete*) with dimensional Units  $ds = AB/n$  where  $n = 1 \rightarrow \infty$ , and continuous with points [ $ds = 0$ ], (*This is the Dual Nature of lines, geometry, discrete and continuous*).

Spaces Anti-Spaces and Sub-Spaces are *Homogenous* because the Points of Monads are also. Since all Directions  $\vec{AB}$ ,  $\vec{BA}$  are equivalent, then PNS is also *Isotropic*, i.e. all Relative Natural sizes and Laws remain Inalterable with Displacement and Rotation, [11]

Therefore, On any Unit  $AB = ds > 0$  exists, an Inner Impulse ( $P = 0 \rightarrow \infty$ ) at edge points A, B where  $\vec{PA} + \vec{PB} = \mathbf{0}$ , for any price of  $P = 0 \rightarrow P \rightarrow \infty$  i.e. again, The Position and Dimension of all Points which are connected across the Universe and that of Spaces exists, because of this Equal Static Inner and opposite Impulse, on the contrary should be one point only (Primary Point  $A = \text{Black Hole} \rightarrow ds = 0 \rightarrow P = \infty$ ). Monads = Quantum =  $ds = AB / (n = \infty \rightarrow 0) = [a \pm b.i] = 0 \rightarrow \infty$  Impulse is  $\infty$  and may be Vacuum, Momentum, Thermal or Potential or Induced Potential and it is one Type of Effect, of Push nature (Impulse  $\rightarrow$  Motion = Energy)  $\leftarrow$

For two points A, B which coincide, exists Principle of Superposition ( $\equiv$ ) which is a Steady State containing Extrema for each point separately i.e. In three dimensional Space, the infinite points exist as Space because of the Equal and Opposite Impulses (*Opposite Forces*) which is the *Notion of Energy in AB distance* (Points A, B are embodied with the Opposite Forces). *The different Static Inner Impulses at points A, B is Energy (all types of change or moving) which has only one Property, that of motion.* The only Mould in Space is distance (*the first dimensional Unit AB*), so Motion takes place and can exist only between Points A and B (this is Extrema for  $\vec{AB}$ ). Without Space as it is today, Motion (*Energy*) does not exist.  $\rightarrow$  'The Non-existent, Exists when is done'. Moulds in Euclidean geometry is the way that points are connected. (*Mould for two points A, B is straight line AB, for three points is the Plane of the three points, for four points is the Space of the four points etc*). [16]

Analyzing Extrema Principle, there was found, *The Six - Triple Concurrency - Points Line*, which is proved to be the boundaries of Euclidean, Projective and Perspective geometries, [15] i.e. the boundaries of the Non-Orthogonal and Orthogonal Coordinate Systems. so,

*Light for example* is Impulse (*Energy = Force = Conserved quantity on, ds = wavelength  $A_i B_i$* ), which is applied on three perpendicular Space Spheres [The Magnetic Field (Plane) - the Electric Field (Plane) - and the Direction of Propagation (Straight line)] which follows Pythagoras conservation law of, *In Plane for Areas* (The Sum of Areas of the two Changeable Squares is constant and equal to that of Hypotenuse) and *In Space for Volumes* (The Total Volume of Consultant Sphere,  $HO^3$ , is Equal to the Sum of Volumes of the three Moving and Changeable Spheres of, *the first three dimensional Units HP, HC, HJ*, or  $HO^3 = HP^3 + HC^3 + HJ^3$ ). It is easy to be seen here the reason of, why Conservation of Energy exists on the three Units and the, why Energy (the motion of Photons) moves as wave and as Particle, (the diffraction Patterns). Since total energy (*Work*) is conserved, so all interactions are mediated with energy (wave motion) [16]. *Time exists in Relative Motion and it is the numerical order of material change in PNS - Space, and is not a fundamental entity of PNS.* Distance AB is the metric of a Space (It is the mass of the Spaces AB with the bound State,  $\vec{PA} + \vec{PB} = \mathbf{0}$ ). Since the first dimensional Unit  $\vec{AB}$  is of two points A, B which is nothing and aren't coinciding, Time has nothing to do with this metric. In article [13 - P5] is shown that the four dimensional Space is the 4<sup>th</sup> root of monad  $\vec{AB}$  which is  $\pm 1, \pm i$ , each one representing Real and Imaginary Spaces. Real Space is the Regular Shape of Monad (Triangle, Square, Pentagon, Hexagon, Heptagon etc) and Imaginary Space is Impulse P, (Vacuum, Gravity, Momentum etc).

Motion on monads  $\bar{AB}$ , is happening from Potential difference on points A, B and of the intrinsic angular momentum ( the SPIN in them around their own axis ) and this because of their position in Space (S) and equilibrium Anti-Space (AS) . P.14

Since Particles ( wave like ) do not enter a Space smaller than their wave length , therefore photons **Light** do not enter the “ Gravity Space = Graviton ” which is a Space smaller than wave length of light. In Black Holes also , where **ds is nere zero and  $P = \infty$**  , is needed a new type of light to see what is happening below Planck length Level . P.12

**Question 2 :** Where matter is placed since points is nothing and Space also is nothing . ?  
Can we imagine of it as the vessel void of matter ? answer 4 / 4 / 2012

In [ 10 ] , [ Dipole  $AB = Matter$  ] is the communicator of Impulse [ P ] , with the Bounded Impulses (  $P_A, P_B$  ) or [ P ]  $\leftrightarrow$  [ FMD =  $AB - P_A, P_B$  ]  $\rightarrow P_A, P_B$  .

Every material Dipole is consisted of  $AB = [ ds > 0 ] = matter$  , and as **AB is the first dimentional Unit which create Spaces , Anti-Spaces and Sub-Spaces then Impulses  $P_A, P_B$  exist on their superposition . (  $A \equiv B$  ) .** i.e.

**Points A , B** on Primary ( + ) Space is the Positive Dipole which creates **matter** . ( m )

**Points A , B** on Primary ( - ) Anti-Space is the Negative Dipole which creates the Opposite of matter ( mirror ) , or **Anti - matter** ( the negative matter ) . ( Am )

**Points A , B** either be on one Space and Anti-Space alternatively , then is created ( nm )  
**the Neutral matter and Neutral Anti-matter .** ( nAm )

**The Combination of the four types of matter creates all gauge magnitude ( 15 ) , i.e. what is Mass and what is Energy and so all types of Particles and Fields in universe . or as ,**

$$C^4_1 = 4 \quad (m) - (Am) - (nm) - (nAm)$$

$$C^4_2 = 6 \quad (m),(Am) - (m),(nm) - (m),(nAm) -- (Am),(nm) - (Am),(nAm) - (nm),(nAm)$$

$$C^4_3 = 4 \quad (m),(Am),(nm) - (m),(Am),(nAm) -- (m),(nm),(nAm) - (Am),(nm),(nAm)$$

$$C^4_4 = 1 \quad (m) , (Am) , (nm) , (nAm)$$

**Bounded Impulses  $P_A, P_B$**  are not created because exist as a fixed state **on Dipole of Spaces**. Since **Neutral matter** is consisted of these two opposite elements ( + , - ) , **therefore all derivatives in this bounded Neutral Space can alternatively exist itself , as comprise both opposite elements .** Let be  $dP = P_B - P_A$  .

( **Matter , Anti-matter** ) and ( **Neutral Matter , Neutral Anti-matter** )  $\rightarrow$  **equilibrium , and annihilate when coexist ( occupying the same ds ) ,**

$$\underline{+A - B} + \underline{-A + B} = \underline{0} \quad \underline{0} \rightarrow \underline{[ PNS ]} \rightarrow \text{Primary Neutral Space .}$$

When the difference of Impulses  $dP = P_B - P_A > 0$  then Dipole AB is of + (deficit) charge  
When the difference of Impulses  $dP = P_B - P_A < 0$  then Dipole AB is of - (deficit) charge

**Since Matter ( AB ) is made up of Electrons , Protons and Neutrons i.e. [ (-) (+) (  $\pm = 0$  ) ] and Anti - Matter is made up of Anti - Electrons , Anti - Protons and Anti - Neutrons i.e. - [ (-) (+) (  $\pm = 0$  ) ] = [ (+) (-) (  $\mp = 0$  ) ] , therefore any Combination per two for Matter and Anti-Matter is equal to 15 and for Neutral Matter  $C^4_2 = 6$  . [ 11 ]**

In Mechanics exist 6 degrees of freedom , [ dx , dy , dz , wx , wy , wz ] which follow all interactions and all infinite Combinations of monads and their result is all infinite qualities.

The Combinations of the Infinite < Dipole Points > create all qualities of matter . [ A ] , [ 10 ]

It is also valid the same for , **Quarks** [ U-D which are massive and 1-dimensional oscillating lines ] **and Leptons** [ Electrons which are charged ] , which **are for the moment** the known smallest fundamental particles in Universe (  $ds = 10^{-21} \text{ m}$  ) , **exist**  $ds = 1 \times 10^{-N} < \infty$  , where N is any number. Light is radiated at a constant critical speed , in any region of Spaces , Anti-Spaces , Sub-Spaces , while **M.ray** (  $ds = 0$  ) is inherently applicable to all points of [ PNS ] with infinite velocity and zero frequency ( A non-zero vacuum value penetrating to all points of PNS ) . Matter ( **Dipole AB** ) is the sole real entity in nature , as it is everywhere and in any Region , i.e anything which is measured ( *quantized* ) as (ds) , (dP) in the different Spaces , *is matter ( particle ) in PNS* .

PNS is an infinite universal medium in direct conduct with all 3D matter dipoles ( Sub-Spaces ) in nature under the compression of the inherently infinite Impulse ( P ) on points [  $ds = \partial W / \partial Ps$  ] **Attraction** occurs between Monads AB (  $dP = P_B - P_A = \pm \text{charge}$  ) and **Action** between points A and B which is the real universal entity interlinking all three dimensional Spaces . Extending or descending AB is simultaneously as gaining or losing Impulse on points A , B which provides that Work cannot equated to motion since Work is bounded at points ,  $\mathbf{W} = \int P \cdot ds = 0$  ,  $ds = \partial W / \partial P$  Considering **mass as the Inertial property of matter** , *a measure of its energy content* , and *since matter is any Dipole AB with its properties* , **then what is measured is the material Dipole in a different Space** . ( Electricity , Magnetism, Light , Temperature , Vacuum etc ) , while Bounded Impulses (  $P_A , P_B$  ) are not . Matter deduces the Laws of Nature at points A , B with (  $P_A, P_B$  ) by the interconnection of these Sub-Spaces with them in Primary Neutral Space .

Light is of dual nature : It is of mass ( Photon is corpuscular ) associated with wave , the electromagnetic wave in Plane , and on straight line , as medium ( *the three magnitudes of vector ds* ( J, E, B ) *with the conserved energy as Work* ) . All Phenomena of light can be explained by corpuscular because  $ds > 0$  and so Photon is of ultimate Speed of motion . Since in [ PNS ] exists [  $M.ray \rightarrow v = \infty , f = 0 , ds = 0$  ] then M. ray is the universal Homogenous and Isotropic medium for all interactions in all Spaces . [ 11-12-13 ] , [ 16 ] .

