

Definitions of the stochastic metaphysics

Definition 1.1.1 A “vacuum” is a real 3-dimensional empty space without particles, which is outside the consciousness of the observer.

Definition 1.2.1 A beam or ray of light at time t is a fixed line in the “vacuum”, along which a photon has passed in the time interval from the moment t_0 of its emission to t .

Definition 1.2.2 A $\lambda_{m,n}$ -vacuum is a 3-D landscape in a “vacuum” which consists of a stationary intersection of monochromatic rays of light of wavelength range $10^m \text{ cm} < \lambda_{m,n} < 10^n \text{ cm}$, where $n = m + 1$ (Figures 1.2.1 and 1.2.2). The thickness of the light rays, in comparison with the volume of the “vacuum” under investigation, tends to zero, so that the condition of applicability of geometrical optics is fulfilled.

Definition 1.2.3 A longitudinal bundle in a “vacuum” is a representation of an empty 3 - dimensional space consisting of an endless sequence of discrete nested $\lambda_{m,n}$ -vacua (3-D light landscapes).

Definition 1.4.1. “True zero” is defined as: $\Theta = 0 - 0$.

Definition 1.6.1 An orthogonal 3-basis consists of three mutually perpendicular unit vectors emanating from a common point.

Definition 1.7.1 A 2^k - $\lambda_{m,n}$ -vacuum region is an auxiliary logical “structure”, meaning a space with 2^k mathematical measurements (where $k = 3, 4, 5, \dots, \infty$), which are “realized” out of a “vacuum” by probing it with direct and inverse monochromatic rays of light with a wavelength $\lambda_{m,n}$. The simplest 2^3 - $\lambda_{m,n}$ -vacuum region has two “sides”:

- a 4-dimensional space with the Minkowski metric (1.7.3) and the signature (+ – – –);
- a 4-dimensional Minkowski metric anti-space with (1.7.4) and the signature (– + + +).

Definition 1.7.2 The “outer” side of a 2^3 - $\lambda_{m,n}$ -vacuum region (or subcont) is a 4-dimensional region, local metric-dynamic properties of which are given by the metric

$$ds^{(+---)2} = g_{ij}^{(-)} dx^i dx^j \quad \text{with the signature } (+---), \quad (1.7.5)$$

$$\text{where } g_{ij}^{(-)} = \begin{pmatrix} g_{00}^{(-)} & g_{10}^{(-)} & g_{20}^{(-)} & g_{30}^{(-)} \\ g_{01}^{(-)} & g_{11}^{(-)} & g_{21}^{(-)} & g_{31}^{(-)} \\ g_{02}^{(-)} & g_{12}^{(-)} & g_{22}^{(-)} & g_{32}^{(-)} \\ g_{03}^{(-)} & g_{13}^{(-)} & g_{23}^{(-)} & g_{33}^{(-)} \end{pmatrix} \quad (1.7.6)$$

which is the metric tensor of the “outer” side of the 2^3 - $\lambda_{m,n}$ -vacuum region (or subcont).

When

$$g_{ij}^{(-)} = n_{ij}^{(-)} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix} \quad (1.7.7)$$

then a “subcont” is synonymous with the 4-dimensional space with the Minkowski metric (1.7.3) and the signature (+ – – –).

Definition 1.7.3 The “internal” side of a 2^3 - $\lambda_{m,n}$ -vacuum region (or antisubcont) is a 4 - dimensional region, the local metric-dynamic properties of which are given by the metric

$$ds^{(-+++)^2} = g_{ij}^{(+)} dx^i dx^j, \quad \text{with signature } (-+++), \quad (1.7.8)$$

where

$$g_{ij}^{(+)} = \begin{pmatrix} g_{00}^{(+)} & g_{10}^{(+)} & g_{20}^{(+)} & g_{30}^{(+)} \\ g_{01}^{(+)} & g_{11}^{(+)} & g_{21}^{(+)} & g_{31}^{(+)} \\ g_{02}^{(+)} & g_{12}^{(+)} & g_{22}^{(+)} & g_{32}^{(+)} \\ g_{03}^{(+)} & g_{13}^{(+)} & g_{23}^{(+)} & g_{33}^{(+)} \end{pmatrix} \quad (1.7.9)$$

which is the metric tensor of the “external” side 2^3 - $\lambda_{m,n}$ -vacuum region (or antisubcont).

When

$$g_{ij}^{(+)} = n_{ij}^{(+)} = \begin{pmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \quad (1.7.10)$$

the “antisubcont” is synonymous with the 4-dimensional Minkowski metric antispace described by (1.7.4) and the signature (-+++).

