ZENO´S PARADOXE AND THE NATURE OF POINTS
IN QUANTIZED EUCLIDEAN UNIVERSE

This article describes the Physical reality through Euclidean conceptual , for Points Straight lines ,what is Monad in Universe and the Dual Nature of Spaces as *discrete* and *continuous* **.** Euclidean Geometry is proved to be the Model of Spaces since it is Quantized as Complex numbers are.

Markos Georgallides : Tel-00357 -99 634628
Civil Engineer(NATUA) : Fax-00357-24 653551
15 , N . Mylona St , 6010 , Larnaca Cyprus
Expelled from Famagusta town occupied
by the Barbaric Turks .

Email < georgallides.marcos@cytanet.com.cy >

1. Achilles and the Tortoise :

(0m) →   (100 m)   (110 m)
A -------C----------------------- B → ------- D

< In a race , the Quickest runner can never overtake the Slowest , since the Pursuer must first reach the point whence the Pursued started , so that the Slower must always hold a lead >

This problem was devised by Zeno of Elea to support Parmenides´s doctrine that < all is one *in Euclidean Absolute Space* > , contrary to the evidence of our senses for plurality and change and to others arguing the opposite . Zeno´s arguments are as proof by contradiction or (*reduction ad absurdum*) which is a philosophical dialectic method . Achilles allows the Tortoise a head start 100 m and each racer starts running at some constant speed , *one very fast and one very slow* , the Tortoise say has further 10m.

A proposed solution

Straight line AB is continuous in Points between A and B [i.e. all points between AB **are the elements which fill AB** , *which Points are also* , Nothing , Everything and are Anywhere (Fig 2.1)] , and Achilles in order to run the 100 m , has to pass the infinite points between A and B **.** A point C is on line AB only when exists CA+ CB = AB (*or the whole AB is equal to the parts* CA , CB , *and it is the equation , equality .*) . 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 . Definition 2 *(a line AB is breathless length)* is altered as , *for any point C on line AB exists* CA + CB = AB . The three points consist a Plane . **Since points have not any dimension and since only AB has dimension** (the length AB and for ÃC the length AC) and since on ÃB exist infinite AC → AB , which have **infinite Spaces , Anti-Spaces and Sub-Spaces** [*Fig.5*] ,then [P4.P5] is impossible in bringing Achilles to the Tortoise´s starting point B and also for Tortoise´s to 110 m , **because as follows ,**
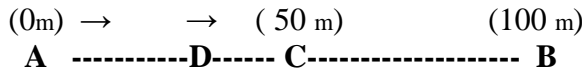
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Straight line AB is not continuous unless **a Common Dimensional Unit AC > 0** *or AC = ds → AB is accepted , and since in this way,*

1a. Straight line AB is continuous with points as filling (*Infinitively divisible*)**.**

2a. Straight line AB is discontinuous (*discrete*) with dimensional Units , ds , as filling (that is made up of finite indivisible parts the Monads ds→AB /n, where n=1,2,→∞)

3a. Straight line AB is discontinuous (*discrete*) with dimensional Units ds , *ds = quantum = AB / n* (where n = 1,2,3 → ∞ , = [a + b.i] / n , *Infinitively divisible keeping the conservation of properties at end points A , B*) *as filling* , **and continuous with points as filling** *(for n = ∞ then ds = 0 i.e. a point)* **. i.e.**

Monads ds = 0 → ∞ are simultaneously (*actual infinity*) and (*potential infinity*) in Complex number form , and this defines infinity exists between all points which are not coinciding , and because **ds** comprises any two edge points with imaginary part then this property differs between the infinite points . **This is the Vector relation of Monads , ds , (or , as Complex Numbers in their general form w = a + b. i) , and is the Dual Nature of lines (discrete and continuous) .**

2. The dichotomy Paradox (*Dichotomy*) :
< That which is in locomotion must arrive at the half-way stage before it arrives at the goal >

(0m) →   →   (50 m)   (100 m)
  A -----------D------ C-------------------- B

As in **1a.** Straight line AB is not continuous unless a Common Dimensional Unit AC > 0   or ds = 0 → AB /2 → AB is accepted ,
Since point C is on line AB then CA + CB = AB and since CA = CB then CD < CB Therefore point D,(AD) will pass through C,(AC) before it arrives at the goal B,(AB).