Mechanical Stability of Monads in [ PNS ] exists on Spaces , Anti-Spaces , Sub-Spaces of each Monad by maintaining Entropy from the constant recycling of Impulses . Stability of Galaxies exists by their Electromagnetic interactions in equilibrium spaces , and is not needed Big Bang theory for this . Terrestrial magnetism is formed in PNS by the interaction of **M.ray** on the infinite Monads in Planets .

This side of view allows the Spatial extend of all particles in a continuously quantum Space and the substructure all of them in lower and higher Layers ( *as this happens for layers on our PC* ) .

It has been clarified in [ 11 ] , [ 13 ] what is matter and what is Space . A simple logic follows ,

**All matter is the same , because all matter is made of atoms** [  $R = 10^{-9} - 10^{-12} \text{ m}$  ] .  
**All atoms is the same, because all matter is made of smaller particles(Quarks and Leptons- $10^{-21}m$ )**  
**All Quarks and Leptons is the same because all matter is made of smaller particles( $Q1, L1- 10^{-25}m$ )**  
**All  $Q1, L1$  is the same because all matter is made of smaller particles  $Q_{2,3}, n \rightarrow \infty, L_{2,3}, n \rightarrow \infty$**   
**All  $Q_{\infty}, L_{\infty}$  , is the same because all matter is made of  $Q_n = 0 \rightarrow \tilde{A}B \rightarrow \infty$  and**  
 **$L = (P_A + P_B = 0) \rightarrow P \rightarrow \infty$  , i.e out of  $\tilde{A}B = 0 \rightarrow \infty$  and  $(P_A + P_B = 0) \rightarrow P \rightarrow \infty$**

so , this is the first dimensional unit AB and Impulse P on it .

[  $\rightarrow 6$  . Any two Points A , B on Primary Space or Anti-Space , consist the first Dimensional Unit AB , so itself , using the same Principles of Equality (  $AB = BA$  ) **Inequality and Stability**, creates **all Spaces , Anti-Spaces and Sub-Spaces of Unit AB** and Since are Property of this Unit only , therefore each of these bounded Spaces is a Restrained System of Unit AB . [ 10 ]

Impulse PA , PB at points A , B is Property of these points only and since also Spaces , Anti-Spaces and Sub-Spaces of Unit AB is a Restrained System of this Unit AB , therefore , Impulses PA , PB at points A,B , and the Spaces , Anti-Spaces and Sub-Spaces of Unit AB is a New Restrained System.

A New Unit with a quite different Quality . THE FIRST MATERIAL UNIT [FMU] i.e.

The [FMU] is a DIPOLE → the First Material Dipole [FMD = ds = AB - PA , PB] .  
 Δηλαδή : < Η Πρώτη Υλική Μονάδα του Σύμπαντος είναι το Δίπολο AB >  

$$\begin{matrix} \vec{P}_A & & \vec{P}_B \\ \leftarrow & & \rightarrow \\ A & \dots\dots\dots & O \rightarrow \dots\dots\dots & \leftarrow & B \end{matrix} = [F.M.D]$$

This Dipole AB may be created , by the opposite displacement ds ↔ of one central point O , or by the Rotation of Dipole AB through this point O . Since [ ds . ( PA+PB ) = 0 ] , ds is self created . Central point O may be the Prime Point or all infinite points of Spaces . The position of points A , B in Spaces and Anti-Spaces fixes the type of Dipole [ FMD ] , all quantum quantities which is motion , and can be created on this Monad , ( that which is one ) , and it is a part of the whole AB . Impulses PA , PB cannot be created because exist at points A , B and are of the same essence as that of Impulse P .

When the difference of Impulses  $dP = PB - PA > 0$  then Dipole AB is of + charge  
 When the difference of Impulses  $dP = PB - PA < 0$  then Dipole AB is of - charge

A different manifestation of these Impulses are Natural forces . Gravitational manifestation of these Impulses is enormously stronger than other of their manifestations rooted in them .  
 A Dipole AB may be Electric , Magnetic , Vacuum , Thermal etc . For greater distance , Electric Fields behave as Magnetic fields , and this because of the Tides (changes) on A,B . In this way Physical laws are equally applicable through the universe under all conditions and in all Spaces ]

The Bounded Spaces , Anti-Spaces , Sub-Spaces , of the First dimensional Unit  $AB = a + b.i$  are composed of the two Elements that of [ Dipole AB = matter ] which is communicator AB , and the Impulse [ P ] of Primary Space , with the Bounded Impulses ( PB , PA ) of Dipole or

[ P ] ↔ [ FMD = AB - PA , PB ] → PA , PB ] where  $dP = PB - PA$  is of ± charge ,

i.e. Space is simultaneously one Monad only , and also infinite monads , following Principle of Equality and Inequality , Principle of Virtual Displacements , Principle of Stability and Principle of Superposition ( A ≡ B ) following Principle of conserved Work →

or , the equations 
$$\mathbf{W} = \int \mathbf{P} \cdot d\mathbf{s} = 0 , \quad d\mathbf{s} = \partial \mathbf{W} / \partial \mathbf{P}$$
  

$$ds = 0 \rightarrow AB = [ \mathbf{a} \pm \mathbf{b}.i ] \rightarrow \infty , \quad P_A + P_B = 0 , \quad dP = P_B - P_A <=> 0$$

**Higgs Particle.**

Big Bang does not hold in Geometry , so Universe must be acknowledged in another cosmological Setting and Framework based on Geometry - Spaces , as the answers of the above questions. A compact presentation with  $ds = AB \rightarrow AC$  and from this all the other framework follows :

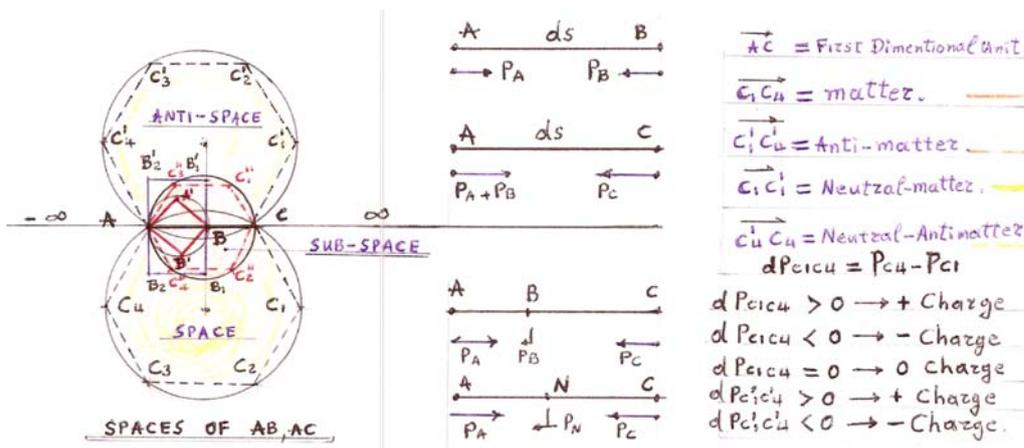


Fig 3 .

**THE THREE SPACES [ S – AS – SS ] OF ANY  $ds = [ \text{First Dimensional Unit} ]$**   
 Fg.(3)

**A** = A point which is nothing , with no Space and not any direction .  
**AB** =  $ds > 0 \rightarrow AB = [ \mathbf{a} \pm \mathbf{b.i} ] \rightarrow \infty$  ,  $\rightarrow$  The first dimensional Unit [ FDU ] .

**ABB<sub>1</sub>B<sub>2</sub>** = The fourth Space of unit AB  
**ABB'<sub>1</sub>B'<sub>2</sub>** = The fourth Anti - Space of unit AB  
**AA'BB'** = The fourth Sub - Space of unit AB  
**ACC<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub>** = The Sixth Space of unit AC  
**ACC'<sub>1</sub>C'<sub>2</sub>C'<sub>3</sub>C'<sub>4</sub>** = The Sixth Anti - Space of unit AC  
**AC''<sub>3</sub>C''<sub>1</sub>CC''<sub>2</sub>C''<sub>4</sub>** = The Sixth Sub - Space of unit AC

Subspace **AA'BB'** is inside Subspace **AC''<sub>3</sub>C''<sub>1</sub>CC''<sub>2</sub>C''<sub>4</sub>**  
**AB' = [ FDU ]** is in Spaces **ABB<sub>1</sub>B<sub>2</sub> -- ACC<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub>**  
**AA' = [ FDU ]** is in Anti-Spaces **ABB'<sub>1</sub>B'<sub>2</sub> -- ACC'<sub>1</sub>C'<sub>2</sub>C'<sub>3</sub>C'<sub>4</sub>** , shortly ,

1. **Point** is nothing , has not any Position and Dimension , and may be anywhere in Space *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* . Since Primary point A , *having not Position and consequently not any Space existing* , *is the only space* , then to exist at a second point B somewhere else , point A must move at point B , where then  $A \equiv B$  . Point B *is the Primary Anti-Space* which Equilibrium point A . [ PNS ] = [  $A \equiv B$  ] . Since Primary point A is the only Space , then exists Principle of Virtual Displacements  $W = \int P.ds = 0$  , or [  $ds . ( P_A + P_B ) = 0$  ] , i.e. for any  $ds > 0$  , Impulse  $\mathbf{P} = ( P_A + P_B ) = \mathbf{0}$  . Points ( PNS ) , may exist either with  $P = 0 \rightarrow$  or also with  $P \neq 0$  , [  $P_A + P_B = 0$  for all points in Spaces and Anti - Spaces ] , therefore [ PNS ] is Self created , and because at each point may exist also  $P \neq 0$  , then [ PNS ] is a Scalar Field with infinite points which have a  $\pm$  Charge  $\rightarrow P = 0 \rightarrow P \rightarrow \infty$  . So Primary Neutral -Space [ PNS ] exists with these infinite Points N with three Spatial dimensions (  $X_o , Y_o , Z_o$  ) and the infinite Impulses P .
2. The Infinite points in [ PNS ] form Units  $A_i B_i = ds$  , which equilibrium by Primary Anti - Space by an Inner Impulse ( P ) at edges  $A_i , B_i$  where  $P_{iA} + P_{iB} \neq 0$  , (for  $P_{iA} + P_{iB} = 0$  is the Absolute Primary Space ) or as  $P_{iA} = P_{iB} = \pm 0 \rightarrow P \rightarrow \infty$  and  $ds = 0 \rightarrow N \rightarrow \infty$  .
3. Monads = Quantum =  $ds = AB / ( n = \infty \rightarrow 0 ) = [ \mathbf{a} \pm \mathbf{b.i} ] = \mathbf{0} \rightarrow \infty$  , are not purely spatial because are Complex numbers . The same exists also for all Spaces , since binomial  $ds^n$  is a Complex number . Monads create Spaces ( S ) Anti -Spaces ( A-S ) , and Sub-Spaces ( S-S ) of AB , which Sub-Spaces are Bounded Spaces Anti - Spaces and Sub - Spaces in PNS . [ Nanotubes follow hexagon Space  $\equiv$  Energy in a fixed state ]
4. Monads  $ds$  ( dipole AB ) , and according to their position in S, A-S , S-S , make the four types of matter , and the Combination of the four types of matter , creates all gauge magnitudes which is Mass and Energy and all types of Particles and Fields , 15 possible types , correspond to Visible , Invisible , Real and Imaginary Universes ( The Visible and Invisible Dark matter and Dark Energy , etc ) . Dipole AB is composed of the two Elements  $\rightarrow$  the [ Dipole AB = matter  $\equiv$  is the communicator ] , and the Impulse [ P ] with the Bounded Impulses (  $P_A , P_B$  ) .
5. The difference of Impulses  $dP = P_B - P_A > = < 0$  of Dipole AB (mass) , creates  $\pm$  charge For very small  $ds$  ( near zero ) which happens at the boundaries of Spaces ,  $\pm$  charge may be point charge ( Spaces form open Strings while Sub-Spaces form closed Strings . Cosmic rays is a Quantum field from a , near zero  $ds$  Sub-Space ) , and in very large scales  $ds$  ,  $\pm$  charge is the same Field , ( This because Particles , wave like , do not enter a Space smaller than their wavelength ) . Impulse  $dP$  creates Motion on monad  $\bar{A}B$  and SPIN in it is around its own axis.