To shorten the exposition, we assigned terms to the two auxiliary concepts which were introduced in Definitions 1.7.2 and 1.7.3.

Definition 1.7.4 A subcont (abbreviation of “substantial continuum”) is a hypothetical continuous elastic-plastic 4-dimensional pseudospace, whereby its local metric-dynamic properties are given by the metric (1.7.5).

Definition 1.7.5 An antisubcont (abbreviation of “anti-substantial continuum”) is a hypothetical continuous elastic-plastic 4-dimensional pseudospace, whereby its local metric-dynamic properties are given by the metric (1.7.8).

Definition 1.8.1 A “base” is one of the sixteen 4-bases, as shown in Figure 1.6.3, in which the direction of all 4-unit vectors are denoted as positive, so the base always has signature {++++}.

Definition 1.8.2 A “signature 4-base” is a set of characters corresponding to the directions of its reference vectors with respect to the directions of the reference “base vectors”.

Definition 1.8.3 “The Yi-Ching analogy” represents an analogy between the Algebra of Signature and the “Yi-Ching” (the Chinese “Book of Changes”).

- In the Book of Changes there are two fundamentals: «—» (Yang) and «- -» (Yin); Algebra of Signature contains two signs: «+» (plus) and «-» (minus).

- In the Book of Changes there are 8 trigrams (Figure 1.8.2 a); in Algebra of Signature we have e

- In the *Book of Changes* the combinations of two trigrams give 64 hexagrams (Figure 1.8.2 b, c); in *Algebra of Stignature* we have 64 combinations (addition or multiplication) of each of the 3-bases with each of the 3-antibases.

- The dialectics of the *Book of Changes* is based on combinations of the two opposite principles «—» (Yang) and «- -» (Yin):

| old Yang | old Yin | young Yang | young Yin |
|----------|---------|------------|-----------|
| ☰ | ☷ | ☱ | ☵ |
| Heat | Cold | Warmly | Cool |
| Summer | Winter | Spring | Fall |
| Fire | Earth | Water | Air |
| ... | ... | ... | ... |

Similarly, in the *Algebra of Stignatures* the four binary combinations of signs «+» u «-» (1.8.5) are possible:

$$\{++\} \quad \{--\} \quad \{+-\} \quad \{-+\}.$$

Definition 1.10.1 A “signature” is an ordered set of signs of the corresponding coefficients of an associated quadratic form.

Definition 1.10.2 “Ranking” denotes an expression that defines the arithmetic operation with stignatures of affine (linear) forms or with signatures of quadratic forms. The signs in the denominator after the brackets are ordered $(\dots)_{+/-/\times}$: indicating what operation is performed with the characters in ordered columns and /or rows: $(\dots)_+$ indicates addition, $(\dots)_-$ indicates subtraction $(\dots)_:$ indicates division and $(\dots)_\times$ indicates multiplication.

Definition 1.11.1 The “Chess analogy” refers to the similarity between the *Algebra of Signatures* (AS) with the world of chess.

On a checkerboard there are 8×8 cells = 64: 32 white and 32 black. Also in the matrix signatures (1.11.5) there are 64 characters, 32 of them plus “+” and 32 minus “-”.

At the beginning of the game on a chess board there are 32 chess pieces present: 16 white and 16 black. Also within the *Algebra of Signatures* at each point $\lambda_{m,n}$ -vacuum there are sixteen 4-bases, which consist of rotating electric field vectors (Figure 1.6.6), i.e. “light figures”, and sixteen 4-bases associated with the corners of the cubic cell of a 3-D landscape (Figure 1.6.2), i.e. “darkness figures”.

In addition, the signature (topology) of 16 types of metric spaces (1.11.2) to (1.11.4) is similar to that of chess pieces (Figure 1.11.3):

- zero to two topologies (1.11.2) correspond to the “king” and “queen”;
- six toroidal topologies (1.11.3) correspond to the three pairs of chess figures: 2 “bishops”, 2 “knights” and 2 “rooks”;
- eight oval topologies (1.11.4) correspond to the eight “pawns”.

| | | | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| (+ - + +) | (- - - +) | (+ + - +) | (+ - - -) | (+ + + -) | (- + + +) | (- - + -) | (- + - -) |
| pawn | pawn | pawn | pawn | pawn | pawn | pawn | pawn |
| (- - + +) | (+ - + -) | (- + + -) | (+ + + +) | (- - - -) | (+ - - +) | (- + - +) | (+ + - -) |
| rook | bishop | knight | queen | king | knight | bishop | rook |

