Non-alternative Artificial and Natural Intelligences Partnership for Put up Shoot in and Return to Rational Co-evolution with Noosphere

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Abstract: Sophisticated informational resources are poorly supported by semantic assistance. To untwist intellectual processes under inter-disciplinary activity in computer systems, life-long partnership with deep-learned artificial intelligence (DL I_A) is needed. Resolving universalities problem to acquire knowledge self-obviousness helps a person to enter hermeneutic circle of noosphere by means of rational auto-poiesis. Otherwise, genus achievements will remain beyond the powers of the person. Purposeful tutoring allows transcendental apperception of the third world on the base of super sensual mathematical meanings. System axiomatic method (AM$_S$) secures true profiling of computer systems and DL I_A building. Its adaptive assistance to subject's self-reflection in intuitive – discursive forms will apply anthropogenesis laws to encourage one's rational consciousness self – building. DL I_A implantation leans on cogno-ontological knowledge base mining. The latter is to be expressed in language of categories playing the role of mathesis universalis to embrace the variety of theories in their comparative description. Semantic glottogenesis keeps up the outlook of cognogenesis and will maintain communication on ideas level. The technology is based on reduction method applied to the person as functional system existing in anthropogenic nature.

1 INTRODUCTION

System-informational culture (SIC) phenomenology impels one's thinking-consciousness be in co-evolution with noosphere and ergonomic changes (Vasilyev, N.S., Gromyko, V.I., Anosov, S.S., 2019). To correspond to scientific complexity of SIC natural intelligence (I_N) is needed constructive evolution as person's auto-poiesis (Maturana, Varela, 2001). It is eurhythmy of idea, intention, and design unity in consciousness-thinking. Evolutional epistemology discovered that anthropogenesis exists in the necessity of adaptive dynamics for knowledge understanding (Campbell, 2000; Popper, 2002). Leaning on cognogenesis as objectization process, philogenesis widens subject's auto-poiesis. Genus stands now on the threshold of self-transformation creating new powerful tool to do it. It can apply DL

I_A to its row. Rational "mutation" on the base of natural sciences is perspective of bio-socio-cultural evolution of common sense man. Putting "reasonable" science at one's disposal is possible by:

- *transcendental* reduction: phenomenology of a person − rational consciousness formation − happens leaning on mathematical universalities (MU) for subjective objectization;
- *eidetic* reduction − intuition phenomenology (image-idea formation) as thinking primary;
- *constitutive* phenomenology of glottogenesis placing meaning in life rang applying image-idea.

Gnoseology is now falsified on the base of cognition complexity. Therefore, laws of adequate rational auto-poiesis must be investigated to apply to DL I_A building. Corresponding technology must be based on MU study. Person's adaptation to noosphere complexity depends on human self-development

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abilities. Narrow professional orientation restricts them by calculating and cognitive functions of mind usage that do not include one into reality of SIC requiring auto-poiesis to conceive changeable SIC meanings. Partnership with DL I_A is needed to develop discursive abilities on the base of MU cultivation and the unity of knowledge formalization and axiomatization, see Sections 2, 3. Semantic tools are necessary for it (Gromyko, et al., 2017; Vasilyev, Gromyko, and Anosov, 2018 – 2020). Our approach to achieve auto-poiesis is relative to neurophysiology (Medvedev, 2017) and considerations of brain – neuro-computer interfaces engineering (Kaku, 2014).

2 NEUROPHENOMENOLOGY

Neurophenomenology puts in order an interface between "ideal" consciousness and "material" thinking. It is tuning fork for the row members when gender achieves obviousness of axiomatic thinking (cognition) and the row applies self-obvious axiomatic formalization. As proto-consciousness, a *person* is molded according to natural ability of self-complication and understands the necessity of self-building. Person brings up his own new organ to create meanings thus becoming self-conscious of transcendental transgression to rational consciousness. Confidence in auto-poiesis possibility issues from natural fertility of self-development processes strengthened by scientific thinking applying constructive self-obviousness of the abstract. Trend *thinking – cognition – identification – consciousness* must be directed by entelechy of semantic language usage.

Neurophysiology includes:

- thinking as neuro-networks ergo-mind acting on the constructive base of idea-image or eidos (Husserl, 2009);
- ego-person as neuro-networks structural integrity (consciousness), see Section 4.

Clinical tools to cue brain diseases highlighted the problem of neurons awakening and the role of ergo-mind - mistakes detector as "inner" voice to rebuild-optimize ego – ergo unity. (Medvedev, 2017).

Person = genome & *ergo-mind* (*eidetic neuro-networks*)
& *ergo-soul* (*neuro-networks integrity*)
& *spirit* (*consciousness of culture*)

Figure 1: Person's neuro-phenomenology.