3. The Arrow Paradox :

< If everything when it occupies an equal Space is at rest , and if that which is in locomotion is always occupying such a Space at any moment , the flying Arrow is therefore motionless >

(0m)   (10 m)   (0m)   **ds = a+b.i = v.dt**   (10 m)
  A --------------→ B   A -----C-D-------------------→ B
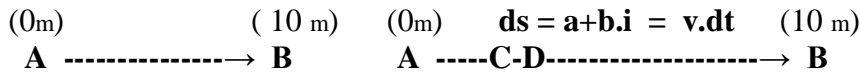
The Arrow Paradox is not a simple mathematical problem because is referred to *motion in Absolute Euclidean Space* i.e.in a Space where *issues Geometry* , *Parallel Postulate the Squaring of circle etc* , **and Physics** where Space [PNS] is not moving and because of its Duality (*discrete and continuous as Complex numbers are*) , *Time is not existing*. This Paradox **is not** in metaphysical problem since [15] is proved that , Complex numbers and Quantum Mechanics Spring out of **the Quantized Euclidean Geometry.**
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As in(**3a)** Straight line AB is discontinuous (***discrete***) with dimensional Units , **ds=CD** as filling and ***continuous with points*** as filling (The Complex Numbers in the general form w = a+b. i) , ***which is the Dual Nature of lines*** (*discrete and continuous*) . [15] It has been shown that Primary Neutral Space is not moving and Time is not existing *so Points* , in Primary Space cannot move to where they are because are already there and motion is impossible . Since *Points C , D* of Primary Neutral Space , PNS , are motionless (v = 0) at any Time (the composed instants are dt = 0) then motion is impossible .

$$\text{i.e. issues} \qquad [\ ds \ = \ a + b. \ i \ = \ v.dt \ ] \qquad \textit{and for ,}$$

$a \ = \ 0$ then $ds = \ b.i = v.dt$ *and for* $b \neq 0$, $dt = 0$ then $ds \ = \ Constant \ = v \, . \, 0$
$b \ = \ 0$ then $ds = \ a \ = v.dt$ *and for* $dt = 0$ then $\rightarrow \ ds = a = \ Constant \ = v \, . \, 0$

therefore in PNS , v = ∞ , T= 0 , meaning infinite velocity and Time not existing , so Since Arrow is moving from   point A to point B , then exists a Numerical order A → B which is not valid for Temporal order (dt) . In case dt = 0 then motion from Point A to point B has not any concept , and distance CD and anywhere exist the Equal CD is unmovable , **i.e.** *Motion of points C, D of PNS* **is not existing** *because time (dt=0) and infinite velocity (v = ∞) exists , while motion of the same points C, D* **exists** *in PNS out of a moving Sub-Space of AB* (arrow CD is one of the ∞ roots of AB)
$$\textit{(ds = CD = Monad in PNS)} \text{ [15].}$$

FUNDAMENTAL   PRINCIPLES .

1 . **The first dimensional Unit AB** , of any two points A and B , is the geometrical Shape that has as Position the (direction ÂB , BÂ) and as Magnitude   (the length AB = 0 → N → ∞) . (F2-3) .
ds = An Infinitely small increment of length AB in the direction   AB , BA .
∞ = An Infinitely great magnitude AB in the direction   AB , BA .
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 2.6.)
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 . Edge points A , B not coinciding on Monad **AB** , keep the properties of Complex Numbers with Imaginary part which differs between the infinite points. Monads ds = 0 → ∞ are simultaneously (*actual infinity*) and (*potential infinity*) in Complex number form , and this defines that infinity , is existing between all points which are not coinciding , and because **ds** comprises any two edge points with imaginary part then this property differs between the infinite points .

2. **Spaces of Unit AB** are (in Plane) the Infinite Regular Polygons inscribed in the circle *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 ∞ Spaces line AB ↔ . (F.3)
The diameter of this circle extends to infinity (*it is of potential nature*).

3. **Anti-Spaces of Unit AB** are (in the three dimentional space) the Symmetrically Infinite Regular Solids inscribed in the Sphere *with AB as side* of the Solid , (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 ∞ Spaces , line BA ↔ . (F2-6 , F3)
The diameter of this Sphere extends to infinity (*it is of potential nature*) .