6. M.ray interact on the infinite Monads of PNS with infinite velocity and zero frequency. Motion is Continuous and occurs on Dimensional Bounded Units,  $ds$ , and not on Points (this may happen only for very small  $ds$  near zero and at the boundaries of Spaces) which are dimensionless. The difference of Impulse  $dP = P_B - P_A$  on points  $A, B$  and on points  $P_i B, P_i A$  is  $\pm$  charge Interaction. All particles act as wave and Particle (wave-particle duality) and this because of the Total Energy conservation law of Pythagoras in 2, 3 Dim.

7. The four types of Interaction of particles occur either directly or Indirectly.

The order of magnitude in (m) for particles is approximately as :

Molecule	diameter	$10^{-9}$ — $10^{-11}$	m
Hydrogen Atom	diameter	$2,5 \times 10^{-12}$	m
Atom	diameter	$10^{-11}$ — $10^{-17}$	m
Gamma Ray	$\lambda$ .dim	$5 \times 10^{-12}$	m
Protons	diameter	$10^{-12}$ — $10^{-15}$	m
Electrons	diameter	$10^{-15}$ — $10^{-17}$	m
<b>Quarks</b>	<b>diameter</b>	<b><math>10^{-18}</math> — <math>10^{-21}</math></b>	<b>m</b>
<b>Leptons</b>	<b>diameter</b>	<b><math>10^{-12}</math> — <math>10^{-24}</math></b>	<b>m</b>
<b>Neutrinos</b>	<b>diameter</b>	<b><math>10^{-18}</math> — <math>10^{-NN}</math></b>	<b>m</b>
Higgs	diameter	$10^{-22}$ — $10^{-24}$	m
Strings	diameter	$10^{-24}$ — $10^{-35}$	m
<b>Beyond Planck length</b>	<b>diameter</b>	<b><math>10^{-35}</math> — <math>10^{-SS}</math></b>	<b>m</b>
Dark matter	diameter	$10^{-SS}$ — $10^{-DM}$	m
Gravity	diameter	$10^{-DM}$ — $10^{-GP}$	m
P - ray	$\lambda$ .dim	$10^{-GP}$ — $10^{-PP}$	m
M- ray	$\lambda$ .dim	$10^{-\infty}$ —	m

Remarks :

Taking Planck length Level, in S.Model, where upper speed is that of light, a case of matter is as,

- For  $C^4_1 = 4$  Using FMD [ AB ] = AB -  $P_A, P_B$ ,  
 1. .... Stable matter [ massive Quarks U+D ] [ Charged Leptons ( Electrons ) ]
- For  $C^4_2 = 6$  Using FMD [ AB ] = AB -  $P_A, P_B$ ,  
 2. .... Stable matter [ massive Quarks U+D ] [ Charged Leptons ( Electrons ) ] [ Neutrons ]
- For  $C^4_3 = 4$  Using FMD [ AB ] = AB -  $P_A, P_B$ ,  
 3. .... Stable matter [ massive DM ] [ Charged DM.Ions ( Particle ) ] [ Neutrinos ]
- For  $C^4_4 = 1$  Using FMD [ AB ] = AB -  $P_A, P_B$ ,  
 4. .... Stable matter [ massive PNS ] [ Charged M.Ray ( M.particle ) ] [(nm)(nAm)]

Higgs Boson ( particle ) is placed in the second case .....

Dark Matter and Energy is placed in the third .....

Black Holes are placed in the fourth case .....

**Question 3** : Because of having trouble following the logic in your paper, how you apply equations to Space time? Would you care to outline it step by step? answer 14 / 10 / 2012

Beginning from the clarification << **Point** is nothing, has not any Position and Magnitude ( Dimension ), and may be anywhere in Space, because we consider Space, then **Primary point is no-where**, i.e. **the only Primary Point being nothing also in no Space, is no-where** >>  
 This logic defines that **Primary point is the only Space** and also this space is nothing (dimensionless). This Primary point which is the **Only Space with unknown determination**, to exist in this Space somewhere else, must move from Initial Point, say A, to another position, say B, where then the two points are identified,  $A \equiv B$ . This Equilibrium for points A and B presupposes in Mechanics the Principle of Virtual Displacements  $W = \int P.ds = 0$ , or  $[ ds \cdot (P_A + P_B) = 0 ]$ , (s) where

$\mathbf{AB} = ds > 0 \rightarrow \mathbf{AB} \rightarrow \infty$  is The first dimensional Unit [ FDU ] .  $A \neq B = \textit{Principle of Inequality}$   
 $\mathbf{PA}, \mathbf{PB} \rightarrow$  Impulses at points A , B , i.e. on points A , B exist Impulses  $\mathbf{PA}, \mathbf{PB}$ , **or as below**  
 $ds . (\mathbf{PA} + \mathbf{PB}) = 0$  , (s) and when  $A \leftrightarrow B$  , the following 3 Spaces are in one Space

- 
- a).  $\mathbf{PA} = \mathbf{PB} = \mathbf{0}$  and  $\mathbf{ds} = \mathbf{0} \rightarrow \text{Constant} \rightarrow \pm \infty$  is self created [ PNS ]  $\equiv$  [ PNaS ]  
 b).  $\mathbf{PA} = \mathbf{PB} \neq \mathbf{0}$  and  $\mathbf{ds} = \mathbf{0} \rightarrow \text{Constant} \rightarrow \pm \infty$  is self created [ PNS ]  $\equiv$  [ PNaS ]  
 c).  $\mathbf{PA} \neq \mathbf{PB} \neq \mathbf{0}$  and  $\mathbf{ds} = \mathbf{0} \rightarrow \text{Point A / in [PNS] dipole } \mathbf{dS} = \mathbf{0} = \mathbf{Ai Bi} = [\mathbf{a} \pm \mathbf{b.i}] \rightarrow \infty$   
Remarks

- Quantization of Points **becomes through Vector Unit**  $\mathbf{d\check{s}} = \check{\mathbf{AB}}$  which is the first dimensional Unit [13] and this because Vector has **Position and Direction** .  
 Quantization of Energy **is done in bound States ( loops )** because bound states (*the subspaces of the Vector units*) **withhold diffusion ( flow )** .  
 The two fundamental dimensions (**quanta of Points and quanta of Energy**) **are connected on Primary dipole** and on any dipole  $\mathbf{AiBi}$  . The position of dipole , *in the equilibrium Space , Anti-Space* , creates **the charge** ( momentum  $\rightarrow$  the difference of **primary Work bounded on edge points** ) and **motion** ( Spin  $\rightarrow$  angular momentum = **the intrinsic twist of Space , Anti - Space** ) which **inextricably unify geometry of Space and motion** .
- The two quantities  $\mathbf{ds}$  ,  $(\mathbf{PA} + \mathbf{PB})$  satisfy equation (s) when one of them is zero , and because  $\mathbf{ds}$  may be zero or not ( $ds \neq 0$ ) then  $(\mathbf{PA} + \mathbf{PB}) = \mathbf{0}$  or  $\mathbf{PA} = -\mathbf{PB}$  (*Space a , b case*)
- Impulses  $\mathbf{PA}, \mathbf{PB}$  are equal and opposite and may have any magnitude from zero (0) to infinite ( $\infty$ )  
 Since for any  $\mathbf{ds} > \mathbf{0} < \infty$  and  $\mathbf{PA} + \mathbf{PB} = \mathbf{0}$  equation (s) is satisfied , **then all ds** in this case formulate the **Primary Space , a Self created Space** , i.e. when  $ds \neq 0$  *all Points of Spaces form a Field* .  
 In the special case where  $\mathbf{PA} = \mathbf{PB} = \mathbf{0}$  then we have the Primary Neutral Space [ PNS ] and for opposite direction BA the Primary Neutral Anti-Space [ PNaS ] , **a Self created Space also** .(case b)
- For  $\mathbf{PA} > \mathbf{PB} \neq \mathbf{0}$  equation (s) is verified only with  $ds = 0$  which is Primary point A . Since in [ PNS ] and [ PNaS ] which is Self created , **already exists a Field with infinite points** which have (+) , (-) **Charge alternatively with difference of Impulses dP** , **therefore this dP creates motion** .

[ Question : Where this motion takes place ? answer , on the Infinite Dipole  $\mathbf{Ai Bi}$  of Field with  $\mathbf{PiA} + \mathbf{PiB} \neq 0$  which points  $\mathbf{Ai}, \mathbf{Bi}$  exist in [ PNS ] and in [ PNaS ] ] .

- [ PNS ] and [ PNaS ] are four (4) dimensional Spaces because  $\rightarrow \mathbf{ds} = \mathbf{0} \rightarrow \mathbf{Ai Bi} = [\mathbf{a} \pm \mathbf{b.i}] \rightarrow \infty$  exists , **On Monad**  $ds = 1 \rightarrow \sqrt[2]{1} = \pm 1$  or  $[-1 \leftrightarrow +1]$  , therefore **xx** (axis) coordinate system represents the one-dimensional Space and Anti-Space . ( the Straight line ) ,  $1.1 = 1$  ,  $(-1).(-1) = 1$

**On Monad**  $ds = 1 \rightarrow \sqrt[2]{-1} = \pm i$  or  $[+i, -i] \rightarrow [+i]$  , therefore **yy** (axis) coordinate system , represents a Perpendicular one-dimensional  $[\updownarrow]$  , **Imaginary** to **xx** (axis) Space and Anti-Space ( the Straight line )  $[-i]$  ,

$$(-i).(-i) = +i^2 = +(-1) = -1 , (+i).(+i) = +i^2 = -1 \quad +i$$

**On Monad**  $ds = 1 \rightarrow \sqrt[4]{1} = \sqrt[2]{\sqrt[2]{1}} = \sqrt[2]{\pm 1} = [+1, -1]$  ,  $[\sqrt[2]{-1} = +i, -i]$  or  $-1 \leftrightarrow +1$  ,  $\updownarrow$   
 and therefore coordinate systems **xx**  $\perp$  **yy** represent these Spaces ,  $-i$

(  $\pm$  **Real** and  $\pm$  **Complex Spaces** ) , where  $ds = \text{Monad} = 1$  , represents the three-dimensional Space and Anti-Space . ( Sphere ) .  $[\pm 1]^2 = [\pm i]^2 = 1$

*i.e. The fourth dimension in Spaces , is the difference of Impulses  $(\pm i).dP = \mathbf{0} \rightarrow dP \rightarrow \infty$  . and not Time , therefore exists < Space - Impulse > and not < Space time > Universe .*

- Monads  $\mathbf{ds}$  ( dipole AB ) , and according to their position in S, AS, SS , make the four types of matter , and the Combination of the four types of matter , creates all gauge magnitudes which is Mass and Energy and all types of Particles and Fields . For  $ds = 0$  ,  $P \rightarrow \infty$  **Springs that Big-Bang has never been existed and Black Holes may be created at any combination of near zero ds Spaces** .