Fig. 1.11.3. Comparison of signatures (topologies) of metric spaces with chess pieces

Definition 1.11.2 *The Algebra of Signatures (AS) is an axiomatic system of arithmetic and algebraic operations as part of a complete set of stignatures of affine spaces and signatures of metric spaces. The Algebra of Stignatures is equipped with the basic operation(s) of multiplication (division) and the Algebra of Signatures is equipped with the basic operation(s) of addition (subtraction) of signatures.*

Definition 1.12.1 *A transverse “split-zero” is defined at every point of the $\lambda_{m,n}$ -vacuum ranked expression (1.12.3).*

Definition 1.12.2 *A longitudinal “split-zero” is defined at every point of a “vacuum” as a complete set of transverse “split-zeros” of all $\lambda_{m,n}$ -vacuums).*

Definition 1.12.3 *A “ $\lambda_{m,n}$ -vacuum balance” (or “vacuum balance”) refers to the statement that each point in a $\lambda_{m,n}$ -vacuum (“vacuum”) is balanced with respect to the “split-zero” form (1.12.3). That is, at each point in a $\lambda_{m,n}$ -vacuum (“vacuum”), there is a longitudinally and transversely designated “split - zero”, any deviation from which is associated with the occurrence of mutually opposite manifestations.*

Definition 1.12.4 *A “ $\lambda_{m,n}$ -vacuum condition” (or “vacuum condition”) is any manifestation in a $\lambda_{m,n}$ -vacuum (“vacuum”) with mutually opposite characters: wave - anti-wave, convexity - concavity, movement - anti-movement, compression - tension, etc. Local $\lambda_{m,n}$ -vacuum (“vacuum”) entity and anti-entity quantities can be shifted and rotated relative to each other, but on the average across the $\lambda_{m,n}$ -vacuum region they completely compensate for each other's existence, restoring “ $\lambda_{m,n}$ -vacuum balance” (“vacuum balance”).*

A “vacuum” can be defined on the basis of “vacuum conditions”.

Definition 1.12.5 *A “vacuum” is a complete invariant for all types of spatial and spatio-temporal transformations. That is, what would be mutually-conflicting changes do not occur in a “vacuum”; the average always remains the same.*

Definition 1.16.1 *A transverse bundle “vacuum” is a representation of each local region $\lambda_{m,n}$ -vacuum as a superposition of 4-dimensional metric sub-regions, sub-sub-regions, etc. with the 64 possible signatures (topologies) (1.11.6).*

Definition 1.16.2 The "Qabbalistic analogy" is a comparison, conceived by the author, to show that the Algebra of Signatures (AS) is identical to the system of the Tree of Ten Sephirot of the Lurian Qabbalah.

According to the Lurian Qabbalah, the Name of GOD יה-וה-י (further, instead of letters of Hebrew letters the transliteration H'VHI is used) is revealed in the form of the "Tree of Ten Sephirot" which can be obtained by squaring the square matrix formed by the Letters of this Name:

$$\begin{pmatrix} I & H \\ H' & V \end{pmatrix}^{\otimes 2} = \begin{pmatrix} I & H \\ H' & V \end{pmatrix} \otimes \begin{pmatrix} I & H \\ H' & V \end{pmatrix} = \begin{pmatrix} I \begin{pmatrix} I & H \\ H' & V \end{pmatrix} & H \begin{pmatrix} I & H \\ H' & V \end{pmatrix} \\ H' \begin{pmatrix} I & H \\ H' & V \end{pmatrix} & V \begin{pmatrix} I & H \\ H' & V \end{pmatrix} \end{pmatrix} = \begin{pmatrix} II & IH & HI & HH \\ IH' & IV & HH' & HV \\ H'I & HH & VI & VH \\ HH' & HV & VH' & VV \end{pmatrix} \quad (1.16.3)$$

The components of this matrix correspond to the 10 Sephirot:

Table 1.16.1

| Name letter | Matrix Component (1.16.3) | Sephirah |
|------------------------------------|---------------------------|-------------|
| <i>i</i> edge of the Letter Yud | II | Kether |
| I | HH | Hochmah |
| H | VV | Binah |
| V | IV, IH, IH', VH, VH', HH' | Tiphereth * |
| H' | VI, HI, H'I, HV, H'V, H'H | |
| H' | H'H' | Malkuth |

where Sephirah Tiphereth * consists of six dual Sephirot:

Chesed (IV = VI) Gvura (IH = HI) Tiphereth (IH' = H'I)
 Netzach (VH=HV) Hod (VH' = VH) Yesod (HH' = H'H)