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 ∞ Elements are the points on the circle) , (*actual infinity*) . (F.4)
The Superposition of Spaces , Anti - Spaces and Sub-Space Layers of Unit AB is shown in F.5 . *Remark* : (+) Spaces , (-) Anti-Spaces , (±) Sub-Spaces , of a unit AB are between magnitude (Point = 0 =Nothing) and the Infinite magnitude (↔ = ± ∞ = Infinite) which means that all Spaces are in one Space .
Because in Spaces and Anti-Spaces , the ∞ Spaces of **Unit AB** is line AB ↔ , and in Sub-Spaces , the ∞ 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 → ∞ are Simultaneously , *actual infinity* **(** *because for n = ∞ then ds = [AB / n = ∞] = 0 i.e. a point* **)** *, and potential infinity* **,** *(because for n = 0 then ds = [AB / n=0] = ∞ i.e. the straight line through AB* **.**

5. Algebraic Numbers : According to F.5 *Monad* **AB = 0 ↔ AB ↔ ± ∞ .** Spaces , Anti-Spaces , Sub-Spaces of AB are **the Infinite Regular Polygons** , on circle with AB as Side ,and on circle with AB as diameter . According to De Moivre's formula the n-th roots on the unit circle AB are represented by the vertices of these Regular n-sided Polygon inscribed in the circle which are Complex numbers in the general form
w = a+b.i = r.e$(i\varphi)$, **a** and **b** = Real Numbers **,** r = $\sqrt{a^2+b^2}$ **,** (±) **i** = Imaginary Unit.
We will show that since Complex Numbers are *on Monad AB* (*any two points*) and it is the only manifold for Physical reality *then Euclidean Geometry is Quantized* (Fig,1)

a. Exists $^2\sqrt{1}$ **= ± 1 or [-1 ↔ +1]** , therefore **xx** (axis) coordinate system represents the one-dimensional Space and Anti-Space . (the Straight line) , $1.1 = 1$, $(-1).(-1) = 1$

[+ i]
b. Exists $^2\sqrt{-1}$ **= ± i or [↕]** , therefore **yy** (axis) coordinate system represents a perpendicular one-dimensional [- i] to xx Space and Anti-Space . (the Straight line) ,
exists ,
$(-i).(-i) = + i^2 = + (-1) = -1$, $(+ i).(+ i) = + i^2 = -1$

c. Exists $\sqrt[3]{1} = [\ 1\ ,\ -\frac{1}{2} + (\sqrt{3}.i\ )/2\ ,\ -\frac{1}{2} - (\sqrt{3}.i\ )/2\ ]$ therefore **xx-yy** coordinate system represents two - dimensional $\pm$ Spaces and $\pm$ Complex numbers .(the Plane)

$1.1.1 = 1$, $[-\frac{1}{2} +(\sqrt{3}.i\ )/2\ ]^3 = 1$, $[-\frac{1}{2} -(\sqrt{3}.i\ )/2]^3 = 1$
$+ i$

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

The fourth root of **1** *are the vertices of Square in circle* with **1** as diameter and since the Geometrical Visualization of Complex numbers , is formula $\sqrt[4]{1} = \pm 1\ ,\ \pm i$ (d) and since ± 1 is the one-dimentional *real Space* (*the straight line*) , the vertical axis is the other one-dimentional *Imaginary Space* $\pm i$ **.** Since for dimension are needed N-1 points then (d) is representing the Space with three dimensions (dx ,dy ,dz) which are Natural , Real and Complex . Monads (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 P_A **,** P_B , etc) , i.e. , *Euclidean geometry is Quantized .* [15]

i.e. The Position and Dimension of all Points which are connected across 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) .* [14-15] *Impulse is ∞ and may be Vacuum , Momentum or Potential or Induced Potential.*

Change (motion) and plurality are impossible in Absolute Space [PNS] and since is composed only of Points that consist an Unmovable Space , then neither Motion nor Time exists   i.e. a constant distance AB $=$ **ds** anywhere existing is motionless . $ds = [AB / n\ ] > 0 = quantum$, and for infinite continuous **n** , **ds** convergence to **0** . Even the smallest particle (say a photon) has mass [15] and any Bounded Space of ds > 0 is not a mass-less particle and occupies Momentum (motion) .
Physical world is scale-variant and infinitely divisible , consisted of finite indivisible entities ds $=$ AB $\rightarrow$0 and infinite points (ds $=$ 0) i.e. is Continuous with points and Discontinuous with ds > 0 . In PNS dt $= 0$, so motion cannot exist at all .