7. The Position of Dipole AB [  $\vec{AB}$  ,  $\vec{PA} - \vec{PB}$  ] in Space (S) and Anti-space (AS) creates on middle point of AB an Impulse  $\vec{PA} - \vec{PB}$  which aligned dipole in PA direction and an axial Moment called **Spin** (this is the intrinsic angular momentum of Unit AB, rotation , around its own Z axis) which rotates the dipole .Since moment is a Vector and may be clock wise or anti-clock wise , so Spin is also clock wise  $\rightarrow$  **Downward arrow Spin** and anti-clock wise  $\rightarrow$  **Upward arrow Spin**. The difference of Impulses  $d\vec{P} = \vec{PB} - \vec{PA}$  is the applied force on edge points A , B and Spin equal to  $d\vec{P} \cdot \vec{y} / 2$  , where  $\vec{y} / 2$  is the moment arm on AB . It is shown that Particles , *electrons* may have two orientations and two loops for their stability and Work is transferred also through this way of motion , *by rotation* .This geometrical way of Spinning in two different , *Force Scale Layers* , explains the *Pauli Exclusion Principle as follows* .

8. Spin Modeling , of Dipole [ AB ] = [  $\vec{AB} - \vec{PA}$  ,  $\vec{PB}$  ] , in microscopic description :

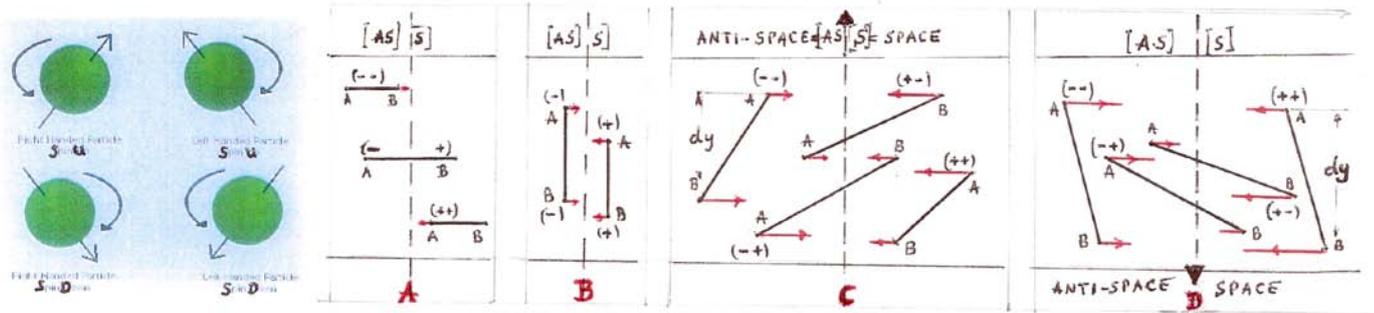


Fig 4 .

A. Force  $d\vec{P}$  is applied in direction AB and is acting in the same straight line so moment lever is 0 .

- a..(- -) Charge =  $d\vec{P} = \vec{PB} - \vec{PA} = + d\vec{P}$  Spin =  $- d\vec{P} \cdot (dy/2) = 0$
- b..(- +) Charge =  $d\vec{P} = \vec{PB} - \vec{PA} = \mathbf{0}$  Spin =  $d\vec{P} \cdot (dy/2) = 0$
- c..(++ ) Charge =  $d\vec{P} = \vec{PB} - \vec{PA} = - d\vec{P}$  Spin =  $- d\vec{P} \cdot (dy/2) = 0$

B. Force  $d\vec{P} = 0$  or  $\neq 0$  applied in direction  $\perp$  AB and so moment lever = AB .

- a..(- -) Charge =  $d\vec{P} = \vec{PB} - \vec{PA} = \pm d\vec{P}$  Spin =  $\pm d\vec{P} \cdot (AB/2) \rightarrow \pm \frac{1}{2} \uparrow$  UP- Down
- b..(++ ) Charge =  $d\vec{P} = \vec{PB} - \vec{PA} = \mp d\vec{P}$  Spin =  $\mp d\vec{P} \cdot (AB/2) \rightarrow \mp \frac{1}{2} \uparrow$  Down-UP

C. Force  $d\vec{P}$  is not applied in direction AB and not acting in the same line so moment lever  $\neq 0$  .

- a..(- -) Charge =  $d\vec{P} = \vec{PB} - \vec{PA} = + d\vec{P}$  Spin =  $+ d\vec{P} \cdot (dy/2) \rightarrow + \frac{1}{2} \uparrow$  UP
- b..(++ ) Charge =  $d\vec{P} = \vec{PB} - \vec{PA} = - d\vec{P}$  Spin =  $- d\vec{P} \cdot (ds/2) \rightarrow - \frac{1}{2} \uparrow$  UP
- c..(+ -) Charge =  $d\vec{P} = \vec{PB} - \vec{PA} = - d\vec{P}$  Spin =  $- d\vec{P} \cdot (dy/2) \rightarrow - \frac{1}{2} \uparrow$  UP
- d..(- +) Charge =  $d\vec{P} = \vec{PB} - \vec{PA} = + d\vec{P}$  Spin =  $+ d\vec{P} \cdot (dy/2) \rightarrow + \frac{1}{2} \uparrow$  UP

D. Force  $d\vec{P}$  is not applied in direction AB and not acting in the same line so moment lever  $\neq 0$  .

- a..(- -) Charge =  $d\vec{P} = \vec{PB} - \vec{PA} = + d\vec{P}$  Spin =  $+ d\vec{P} \cdot (dy/2) \rightarrow + \frac{1}{2} \downarrow$  Down
- b..(++ ) Charge =  $d\vec{P} = \vec{PB} - \vec{PA} = - d\vec{P}$  Spin =  $- d\vec{P} \cdot (dy/2) \rightarrow - \frac{1}{2} \downarrow$  Down
- c..(+ -) Charge =  $d\vec{P} = \vec{PB} - \vec{PA} = - d\vec{P}$  Spin =  $- d\vec{P} \cdot (dy/2) \rightarrow - \frac{1}{2} \downarrow$  Down
- d..(- +) Charge =  $d\vec{P} = \vec{PB} - \vec{PA} = + d\vec{P}$  Spin =  $+ d\vec{P} \cdot (dy/2) \rightarrow + \frac{1}{2} \downarrow$  Down

**Every Charge [  $\vec{q} = d\vec{P}$  ]** in points (The initial Work , Impulse, bounded on points which cannot be created or destroyed ) is analogous to the (x) magnitude ( Energy density ) and is **directional** to the (x)  $\rightarrow$ (-x) straight line connecting Space [S] , Anti-Space [As] in [PNS] . Because in [S] and [aS] forces  $\vec{PA} - \vec{PB}$  are acting in the same straight line so *moment lever is zero ( 0 )* , **therefore Primary [S] and [aS] is irrotational** and so it is possible to express this Primary field as a scalar function ( $\Phi$ ) of **Static Potential** ,

and at any point can be defined as *the amount of Work per unit charge required to move a charge from infinity to this point i.e. a field as in Electrostatic potential [PNS] field.*

**Charge on dipole AB** ( *The initial Work bounded on quantized points A , B ) is the (  $X_A - X_B$  ) magnitude ( *Work difference Flux with direction the (  $X_A, X_B$  )  $\rightarrow$  ( -  $X_A$  , - (  $X_B$  ), straight line or lines in Space , Anti-Space field ( the created Volume of the three dimensions ) , accompanied with the Modeling Angular Momentum ( Spin magnitude ) perpendicular on middle of AB axis and both quantized magnitudes ( Energy and Spin ) are simultaneously conserved .**

These *quanta of Energy , connected on Primary dipole  $A_i B_i$  create motion ( Spin = the intrinsic twist of Space , Anti-Space ) which inextricably unify geometry of Space and motion( Energy )*.

Solving equation  $ds.(P_A + P_B) = 0$  then  $ds.P_A = - ds.P_B$  and since  $ds = \text{constant}$  for Primary dipole , then the Work conserved on every point in Spaces is constant and equal to  $d\check{s}$ . Force  $P = \text{constant}$  i.e.

*The applied Work [  $W_i \rightarrow 1 \rightarrow \infty$  ] = ( momentum  $p$  ) on every point of the three , Spaces , Anti-Spaces and Sub-Spaces , which coexist in [ PNS ] is conserved on Points , meaning that every point of [PNS] consist the fundamental  $\pm$  Scalar Field with variables the Constraint Forces [  $P_i \rightarrow 1 \rightarrow \infty$  ] on [PNS] , [PNaS] and momentum [  $p = W_{ij} \rightarrow 1 \rightarrow \infty$  ] are conserved always in [ PS ] , [ PaS ] , or The two elements [  $d\check{s} = AB$  (matter) ,  $\pm dP$  , Work  $p$  ] of the Infinite Dipole [AB] = [  $\check{A}B - P_A, P_B$  ] build Particles , with Identity Card the Constant Product  $\rightarrow d\check{s} . p = \text{constant} \dots ( p )$  and so , the Possible Energy Range (m) Scales , of [  $ds$  , - P , + P ] are the three following Layers ,*

- (- i)  $\leftrightarrow$  (0) = - P  $\rightarrow$  [  $ds$  , - P , ]  $\rightarrow$  Black Holes Scale =  $k_1 \rightarrow ds_1 . dP_1 = k_1$
- (-)  $\leftrightarrow$  (+) =  $\mp$  P  $\rightarrow$  [  $ds$  , - P , + P ]  $\rightarrow$  Planck Scale Matter =  $k_2 \rightarrow ds_2 . dP_2 = k_2$
- (+i)  $\leftrightarrow$  (0) = + P  $\rightarrow$  [  $ds$  , + P , ]  $\rightarrow$  Dark Matter Scale =  $k_3 \rightarrow ds_3 . dP_3 = k_3$

For any single particle of wavelength  $\lambda = ds$  and  $dP = \text{momentum} ( p )$  exists :  
 $d\check{s} . dP = \lambda . p = \text{constant} = h \rightarrow$  is the reduced Planck constant in Planck Scale Matter .