A slightly transformed matrix (1.16.3) can be put into correspondence with a matrix of signatures (1.11.5)

$$\begin{pmatrix} II & HI & VI & H'I \\ IH & HH & VH & H'H \\ IV & HV & VV & H'V \\ IH' & HH' & VH' & H'H' \end{pmatrix} \equiv \begin{pmatrix} (++++) & (+++-) & (-++-) & (++-+) \\ (---+) & (-+++), & (--++) & (-+--+) \\ (+--+), & (++++), & (+---) & (+---) \\ (-+--), & (+--+), & (-+--), & (----) \end{pmatrix} \quad (1.16.4)$$

where

$$(1.16.6)$$

$$\begin{pmatrix} \text{Kether} & 0 & 0 & 0 \\ 0 & \text{Hochmah} & 0 & 0 \\ 0 & 0 & \text{Binah} & 0 \\ 0' & 0 & 0 & \text{Malkuth} \end{pmatrix} \equiv \begin{pmatrix} II & 0 & 0 & 0 \\ 0 & HH & 0 & 0 \\ 0 & 0 & VV & 0 \\ 0' & 0 & 0 & H'H' \end{pmatrix} \equiv \begin{pmatrix} (++++) & 0 & 0 & 0 \\ 0 & (-++) & 0 & 0 \\ 0 & 0 & (+---) & 0 \\ 0 & 0 & 0 & (----) \end{pmatrix}$$

$$\text{Tiphereth}^* = \begin{pmatrix} 0 & HI & VI & H'I \\ IH & 0 & VH & H'H \\ IV & HV & 0 & H'V \\ IH' & HH' & VH' & 0 \end{pmatrix} \equiv \begin{pmatrix} 0 & (+++-) & (-+-) & (+--+) \\ (----) & 0 & (--++) & (-+--) \\ (+---) & (+--+) & 0 & (+--+) \\ (-+-) & (+--+) & (-+--) & 0 \end{pmatrix} \quad (1.16.7)$$

At the same time, just as each qabbalistic Sephirah consists of an infinite set of sub-Sephirot, so too each signature is the result of superposition of infinite number of sub-signatures [e.g. (1.16.1) and (1.16.2)].

Definition 1.22.1 A *k*-braid is the result of averaging the metrics with different signatures (where *k* = the number of averaged metrics, i.e. the number of “threads” in the “braid”).

Definition 1.24.1 A mask of a subcont is a 4-dimensional affine length of the interval type

$$ds^{(-)'} = c dt' + idx' + jdy' + kdz'.$$

Definition 1.24.2 An interior of a subcont is a 4-dimensional affine length of the interval type

$$ds^{(-)''} = c dt'' + idx'' + jdy'' + kdz''.$$

Definition 1.24.3 A mask of an antsubcont is a 4-dimensional affine length of the interval type

$$ds^{(+)' } = -c dt' + idx' + jdy' + kdz'.$$

Definition 1.24.4 An interior of an antsubcont is a 4-dimensional affine length of the interval type

$$ds^{(+)' '} = c dt'' - idx'' - jdy'' - kdz''.$$

Definition 5.8.1 The *abyss* (*rakya*) is a multi-layered spherical boundary (shell) between the core and the outer shell of any spherical vacuum formation (Figures 5.8.1 and 5.10.5 through 5.10.8).

Definition 5.8.2 The *scope* is a kind of memory of the undeformed state of the spherical area of the vacuum region under consideration.

Definition 5.10.1 The *intra-vacuum current* is a local current of the pseudo-medium (*a*-subcont and/or *b*-subcont and/or *a*-antsubcont and/or *b*-antsubcont) which spirals around one of the radial directions.

Definition 5.10.2 A *naked* vacuum formation is a stable curvature of the vacuum region of any scale («electron», «biological cell», «planet», «star», «galaxy», etc.) whose metric-dynamic model is determined by a set of metrics of the type (5.8.1) through (5.8.20) as is shown in Figure 5.8.1. Many smaller vacuum formations can be attracted to a naked vacuum formation. For example, many small

«particles» can be attracted to the nucleus of a **naked** «planet»: «biological cells», «atoms», «elementary particles», etc. (Figure 5.10.8 b).

Definition 9.2.1 A naked «star» and a naked «planet» are macroscopic electrically neutral «particles», i.e. vacuum formations (Figures 9.2.5 and 9.2.6) with a core radius of order $r_4 \sim 1,4 \cdot 10^8$ cm {according to hierarchy (2.6.20)}. The metric-dynamic models of the «star» and «planet» are virtually indistinguishable, but the size of the core of the «star», as a rule, exceeds the size of the core of the «planet».