Since points A,B of PNS coincide with the infinite Points , of the infinite Spaces Anti-Spaces and Sub-Spaces **of PNS** , and since Motion may occur at all Bounded Sub-Spaces then this *Relative motion* is happening between all points belonging to PNS and those belonging to other Spaces . *Time exists in Relative Motion and it is the numerical order of material change in PNS - Space , and is not a fundamental entity .* Infinity exists between all points not coinciding and because Monad **ds** comprises any two edge points with Imaginary part then this property differs between the points forming infinite Dipoles .

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 = Matter]** is the communicator **of Impulse [P]** *of Primary Space* **, with the Bounded Impulses (P$_A$, P$_B$) of Dipole**
 or [15] **[P]** $\leftrightarrow$ **[FMD = AB – P$_A$, P$_B$]** $\rightarrow$ **P$_A$, P$_B$** .

on ↓ **Communicator = Medium** ↓
Impulse P $\rightarrow$ **[Bounded** *Primary Space- Anti-Space* **]** $\rightarrow$ **Bounded Impulse P$_A$**
P$_Â$ = P$_B$
A $\rightarrow$ . . . . . . $\leftarrow$ **O** $\rightarrow$ . . . . . . $\leftarrow$ **B**
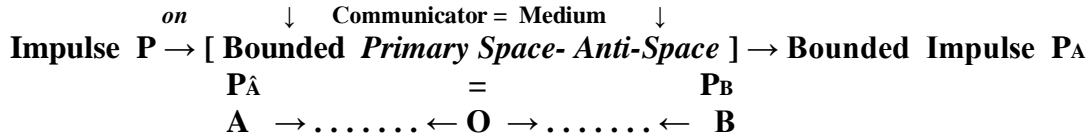
Motion is Continuous and occurs on Dimensional Units , *ds* **, and not on Points which are dimensionless ,** upon these Bounded States of **[PNS]** , *Spaces and Anti-Spaces ,* **and because of the different Impulses P$_A$, P$_B$ of points A , B and that of Impulses Pi$_A$, Pi$_B$,** of Sub-Spaces **,** *are* **either on straight lines AB or on tracks of Spaces , Anti-Spaces , Sub-Spaces of AB . [14-15] . The range of** *Relative velocities* **is bounded according to the single slices of spaces (** *ds* **).**

Remarks :

1. Spaces and Anti-Spaces are continuous and represent Real numbers , $^2\sqrt{1} = \pm 1$
A Continuous Function is a Static Completed Entity while **ds** is a quality existing Entity conveyed through PNS .
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 $\rightarrow \infty$)** and represent reality . The roots of Monads are the *same Monads* in Space and Anti-Space as well as Imaginary Monads in Sub-Space i.e.
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 $^4\sqrt{1} = \pm 1 , \pm i$ (d) and since ± 1 is the one dimentional **real Space** (*the straight line*) the vertical axis is on (*Harmonic repetition of Spaces*) the other one dimentional **Imaginary Space** which is conveyed . Since dimension needs (N-1) points then (d) is representing the Space with three dimensions (dx ,dy ,dz) which is Natural , Real and Complex numbers and it is not four dimensional Space as it is in " Space-Time " theory .
Position and Momentum are incompatible variables because any determination of either one of them , leaves the other completely undetermined i.e.
The Eingenvalues of Spation Position are Incompatible with the Eingenvalues of Momentum (motion) , and so any **ds** in PNS has a definite Position and Momentum simultaneously . This is the Relative motion of Spaces .
3. Natural Numbers with their discrete nature Symbolize Discontinuity of Spaces , because Physical World is Continuous with Points (*motion* **) and Discrete with Numbes =** *Monads = ds . The Dual property of Physical World. also exists ,*

1a. *Point* is nothing , Everything , it is Anywhere , without Position and Magnitude.

2b. *Straight line* is 0 and $\pm\infty$ 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 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 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) .*

5e. *The Bounded Spaces , Anti-Spaces , Sub-Spaces , of the First dimensional Unit* $AB = a + b.i$ *, are composed of the two Elements of* **the [Dipole AB = Matter]** *which is communicator AB ,* **and Impulse [P]** *of Primary Space , with the Bounded Impulses (P_A , P_B)of Dipole or* **[P]↔[FMD =AB – P_A , P_B]→P_A ,P_B**

A complex number can be visually represented as a pair of numbers forming a vector on a diagram called an Argand diagram, representing the complex plane. *Re* is the real axis, *Im* is the imaginary axis, and *i* is the square root of –1.