In order that a Particle can enter inside another Particle , then according to equation ( p ) and for  $ds = d\check{s}/2 \rightarrow$  and  $dp = 2 . dP$  , Spin (s) becomes  $S = ( 2 . dP ) . ( ds/2 ) = 1 . \uparrow dP . ds .$  i.e .

**Particles with wavelength ( a single oscillation that fits a Space and defines the Energy scale ) beyond Planck length need twice  $dP \rightarrow ( 2 . dP )$  to enter Planck wavelength .**

Since any dipole  $\check{A}B$  is consisted of the two quantized elements  $ds$  and  $\pm dP$  , then exist Infinite combinations with them . An obvious one is that of very small  $ds$  , under Planck length level-Planck length , and in the known range of magnitudes of  $dP$  , the four known forces , which are as ,

**BOSONS ( Particles )**

- For  $ds < \text{Planck length}$  and  $2 . dP = \text{Strong force}$  ..... Gluon **Spin S = 1**
- For  $ds \ll \text{Planck length}$  and  $2 . dP = \text{Weak force}$  .....W & Z Bosons **S = 1**
- For  $ds \lll \text{Planck length}$  and  $2 . dP = \text{Electromagnetic force}$  ....Photon -W&B Bosons **S = 1**
- For  $ds \llll \text{Planck length}$  and  $2 . dP = \text{Gravity force}$  ..... Graviton - Higgs **S = 2**

**FERMIONS ( Particles )**

- For  $ds = \text{Subatomic}$  and  $dP = 0 \rightarrow dP < \infty$  ..... Leptons **Spin S = 1 / 2**
- For  $ds = \text{Atomic to cellular}$  and  $dP = 0 \rightarrow dP < \infty$  ..... Quarks **S = 1 / 2**

**Remarks :**

- 1.. Bosons and Fermions are all Particles with different  $ds$  in their Energy scale .
- 2.. Motion on Particles , is happening from Impulse P and the Intrinsic angular momentum ( SPIN) in them around their own axis and this because of their position in Space (S) and equilibrium Anti - Space (AS) .
- 3.. Since Particles ( wave like ) do not enter a Space smaller than their wave length , therefore photons , **Light** , does not enter the “ Gravity Space = Graviton ” which is a Space smaller than wave length of light.

- 4.. Particles with wavelength ( a single oscillation that fits a Space and defines the Energy scale ) beyond Planck length need  $2.dP$  to enter Planck wavelength **and** , extending also this to all scales ( Layers ) beyond , Spaces are simultaneously continuous and discrete ( 13 ). *See Centrifugal and Coriolis forces.*
- 5.. In Black Holes also , where **ds is near zero and  $P = \infty$  , is needed a new Type of Light** to see what is happening below Planck length Level ( Layer  $10^{-35}$  m ).
- 6.. Since points act , **in Space [S] as a Source (+) and in Anti-Space [aS] as a drain (-)** , then for the included Primary Fields in [PNS] which is Static ( unaltered because of constant points ) , *the Space Field Straight lines **diverge away** from Positive charges (+) and coincide with the Anti-Space Field Straight lines , which **diverge towards** the Negative charges (-)* .
- 7.. In page 7 we refer light as a constant moving charge ( Vector )  **$d\check{s} = A_i B_i = [ a \pm b.i ] = OP$**

And the module of any Orthogonal moving vector ( charge ) is  $\rightarrow |ds| = \sqrt{J^2 + E^2 + B^2}$  where :

- J = The **x** coordinate of  **$d\check{s}$**  , representing the Strength magnitude of  **$ds$**  in **x-x** direction .
- E = The **y** coordinate of  **$d\check{s}$**  , representing the Strength magnitude of  **$ds$**  in **y-y** direction .
- B = The **z** coordinate of  **$d\check{s}$**  , representing the Strength magnitude of  **$ds$**  in **z-z** direction .

Since Vectors follows Pythagoras conservation law [16] , so exists a constant relation between them . In Vector Calculus are quantified the different Aspects and Physical Terms for the four properties **Gradient , Divergence , Curl , Laplacian** which relates Space ( ds ) and Imaginary Part ( Energy ) which very shortly are as ,

- 1.. Operation **Gradient**  $\rightarrow$  Notation  **$grad(f) = \nabla f \rightarrow Del(multiply)Sf$**   
Measures the Rate and Direction of Change in a Scalar Field (Sf) ,( by multiplying ) and Maps Scalar Fields ( Sf ) to Vector Fields ( Vf ).  $\rightarrow$  *Vector Flux per unit volume*
- 2.. Operation **Divergence**  $\rightarrow$  Notation  **$div(F) = \nabla \cdot F \rightarrow Del(dot)Vf$**   
Measures the Magnitude of a Source or Sink at a given Point in a Vector Field (Vf), ( by multiplying ) and Maps Vector Fields ( Vf ) to Scalar Fields ( Sf ).  $\rightarrow$  *Vector Flux density per unit area*
- 3.. Operation **Curl**  $\rightarrow$  Notation  **$curl(F) = \nabla \times F \rightarrow Del(cross)Vf$**   
Measures the Tendency to Rotate about a Point in a Vector Field (Vf), ( by rotating ) and Maps Vector Fields to ( pseudo ) Vector Fields .  $\rightarrow$  *Vector change of Flux*
- 4.. Operation **Laplacian**  $\rightarrow$  Notation  **$\Delta(f) = \nabla^2 f = \nabla \cdot \nabla f \rightarrow Del(dot)Del(multiply)Sf$**   
A Composition of the Divergence and Gradient operation ( by multiplying and rotating ) and Maps Scalar Fields (Sf) to Scalar Fields(Sf).  $\rightarrow$  *The Divergence of the gradient of the Tensor ( Scalar and Vector )*

$\begin{array}{c} | \\ \text{9.. Primary Dipole } \bar{A}\bar{B} \quad \text{Equilibrium Horizon} + | - \text{Equilibrium Horizon} \\ \bar{P}\bar{A} \quad \text{Primary Vector } d\check{s} = \bar{A}B \quad \bar{P}\bar{B} \\ (+x,+y,+z) \quad \bar{A} \rightarrow \dots \leftarrow \bar{O} \rightarrow \dots \leftarrow \bar{B} (-x,-y,-z) \end{array}$

Like Static equations of Equilibrium need the *Contents* which is the *Principle of Virtual displacement* ( $dW = 0$  for any variation so that generalized forces are zero for any ds) , Unlike , Principle of Virtual displacement needs its Intrinsic Contents ( **where and how the only two static and Fundamental quantized properties **P and ds** , simultaneously exist as  $\int P.ds = 0$**  ) to agree with its **Conservation State** , and so for ,

**Point** ( . ) : Impulse  $P = 0 \rightarrow \infty$  , Work  $W = \int P.ds = 0 \rightarrow$  constant ( *is conserved* )  
**Line** (  $\leftrightarrow$  ) : Impulse  $P = 0 \rightarrow \infty$  , Work  $W = \int P.ds = 0 \rightarrow$  constant in x-x direction( *conserved* )  
**Vector**  $\bar{A}\bar{B}$  (  $\leftrightarrow$  ) : Impulse  $P = 0 \rightarrow \infty$  , Work  $W = \int P.ds = 0 \rightarrow$  constant  $\rightarrow \infty$  ( *quantization of points A , B to unit **AB** multiplied by the quantized Impulse **P** i.e. the area of vectors **P** , ds in their Plane* ) .

**Two Vectors  $\tilde{A}$  ,  $\hat{E}$**  in Plane : Impulse  $P = 0 \rightarrow \infty$  , Work  $W = \int P.ds = 0 \rightarrow$  constant  $\bar{A}\uparrow \rightarrow \hat{E} =$  Area of  $A \times E$  [ *the quantization of Area  $A \times B \rightarrow \textcircled{R}$  multiplied by the quantized Impulse **P** equal to the area of the resultant vectors  $\textcircled{R}$  , **P** , i.e. the Vector with its Content , in a Plane perpendicular to their Plane* ] to agree with its conservation state . For **Vectors  $\tilde{A}$  ,  $\hat{E}$  ,  $\hat{C}$**  in Space : Impulse  $P = 0 \rightarrow \infty$  , Work  $W = \int P.ds = 0 \rightarrow$  constant  $\bar{A}\uparrow \rightarrow \hat{E} \textcircled{R} \curvearrowright \hat{C} =$  Area of  $(\bar{A} \times \hat{E}) \times$  Vector  $\hat{C} =$  magnitude of Volume  $AEC$  ( *the quantization of Volume  $A \times E \times C \rightarrow \textcircled{R}$*  ) multiplied by the quantized Impulse **P** i.e. the area of the resultant vectors  $\textcircled{R}$  , **P** in a Plane in their Plane , i.e. the Vector with its Content.

The Total Work on points A,B ( Points in the three directions  $x \perp y \perp z$  ) is  $W = 0 \rightarrow c = \text{finite} \rightarrow \infty$  and is equal to that what is done , **which this is nothing else of the same Vector** which is equal to **the volume of  $\bar{AB}$  included plus in this the Contents  $\odot$  of the Imaginary Part** , i.e. equal to the Volume multiplied by  $\mathbf{bi}$  , or ( Cross area of Vector =  $\mathbf{a}$  ) . ( Magnitude of Vector =  $\mathbf{AB}$  ) . ( $\mathbf{bi}$ ) or the **generally valued equation for Work**  $\rightarrow W = [\mathbf{a} \cdot \mathbf{AB}] \cdot \odot = \mathbf{a} \cdot (\mathbf{AB} \cdot \odot) = \mathbf{a} \cdot d\check{s}$  ... 8.0

and in Differential form  $W = \nabla \cdot d\check{s} \cdot \odot \rightarrow$  in Integral form  $W = \oint_v d\check{s} \cdot \odot$  where

$W = \leftrightarrow \quad \quad \quad \rightarrow$  Work or Flux or any Total Quantity .

$\nabla \cdot = (\partial/\partial x) \cdot dx + (\partial/\partial y) \cdot dy + (\partial/\partial z) \cdot dz = [ \partial / \partial qi ] = \partial qi$ , *del* , the unit vectors in the three directions

$d\check{s}$  = Any Vector in , x-x , y-y , z-z , direction with magnitudes coordinate components  $\mathbf{J}, \mathbf{E}, \mathbf{B}$

$|d\check{s}| = \sqrt{J^2 + E^2 + B^2} \rightarrow$  the module Vector  $ds$  .

$\odot$  = Contents  $\rightarrow (\mathbf{b}, \mathbf{i})$  , Charge , Force , Fields or any Imaginary term of  $d\check{s} = [\mathbf{a} \pm \mathbf{b}, \mathbf{i}]$  related to [ Surface  $S(x,y)$  , Included Volume  $V(x,y,z)$  ,  $dP$  ( Charge  $q$  , Spin ) ,  $\epsilon$  ( Internal structural constant ) ]

$\mathbf{a}$  = Cross area of Vector  $d\check{s}$   $V$  = Elementary volume  $d\mathbf{v}$  of vector  $d\check{s}$  .

Equation 8.0 has seven different Aspects and Physical Terms for Vector  $d\check{s}$  . [  $\mathbf{J} \rightarrow$  ,  $\mathbf{E} \uparrow$  ,  $\mathbf{B} \otimes$  ] .