Figure 1: A complex number plotted as a point (red) and position vector (blue) on an Argand diagram; $a + bi$ is the *rectangular* expression of the point.

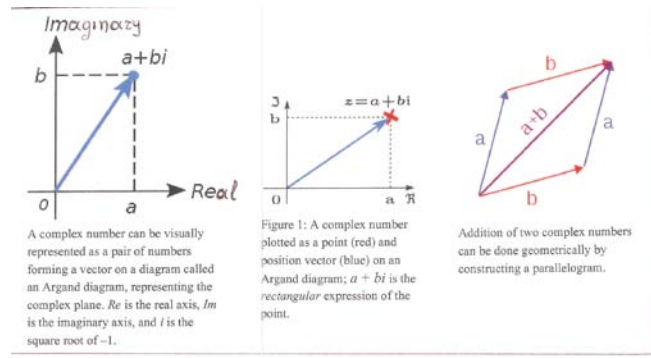Addition of two complex numbers can be done geometrically by constructing a parallelogram.

Fig.1

6f . **Achilles has to pass every point of line AB which is then as passing from the starting point A , ds =0 , where Velocity of Achilles is $v(A) = ds/dt = 0$. The same happens for Tortoise at point B where Velocity $v(T) = ds/dt = 0$. On the contrary , Achilles passing AB on dimensional Units , ds , then Achilles velocity $v(A) = ds/dt(A)$ is greater than that of Tortoise $v(T) = ds / dt(T)$.**

A   ds = (AB / n= ∞) = 0   B   A   ds = →AB / n =11   B
……..…………….………..   →→→→→→→→→→→→
      Continuous(.)   *Discrete (→)*

Since in PNS , $v = \infty$, $T = 0$, meaning infinite velocity and Time not existing , then **Arrow AB in [PNS] is constant because AB = ds = Constant = u . 0 = ∞ . 0 Straight line AB is discontinuous (*discrete*) with dimensional Units ds =AB / n where $n = 1 \to \infty$ and continuous with points [$n = \infty$] ,** (*This is the Dual Nature of lines , and generally in geometry , discrete and continuous*) **.**
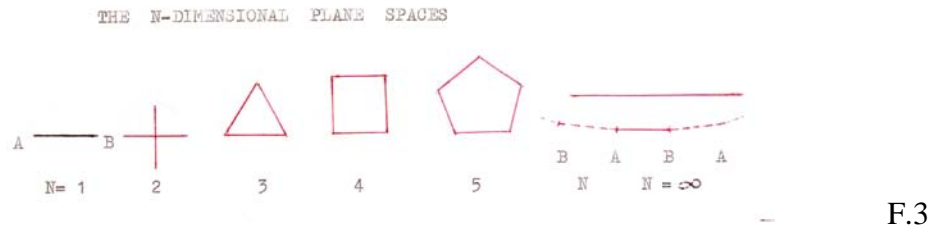
Spaces Anti-Spaces and Sub-Spaces are ***Homogenous*** because the Points of Monads are also. Since all Directions $\tilde{A}B$, $B\tilde{A}$ are equivalent , then PNS ***is also Isotropic*** , i.e all Relative Natural sizes and Laws remain Inalterable with Displacement and Rotation.

Since [*Spaces Anti-Spaces Sub-Spaces*] are the Roots of Monads and since Monads are composed of **Real and Imaginary Parts** , as Complex numbers are , then are Real and Imaginary , Discrete and Continuous and is not needed to be separate in Visualization. Since velocity is ∞ and time is not existing , $T = 0$, Curvature in PNS is zero and ∞.
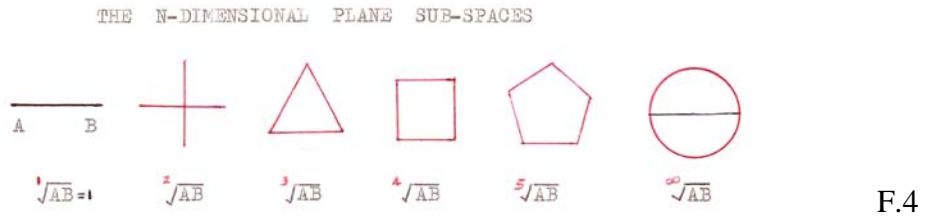
1. The Elements of Euclidean geometry are , Points , straight Lines , circle .etc,