**Equation**  $W = \nabla \cdot d\check{s} \cdot \odot \rightarrow W = \oint_v d\check{s} \cdot \odot$  is **Compatible with Space and all Universe... 8.1**

**A.. [PNS]** is a region with **No Charges but Constant Points** ( absolute Space ) where then 8.1 becomes

$$W = \nabla \cdot d\check{s} \cdot \odot = [\infty] \cdot \odot \quad \text{i.e. the Absolute Space accepts any Contents ... 8.2}$$

*thus Non-Existence becomes as Existence ...*

The two quantized quantities  $d\check{s}$  ,  $\mathbf{P}$  of Primary dipole  $\bar{AB}$  ( Vector  $d\check{s} = [\mathbf{a} \pm \mathbf{b}, \mathbf{i}]$  ) is the equilibrium of Space and Anti-Space , so point A is **the Source** (+)  $\mathbf{P}\bar{A} = \mathbf{P}A$  ) in [ S ] and point B is **the drain** (  $\mathbf{P}B = -\mathbf{P}\hat{A}$  ) in [ aS ] , and straight lines **diverge away** from point A and **diverge towards** point B and it is so **the first Vector monad** . [PNS] is **Static** ( because of equilibrium) or **Dynamic** ( where the motion of dipole  $AiBi$  or other spaces in PNS ) , and keeps **Conservation of State in the three equilibrium perpendicular monads i.e. in Subspaces , Spaces and Anti-Spaces**, interchanged by the Pythagoras conservation law of Volume [ Fig.3] satisfying the two quantities when one of them is zero , **and so when** ,

**a..  $d\check{s}=0$**  and also  $(\mathbf{P}A + \mathbf{P}B) = 0$  { or  $(\mathbf{P}A = -\mathbf{P}B)$  } then this is **Primary point A** .

**b..  $d\check{s}=0$**  and also  $(\mathbf{P}A + \mathbf{P}B) \neq 0$  { or  $(\mathbf{P}A \neq -\mathbf{P}B)$  } then this is **Primary point A** .

**c..  $(\mathbf{P}A + \mathbf{P}B) = 0$  and  $\mathbf{P}A = \mathbf{P}B = 0$**  and also  $d\check{s} \neq 0 \rightarrow$  **Constant**  $= \pm \tilde{A}\tilde{B} \rightarrow < \pm \infty$  then **Infinite Points A and B , formulate Primary Neutral Space and the Equilibrium Anti - Space** [ PNS ]  $\equiv$  [ PNaS ] , i.e. the existing Euclidean Space and the Symmetrical to Primary Point equivalent Anti-Space **and because are not needed any applied Forces for this** [since  $\mathbf{P}A = \mathbf{P}B = 0$ ] **then both Initial Spaces** [ PNS ] , [ PNaS ] **are Self created Spaces and the base for all others** . When the Applied Forces  $\mathbf{P}A = -\mathbf{P}B = 0 \rightarrow Pn \rightarrow \infty$  ( this happens for non symmetrical points) then **formulate a non-uniform  $\pm$  Dynamic Field**  $[\check{U}] \equiv [ -\check{U}]$  **which exists in** [ PS ]  $\equiv$  [ PaS ] **and these fields are in the coinciding Spaces** [PNS]  $\equiv$  [PNaS] **and because are needed also the equal and opposite Imaginary Magnitudes ( that what we call Impulses (Forces) in order that points agree with their conservation state)** then since their resultant Force is zero , infinite other forces are needed by other Spaces on this point to move *i.e.*

1. [ PS ]  $\equiv$  [ PaS ] , [ PNS ]  $\equiv$  [ PNaS ] **and Spaces** [ PS ] , [ PaS ] , [ PNaS ] **coexist in** [ PNS ]
2. [ PNS ] **is a Field with zero point Energy , while all Infinite points of the three coexisting Spaces Produce all dipole  $AiBi$  and the infinite  $\pm$  Dynamic Fields .**

3.. In [ PNS ] opposite forces  $PA, PA'$  of Space and equilibrium Anti-Space are acting in the same straight line  $AA'$ , so *moment lever is 0*, therefore [PNS] is an **infinite stationary Scalar region (field)**  $S(x, y, z)$  where  $x, y, z$  are the generalized Cartesian coordinates of any point  $p$  with the microscopic bounded Work conserved as **Potential and Spin**, and construct an **irrotational Vector field and maps to Flux Vector field**  $X_s = \nabla \cdot S_s = [(\partial S/\partial x) \mathbf{x} + (\partial S/\partial y) \mathbf{y} + (\partial S/\partial z) \mathbf{z}]$ . Vector field  $X_s$  maps to **Density Scalar field**  $D_s = \nabla \cdot X_s = \nabla \cdot (\nabla \cdot S_s)$  and to the **Changeable Vector field**  $C_s = \nabla \times X_s = \nabla \times (\nabla \cdot S)$  which is equal to zero.

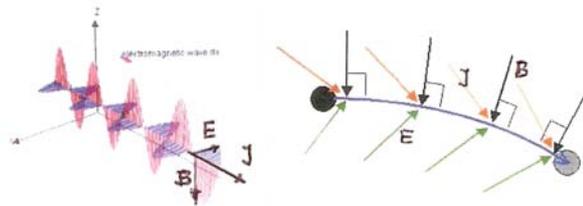
The coupling of quantized Space and Energy ( $ds$  and  $dP$ ) becomes on points of dipole  $AiBi$  through the Scalar potential field  $P(X, Y, Z)$  where  $X, Y, Z$  are the generalized Forces mapping to Flux Vector field  $V_p = \nabla \cdot P = [(\partial P/\partial x) \mathbf{x} + (\partial P/\partial y) \mathbf{y} + (\partial P/\partial z) \mathbf{z}] = [J \cdot \mathbf{x} + E \cdot \mathbf{y} + B \cdot \mathbf{z}]$  to the **Density Scalar field**  $D_p = \nabla \cdot V_p = \nabla \cdot (\nabla \cdot P)$  and to the **Changeable Vector field**  $C_p = \nabla \times V_p = \nabla \times (\nabla \cdot P)$ . Because the curl of the gradient of a Scalar field vanishes then,  $C_s = C_p = 0$  (produced fields). The gauge freedom Unit vectors  $d\check{s} = s(n1, 2, 3)$ ,  $dP = P(n1, 2, 3) \cdot \odot$  depended in Space and Anti-Space to be a source or sink  $x, y, z \leftrightarrow -x, -y, -z$  which presupposes Impulses  $PA = -PA'$ , is force  $P$ , which is  $P = W/ds = \partial/\partial\check{s} [W] = \nabla W = \nabla \cdot [\nabla J \cdot \odot] = \nabla^2 J \cdot \odot$  ..... 8.3 where

$$\text{Vector } J = (\partial P/\partial x) \mathbf{x} = dP(dx) \cdot \odot = X_p \text{ and } \nabla^2 J \rightarrow \text{the Laplacian of vector field } J.$$

Electrons circulate around nucleus *for ever* by using conserved interchanged **magnitude J as velocity field**, **magnitude E as atom's energy level field** and **B as energy exchanged field** with the nucleus.

Specification of  $S = S(\mathbf{r})$  as a scalar function with four dimensional scalar functions  $\mathbf{r}(x, y, z, s)$  contains the same informations as the specification of any other field  $D(\mathbf{r})$  and so  $D = -\nabla S(\mathbf{r})$ . It is an identity of Vector calculus (*for geometry also a point has not direction*) that for any scalar field  $S(\mathbf{r})$ , exists  $D = -\nabla S$  the lines of **Potential field Intensity** follow contours of steepest descent of surface, and for Plane the perpendicular on Plane. The geometric concepts of [PNS] as two dimensional field is that the third dimension represents the Amplitude of the potential  $S$ . Considering x-y Plane as the base and the vertical (z) is the potential  $S$ , then contours of constant potential altitudes of [PNS] are **Cylindrical or Solenoidal** and for Position  $0$  (which is the equilibrium Horizon of Space and anti - Space) is **Sphere**, therefore [PNS] with the included Space [S] and Anti-Space [aS] may be **Sphere and Solenoidal simultaneously**.

The three fictitious forces Fields [J, E, B] of any motion



Linear motion Non-Linear motion (F.5)

On any single particle of wavelength  $AiBi = \lambda = ds$  and  $p =$  momentum exists :

$d\check{s} \cdot dP = \lambda \cdot p = \text{constant} = h \rightarrow$  is the reduced Planck constant for each Energy Layer.

Since  $dP = (\partial P/\partial x) \mathbf{x} + (\partial P/\partial y) \mathbf{y} + (\partial P/\partial z) \mathbf{z} = [(\partial/\partial x) \mathbf{x} + (\partial/\partial y) \mathbf{y} + (\partial/\partial z) \mathbf{z}] \cdot P \cdot \odot = -\nabla P$ , the unit gradient of  $d\mathbf{s} = \mathbf{a} \pm \mathbf{b}i = 1 \rightarrow 1 = \lambda \cdot \nabla \pm k \cdot \nabla \cdot (\odot) = \lambda \cdot \nabla \pm k \cdot \nabla(i) = \lambda \cdot \nabla \pm i \cdot k \cdot \nabla$ .

b.. Equation 8.2 for zero Work in [PNS] is  $W = \nabla \cdot d\check{s} \cdot \odot = 0 \rightarrow [\nabla \cdot J + \nabla \cdot E + \nabla \cdot B] \cdot \odot = 0$  and because Fields  $E = \nabla \times J$ ,  $B = \nabla \times E$  then  $\rightarrow W = \nabla \cdot J \cdot \odot = 0$  ..... 8.4

On Any Dipole  $AB$  of [PNS] with  $d\check{s} = ([J, E, B]$  and  $\odot$ ), where motion occurs only as (+)  $\rightarrow$  (-) Source (+)  $\rightarrow$  Drain (-), Conservation State exists on magnitude  $|d\check{s}| = \sqrt{J^2 + E^2 + B^2}$  of vector  $\check{r}(J, E, B)$  (which is Sub-Space of  $AB$ ) and on the two perpendicular Fields  $\hat{E} = \nabla \times J$ ,  $B = \nabla \times \hat{E}$  which are the two equilibrium Spaces and Anti-Spaces of vector  $AB$  where  $\nabla \times \hat{E} \neq 0$ ,  $\nabla \times B = 0$ , and for the two equilibrium Spaces and Anti-Spaces of [PNS],  $\nabla \cdot E = 0$ ,  $\nabla \cdot B = 0$ , which

happens in a region with no charges and no currents as this is for *motion of light in vacuum*,  $\nabla \cdot \mathbf{E} = 0$ ,  $\nabla \cdot \mathbf{B} = 0$ ,  $\nabla \times \mathbf{E} = \partial \mathbf{B} / \partial t$ ,  $\nabla \times \mathbf{B} = k \cdot \partial \mathbf{E} / \partial t$ . ( F.5 )

Since, *Source (+) → Drain (-)*, in [PNS] is the equilibrium of Space [S] and Anti-Space [aS] therefore the **only magnitude for motion is J, while E and B are produced** ( Inertial ) and the **Conservation State (e) happens**, as this happens in Magnetic fields where lines ( loops ) close in themselves, because **no sources exist in the produced magnetic fields B**.  $\uparrow \rightarrow \textcircled{R}$ .

Conservation State on a dipole  $A_i B_i = m \cdot \textcircled{C}$  which simultaneously rotates about a point and moves relative to that point, are the three perpendicular and conserved Vector Force Fields, **Centrifugal** ( $m \omega^2 R$ ), **Euler's** ( $m a R$ ), and **Coriolis** ( $2 \cdot m \omega v$ ). ( F.5 )

Using (cgs) conventional units then **E** and **B** have the same units. **Spin** is **macroscopic (a)** on bound charge of Space and anti-Space, and **microscopic (i)** on any separate dipole  $A_i B_i$ , combined to produce a Positive and Negative charge layer on both sides so the two fields split as  $\mathbf{E} = \mathbf{E}_a + \mathbf{E}_i$  and  $\mathbf{B} = \mathbf{B}_a + \mathbf{B}_i$  defining the **unified Macroscopic and Microscopic bound conservation of Work**.

In a **Stress System**, the **State of Principle Stresses at each point** ( it is the double refraction in **Photo - Elasticity** ) is as Isochromatics lines [  $(\sigma_1 - \sigma_2) = J \cdot k/d$  ] or Isochromatics surfaces.

c.. For any vector  $\check{r}(x, y, z)$  and  $r = |\check{r}|$  is holding  $\nabla \cdot \check{r} = 3$ ,  $\nabla \cdot (\check{r}/r) = -2/r$ ,  $\nabla \cdot (r^4 \check{r}) = 7r^4$

d.. For any vector  $\check{r}(x, y, z)$  and  $r = |\check{r}|$  is holding  $\nabla \times \check{r} = \nabla \times (\check{r}/r) = \nabla \times (\check{r}/r^3) = \mathbf{0}$  i.e. vector  $\check{r} f(r)$  is irrotational for any  $f(r)$ , or its curl vanishes because it is parallel to  $\check{r}$  while  $\nabla \times \check{r} = \mathbf{0}$ . In the same way for vector  $d\check{s} = \check{A} \check{A}'(J, E, B)$ , **J** is aligned in  $\check{A} \check{A}'$  direction of Source **A** and Drain **A'** and so magnitude  $\mathbf{E} = \nabla \times \mathbf{J}$  is a constant field perpendicular to **J**, and so magnitude  $\mathbf{B} = \nabla \times \mathbf{E} = 0$  i.e. a produced field ( Inertial ) perpendicular to **E** field is not existing or it is constant.

e.. For any vector  $\check{r}(0, 1, xy)$  is holding  $\nabla \cdot (0, 1, xy) = 0 \rightarrow$  i.e. a solenoidal field.

f.. For any Scalar field  $f(x, y, z)$  where  $x, y, z$  lie on a curve  $t \rightarrow x(t), y(t), z(t)$  and vector  $\check{a}$  is tangent to the curve then is holding  $d\mathbf{f} / dt = (\check{a} \cdot \nabla) f = \check{a} \cdot \nabla f \rightarrow$  i.e. ( Flat Plane Space )  $d\mathbf{f} / dt = [(\partial J / \partial x) \cdot dx/dt + (\partial E / \partial y) \cdot dy/dt + (\partial B / \partial z) \cdot dz/dt] = [(\partial J / \partial x) \cdot ax + (\partial E / \partial y) \cdot ay + (\partial B / \partial z) \cdot az] = \check{a} \cdot \nabla \check{r}$  as this happens for gradient of work  $\nabla W = \check{a} \cdot \mathbf{S}_a = \check{a} \cdot \nabla S$  in stationary Scalar field  $S(x_p, y_p, z_p)$ .

g.. [PS] and [PaS] is coinciding with [PNS] and it is a region which **Preserve Charges (This is the field where Conservation Energy is the momentum which is stored in [PNS] and not turn to non-existence)**. The three constituents **J, E, B** follow Pythagoras conservation law and each one is derived from the other or others, and since this is a familiar domain of *Vector Calculus* then, for magnitude  $\mathbf{J} = \mathbf{J} \rightarrow \hat{\mathbf{E}} = \nabla \times \mathbf{J} \rightarrow \mathbf{B} = \nabla \times \hat{\mathbf{E}} = \nabla \times (\nabla \times \mathbf{J}) = \nabla (\nabla \cdot \mathbf{J}) - \nabla^2 \mathbf{J} \dots 8.4$

Using the four-gradient with respect to coordinates in an inertial frame  $\partial_n = \partial / \partial x^n$ , [ since gradient of Space . anti-Space = -1  $\rightarrow \nabla_x 1 / \nabla = -1$  ]  $\square = \partial_n \partial^n = k \cdot \partial^2 / \partial t^2 - \nabla^2$  where  $\rightarrow k =$  The Energy Range (m) Scale,  $n =$  momentum,  $x^n = (x, y, z, n)$ , then  $\hat{\mathbf{E}} = \nabla \times \mathbf{J}$ ,  $\mathbf{B} = \nabla (\nabla \cdot \mathbf{J}) - \nabla^2 \mathbf{J}$

**B..** In a Sub-region with charges ( $J \neq 0$ )  $\rightarrow \mathbf{E} = \nabla \times \mathbf{J}$ ,  $\mathbf{B} = \nabla \times \mathbf{E}$  and work  $\mathbf{W} = \nabla \cdot d\check{s} \cdot \textcircled{C}$

a..  $\mathbf{W} = \nabla \cdot d\check{s} \cdot \textcircled{C} = \nabla \cdot [\mathbf{E}] \cdot \textcircled{C} = \nabla \cdot \mathbf{E} \cdot \textcircled{C} = 4 \cdot \pi k \rho \rightarrow$  ( Gauss Law for Electric Flux,  $\Phi_E = W$  ) out of a closed surface, where Content  $\textcircled{C}$  is related to  $\rightarrow$  [ Surface  $S(x, y)$ , Included Volume  $V(x, y, z)$ ,  $dP$  (Charge  $q$ , Spin),  $\epsilon$  ( Internal structural constant ) ]  $\rightarrow = 4 \cdot \pi k q$

b.. For  $\hat{\mathbf{E}} = \text{constant}$  and for  $\mathbf{B} = \text{constant}$  then  $\nabla \times \hat{\mathbf{E}} = \mathbf{0}$  and  $\nabla \times \mathbf{B} = \mathbf{0} \rightarrow$  ( Gauss Law for Magnetism Flux,  $\Phi_M$  ) out of a closed surface is zero.  $\Phi_M = \nabla \cdot \mathbf{B} \cdot \textcircled{C} = \nabla [ (\partial J / \partial x) \cdot dx + (\partial \hat{\mathbf{E}} / \partial y) \cdot dy + (\partial B / \partial z) \cdot dz ] \cdot \textcircled{C} = d\mathbf{y} (\partial J / \partial z) \cdot \textcircled{C} = 0 \cdot 0 = 0$  and because  $\textcircled{C} = 0$

c.. ( Faraday's Law of Induction ( Any change in the magnetic environment ) will cause a voltage *emf*

$$\nabla \times \mathbf{E} = - [ \partial \mathbf{B} / \partial \mathbf{q}_i ]$$

$$\Phi_E = \nabla \cdot \mathbf{d}\mathbf{s} \cdot \odot = \nabla [ (\partial/\partial x).dx + (\partial/\partial y).dy + (\partial/\partial z).dz ] \cdot \odot = \nabla [ (\partial/\partial x).dx + (\partial/\partial y).dy ] \cdot \odot$$

d.. ( Ampere's Law ) Induction ( Any change in the magnetic environment ) will cause a voltage *emf*

$$\nabla \times \mathbf{B} = [ \mathbf{J} - (\partial \mathbf{E} / \partial \mathbf{q}_i) ] / \mathbf{k}_i$$

$$\Phi_E = \nabla \cdot \mathbf{d}\mathbf{s} \cdot \odot = \nabla [ (\partial/\partial x).dx + (\partial/\partial y).dy + (\partial/\partial z).dz ] \cdot \odot = \nabla [ (\partial/\partial x).dx + (\partial/\partial y).dy ] \cdot \odot$$

e.. Maxwell's Equations in Vacuum , No charges (  $E = 0$  ) , No currents (  $J = 0$  )

$$\text{Differential} \quad \nabla \cdot \mathbf{E} = \mathbf{0} \quad \nabla \times \mathbf{E} = - [ \partial \mathbf{B} / \partial \mathbf{q}_i ]$$

$$\text{Differential} \quad \nabla \cdot \mathbf{B} = \mathbf{0} \quad \nabla \times \mathbf{B} = - [ \partial \mathbf{E} / \partial \mathbf{q}_i ] \cdot \mathbf{k}_i$$

$$\text{In Integral form} \quad \oint \mathbf{E} \cdot d\mathbf{l} = - \iint [ \partial \mathbf{B} / \partial \mathbf{q}_i ] \cdot d\mathbf{a} = \mathbf{0}$$

$$\text{In Integral form} \quad \oint \mathbf{B} \cdot d\mathbf{l} = - \iint [ \partial \mathbf{E} / \partial \mathbf{q}_i ] \cdot d\mathbf{a} = \mathbf{0}$$

### THE EQUATIONS OF EQUILIBRIUM IN CLASSICAL MECHANICS .

A . **Lagrange** , by applying Inertia Forces ( constraints ) [  $\bar{P} = m \cdot \bar{d}\mathbf{v} / dt$  ] on stationary Points , developed the following General equations of Equilibrium :

$$\sum_{i=1}^{i=n} [ \mathbf{P}_i + \mathbf{H}_i ] \cdot \delta \mathbf{r}_i = 0 \quad \text{or} \quad \sum_{i=1}^{i=n} [ \mathbf{P}_i - m_i \cdot d\mathbf{v}_i / dt ] \cdot \delta \mathbf{r}_i = 0 \quad \text{and in rectangular Cartesian coordinates} \quad (1)$$

$$\sum_{i=1}^{i=n} \{ [ \mathbf{X}_i - m_i \cdot d^2 \mathbf{x}_i / dt^2 ] \cdot \delta \mathbf{x}_i + [ \mathbf{Y}_i - m_i \cdot d^2 \mathbf{y}_i / dt^2 ] \cdot \delta \mathbf{y}_i + [ \mathbf{Z}_i - m_i \cdot d^2 \mathbf{z}_i / dt^2 ] \cdot \delta \mathbf{z}_i \} = 0 \quad \text{where :}$$