F.2
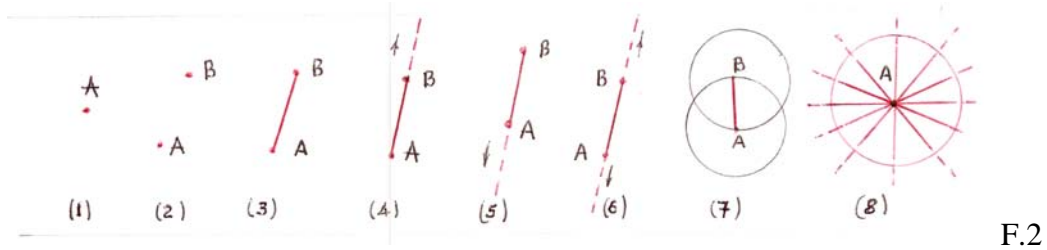
2. The Space Layers (Regular Solids) with sides equal to $AB = 0 \rightarrow \infty$
The Increasing Plane Spaces by Repetition of the same Unit AB . [10]


F.3

3. The Sub-Space Layers (Regular Solids on AB) as Roots of $AB = 0 \rightarrow \infty$
The Decreasing Plane Spaces by Repetition of the same Unit AB . [10]

F.4

4 . The Superposition of Plane Space , Anti-Space Layers and Sub-Space Layers :
The simultaneously co-existence of Spaces , Anti-Spaces and Sub-Spaces of any **Unit AB = 0 $\rightarrow$ ∞**, 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.[10] 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.5
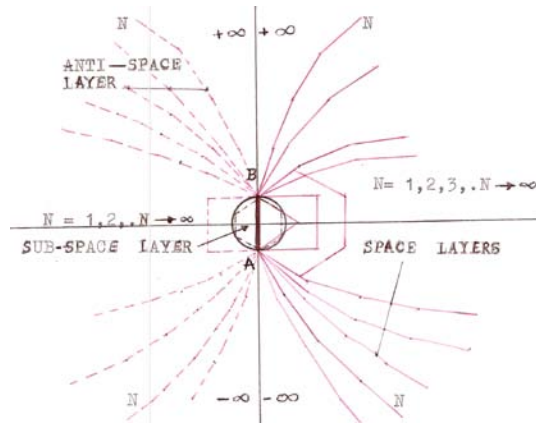
F.5

References :

[1]   MATRIX STRUCTURAL of ANALYSIS , by J.L.MEEK library of Congress Catalog 1971.
[2]   DER ZWECK IM RECHT   by RUDOLF V. JHERING 1935
[3]   EUCLID'S ELEMENTS IN GREEK
[4]   The great text of J . L .Heiberg   (1883-1886) and the English translation]
[5]   ELEMENTS   BOOK 1   [by Richard Fitzpatrick]
[6]   GREEK MATHEMATICS by, Sir Thomas L .Heath - Dover Publications ,   ]
[7]   WIKIPEDIA , THE FREE ENCYCLOPEDIA   [Inc , New York.63-3571.]
[8]   ARISTOTLE PHYSICS .

    ON SCRIBD & VIXRA

[9] A SIMPLIFIED APPROACH OF SQUARING THE CIRCLE . (**MELAN.doc**)

[10] THE PARALLEL POSTULATE IS DEPENDED ON THE OTHER AXIOMS (**EUCLID.doc**)

[11] MEASURING REGULAR POLYGONS AND HEPTAGON IN CIRCLE (**REGULAR.doc**)

[12] THE TRISECTION OF ANY ANGLE .   (**TRISECTION.doc**)

[13] THE EUCLIDEAN PHILOSOPHY OF UNIVERSE . (**EUCLID .Spaces.doc**) .

[14] UNIVERSE ORIGINATED **not** WITH BIG BANG   (**EUCLID .not.BIG BANG .doc**)

[15] COMPLEX NUMBERS , QUANTUM MECHANICS FROM EUCLIDEAN UNIVERSE .
                                          (**ComplexQuantumEuclid.doc**) .
[16] TIME REGISTRATION IN PRIMARY NEUTRAL SPACE , ANTI - SPACE
                                          (**Time-Spaces.doc**)
[17] ZENOS PARADOX , NATURE OF POINTS IN QUANTIZED EUCLIDEAN GEOMETRY
                                          (**ZENO - PARADOX. doc**)

                                                    by

                                          Markos Georgallides

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