- $i = 1, 2, \dots, n$  : The material points .
- $x, y, z$  : The position in Cartesian coordinates ( *degrees of freedom* )
- $m_i$  (  $m_1, m_2, \dots, m_i, m_n$  ) : The mass on every point  $i = 1 \rightarrow n \rightarrow \infty$
- $\mathbf{P}_i$  (  $\mathbf{X}_i, \mathbf{Y}_i, \mathbf{Z}_i$  ) : The applied Resultant Forces .
- $\delta \mathbf{r}_i$  (  $\delta x_i, \delta y_i, \delta z_i$  ) : The Virtual displacement ( *the possible motion* )
- $d\mathbf{v}_i / dt = \dots \mathbf{v}$  : The time derivatives of velocities
- $d^2 \delta \mathbf{r}_i / dt^2 \dots$  : The time derivatives of acceleration .
- $n, j$  : An Integer label corresponding to a generalized .. coordinate .
- $\mathbf{H}_i \dots$  : Inertia Forces ( Newton's second law ) equal to  $m\mathbf{r}$
- $\sum \mathbf{P}_i \cdot \delta \mathbf{r}_i = \mathbf{V}$  : Potential Energy
- $\sum [ m_i \cdot d\mathbf{v}_i / dt ] \cdot \delta \mathbf{r}_i = \mathbf{T}$  : Kinetic Energy , Lagrangian  $\rightarrow L = \mathbf{T} - \mathbf{V}$

**For  $i = 1$**  , rewrite equation (1) as [  $\mathbf{P}_1 + \mathbf{H}_1$  ]  $\cdot \delta \mathbf{r} = 0$  , or [  $\mathbf{P} + \mathbf{H}$  ]  $\cdot d\mathbf{r} = 0 \rightarrow d\mathbf{r} \cdot [ \mathbf{P} + \mathbf{H} ] = \mathbf{0}$  (2)

Since ( **for  $i=1$**  ) Primary Point is the only Space , then this point to exist in this Space and somewhere else , must move from the Initial Position , say A , to another position , say B . This Equilibrium for points A and B presupposes in Mechanics the Principle of Virtual Displacements  $\rightarrow$  work done  $\mathbf{W} = \int \mathbf{P} \cdot d\mathbf{s} = 0$  , or when  $d\mathbf{s} =$  distance AB , [  $d\mathbf{s} \cdot (\mathbf{P}_A + \mathbf{P}_B) = \mathbf{0}$  ] , (s)

i.e. The two equations (2) , (s) are the same and quantities  $d\mathbf{r} \equiv d\mathbf{s}$  ,  $(\mathbf{P} + \mathbf{H}) \equiv (\mathbf{P}_A + \mathbf{P}_B)$  , satisfy the two equations when one of them is zero , **and so** , equation 8.2 ( P17) is holding . Since forces  $\mathbf{P} = -\mathbf{H} = 0 \rightarrow \mathbf{P} \cdot n \rightarrow \infty$  , in [  $\mathbf{P} \cdot \mathbf{s}$  ] and [  $\mathbf{P}_A \cdot \mathbf{s}$  ] , are equal and opposite , **then Resultant force  $\bar{\mathbf{A}}$  is zero** , and according to the three mathematical condition for Field Forces , issues ,

a). The Curl of  $\bar{\mathbf{A}}$  is  $\nabla \times \bar{\mathbf{A}} = \mathbf{0}$     b). The net work through a closed trajectory  $\bar{\mathbf{A}} \cdot d\mathbf{s} = \oint \bar{\mathbf{A}} \cdot d\mathbf{s} = \mathbf{0}$

c). Opposite forces  $\mathbf{A}_P, \mathbf{A}_H$  can be written as the negative gradient of the same potential  $\bar{\mathbf{A}}_{PH} = -\nabla U$

so then the  $n$ th Space and Anti-Space is a Conservative Force Field  $\bar{A}_n$  corresponding to the  $n$ th Potential energy function  $\check{U}_n(\check{a})$  or  $\bar{A}_n(\check{a}) = -\nabla \check{U}_n(\check{a}) = -\nabla [\nabla \check{U}_n] = \nabla^2 \check{U}_n$ , where  $\check{a} = x_o, y_o, z_o$ , the coordinates of Initial Space.

## B. Principles and generalized forces in [PNS].

In Field Theory, the Position vector  $\overline{ds} = \overline{AB}$  of two points A, B in a Standard coordinate System is related to the generalized coordinates by transformation equation  $\overline{r}_i = \overline{ds} = ds(q_i, p_i)$ , where

$q_i$  = The  $i$  number of degrees of freedom ( $x, y, z$ )

$p_i$  = A set of variables or constant magnitudes (time, forces, etc)

$\mathbf{P}_A = (X_A, Y_A, Z_A)$  = Generalized forces  $\mathbf{P}_A$  with the components  $X_A, Y_A, Z_A$ .

$\mathbf{P}_B = (X_B, Y_B, Z_B)$  = Generalized forces  $\mathbf{P}_B$  with the components  $X_B, Y_B, Z_B$ .

$\mathbf{r} = \overline{ds} (d\mathbf{x}, d\mathbf{y}, d\mathbf{z}) = \text{Incremental distance } dx, dy, dz$

$\mathbf{T} = \frac{1}{2} \sum_{i=1}^n m_i \cdot \overline{r}_i \cdot \dot{\overline{r}}_i$  = The Kinetic Energy for  $n$  points in a system.

Since the work on each point is  $\overline{P}_i \cdot \overline{ds} = X_i dx + Y_i dy + Z_i dz$  and forces  $P_i$  are conservative, so

there is a Scalar potential field  $V$  in which the gradient  $\nabla$  of  $V$  is the force and such that  $\rightarrow$

$\partial V / \partial x = dx, \partial V / \partial y = dy, \partial V / \partial z = dz$  and the work  $\overline{P}_i \cdot \overline{ds} = [X, Y, Z] \cdot [dx, dy, dz] =$

--

$P \cdot ds = (\partial V / \partial x) \cdot dx + (\partial V / \partial y) \cdot dy + (\partial V / \partial z) \cdot dz = -\nabla V \cdot ds = -[\partial V / \partial q_i] \cdot [ds(q_i, p_i)]$

Where  $\nabla V =$  Potential gradient in terms of generalized coordinates.

and Euler - Lagrange equation yields  $\rightarrow d/dt [\partial T / \partial \dot{q}_r] - \partial [T - V] / \partial q_r = 0 \dots (4)$

Hamilton replaced  $[\partial T / \partial \dot{q}_r]$  with the unknown  $t_1$   $i=n$  magnitude  $p$  so then equation (1) of Equilibrium is transformed to  $\int_{t_0}^{t_1} \sum [P_i - m_i \cdot d\mathbf{v}_i / dt] \cdot \delta \mathbf{r}_i = 0$  or,

$\int_{t_0}^{t_1} \sum [m_i \cdot \mathbf{v}_i \cdot \delta \mathbf{r}_i] \cdot dt = 0$  and for conservative system  $V(t, q_1, \dots, q_r, \dots, q_k)$  so that

$X_i = -\partial V / \partial x_i, Y_i = -\partial V / \partial y_i, Z_i = -\partial V / \partial z_i$  then  $\overline{P}_i \cdot \delta \mathbf{r}_i = -\delta V$  and

$\int_{t_0}^{t_1} \delta \cdot [T - V] \cdot dt = \delta \cdot \int_{t_0}^{t_1} [T - V] \cdot dt = 0 \dots \dots \dots$  Hamilton equation  $\dots \dots \dots (5)$

Since points in [PNS] are stationary then  $u_i = \dot{q}_i = 0$  and  $T = 0$  or constant, and Equation (4) becomes

$$d/dt [\partial T / \partial \dot{q}_r] - \partial [T - V] / \partial q_r = \partial [T_i - V_{ij}] / \partial q_r = 0 \dots \dots (6)$$

where:

$T_i =$  The constant concentrated Initial Work  $W_i = 0 \rightarrow W \rightarrow \infty$  at point  $i$  between Primary point and point  $i$  in [PNS].

$V_{ij} =$  The relative concentrated Potential Energy  $[-P_{ij}(X_{ij}, Y_{ij}, Z_{ij})] \cdot \delta_{ij}$  of the infinite  $j$  points in the Scalar Potential Field of generalized coordinates  $q_{ij}$  at point  $i$  of PNS.

$t = 0$  Time  $t$  is always zero because constants  $T, V$  of every point are not altered with  $t$ . Since  $T, V$  are in-depended on time elements, time is not existing in [PNS] and so is not a fundamental property of this Space.

In equation (5) since  $\delta \neq 0$  then  $\int_{t_0}^{t_1} [T - V] \cdot dt = 0$  and since  $t_0 = t_1 = 0$  then  $T = V$

On a System subject to constraint equation on the generalized coordinates and  $H(r_1, r_2, r_3) = \text{constant}$  then  $\delta L / \delta r_i + \lambda \cdot \partial H / \partial r_i = 0$  where  $\lambda =$  the Lagrange multiplier, and  $L = T - V = T - W_{ij}$  (*momentum* [  $W_{ij} \rightarrow 1 \rightarrow \infty$  ] on [ PS ], [ PaS ] ) *and the two expressions*

$$[ \partial L / \partial r_i - d/dt \cdot (\partial L / \partial \dot{r}_i) ] + \lambda \cdot \partial H / \partial r_i = 0 \rightarrow \text{Generalized equation of motion .}$$

$$[ \delta L / \delta r_i + \sum_{j=1}^n \lambda_j \cdot \partial H_j / \partial r_i = 0 \rightarrow \text{Lagrange's equation ( 1st kind ).. (3.a)}$$

$$\text{is transformed to } -\delta W_{ij} / \delta r_i + \sum_{J=1}^n \lambda_j \cdot \partial H_j / \partial r_i = 0 \text{ , this because in [ PNS ] , } T = 0 \dots \text{ (3.b)}$$

### C . Lagrange's equation ( 2 nd kind ) :

For any material System with  $n$  degrees of freedom, the position vector  $\mathbf{r}$  in a Standard coordinate System is related to the generalized coordinates by *the transformation equation*  $\mathbf{r} = \mathbf{r}(t, \mathbf{q}_n)$  and depends on  $\mathbf{q}_n$  ( $x_i, y_i, z_i \dots n =$  number of degrees of freedom in the system) coordinates at Time  $t$  and for  $n$  generalized velocities  $\rightarrow \mathbf{r} = \mathbf{r}(t, \mathbf{q}_n, \dot{\mathbf{q}}_n)$

The expression for the Virtual displacement  $\delta \mathbf{r}_i$  of the system for, *velocity depended constraints*, is the same form as a total differential.

$$\delta \mathbf{r}_i = \sum_{n=1}^n [ \partial r_i / \partial q_n ] \cdot \delta q_n = \nabla \mathbf{r} \cdot \odot$$

where :

$\mathbf{q}_n = n$  Independent generalized coordinates (*are the number of degrees of freedom in the system or the spatial coordinates*) and  $\mathbf{Q}_n$  the Total Work done by the applied forces  $\mathbf{P}_i$  on one of the Virtual displacement  $\delta \mathbf{q}_n$ . The Kinetic energy,  $T$ , for the system of Point particles is defined by,

$$T = (1/2) \cdot \sum_{i=1}^n m_i v_i^2 \quad \text{and } Q_n \quad \text{by Newton's fundamental equation} \quad \bar{P} = m \cdot (dv/dt) \quad \text{and work}$$

$$Q_n = (d/dt) \cdot (\partial T / \partial \dot{\mathbf{q}}_n) - (\partial T / \partial \mathbf{q}_n) = (d/dt)(\nabla \cdot T) - \nabla^2 T \quad \dots\dots\dots (4)$$

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