Consequently, consciousness can strengthen brain with the help of meaning code and can be regarded on as real ground giving possibility to control the

material (Kaku, 2014). Constructive boundaries of real-ideal unity determine neurophenomenology, see Figure 1. Needed auto-poiesis is connected with the highest level of nervous system activity. Cognogenesis, ego-soul integrity, and ergo-mind are to be used for the modification under the influence of SIC. Thinking - consciousness is developed on the way of semantic glottogonia (Pinker, 2013). Expressing universal essences of mind by means of MU allows compressing complex knowledge and making it plain to man. Knowledge substantiation by MU and AM_S application will complement intuition with convincing tools. Generated in subject's memory abiding cognatoms of intellectual processes will become imprints of these structures for consciousness building (Vasilyev, Gromyko, and Anosov, 2019). Glottogenesis transforms phenotype. Semantic means allow expressing explicitly mind universal properties. They are to be reflected in personal cogno-ontological knowledge base (CogOnt) used by DL I_A to see to the subject's ascent on meanings. So, ego mind intuition is supported by ergo structure. Informatics brings formalization in the form of object oriented approach thus connecting up language of categories (L_C). Man possesses necessary neuro-complexity that allows untwisting his intellectual processes up to meaning – transcendation that has not yet been used in full measure. Entelechy of consciousness sophistication requires connotation with DL I_A.

2.1 Universal Tutoring

Thinking in meanings has direct cognitive effect. For the first time, I_A must and is able to support adaptively gender on the limit of I_N abilities. Complexity of subjective objectization of the third world caused the wealth of pseudo-crisis psychological phenomena up to the loss of landmarks in life. But it does not affect mathematical positions in human intellectual development due to axiomatic method (AM) of modeling. As before, computer systems apply algebraic structures to new phenomena significantly differing from classical ones. Despite of the fact, the utmost mathematical abstractions help to untwist corresponding intellectual processes under new conditions. Deep–learning of I_N and I_A will ensure speculation on new reality. Education must react on noosphere changes to overcome difficulties exposed by coming cognitive revolution. Necessary universal tutoring (T_U) must guarantee:

- interdisciplinary activity in SIC;
- man's adaptation to big data of the third world;
- semantic communication;

• human life in the virtual worlds of applications. (Vasilyev, N.S., Gromyko, V.I., Anosov, S.S., 2020). Only universally educated person can be adapted to Internet meanings. Sciences outcome and genuine rationalism can be used to put up shoot in noosphere. T_U allows tuning thinking – consciousness processes to achieve apperception integrity. Partnership technology with DL I_A based on mutual T_U pushes subject to grow naturally into hermeneutic circle to widen it (Gromyko, et al., 2017). A person cannot help thinking. Own complexity identification by self-reflection and T_U transform meanings image obvious for gender into proto-image self-obvious to a person due to its description in L_C. DL I_A will assist man to identify meanings in symbolic form (Kassirer, 2000). Adaptive T_U will unite inductive real work in computer systems with scientific ideal presentations to transform them into "self-obvious" knowledge. When all is said and done the real and the ideal is the same synchronized thing (Vasilyev, Gromyko and Anosov, 2018 − 2019). So, personal transcendence happens on the basis of universalities problem solution and semantic glottogenesis (Pinker, 2013). Origins of meanings birth are to be investigated to discover underlying universal system properties. Instead of elements base usage the latter are to be described in L_C admitting their comparative study. Knowledge formalization uses free mathematical constructions. DL I_A implantation leans on CogOnt usage as meanings core (Vasilyev, et al., 2018 − 2019). Consciousness dig data are to be factorized by the meanings to compress knowledge. T_U prepares the work. Meanings genesis is to be used in CogOnt built in L_C and having visually clear form of commutative diagrams (McLane, 2004).

2.2 System Axiomatic Method

AM gives knowledge presentation by theories. It marks virtual worlds boundaries. Presentations objectization occurs with the help of MU. It is result of algebra, geometry, and analysis synthesis that attained now formalization. AM is means to conserve personal integrity under conditions of SIC. Thinking – consciousness is constantly modified. Sensual perception and rational scope of the life grounded on natural sciences(K_{N_S}) exercise influence on the process. Only AM application has constitutive, developing effect on a person. AM_S causes person's auto-poiesis presenting knowledge on meta-mathematical and semantic levels so as synchronization of the real-concrete and the ideal-abstract is needed. Origins are displayed on initial AM_I (Euclid, 1949-1951) and modern AM_M (Hilbert,

1948) levels that help adaptively to transform the real into the ideal and vice versa, see Figure 2:

$$\left\langle \; system\ meanings \;\middle|\; S_{K_{S_N}} of\ theories = \begin{cases} \Leftarrow \langle \mathrm{AM}_I: instrumental\ reality \rangle \\ \Leftarrow \langle \mathrm{AM}_M: ideation\ by\ axioms \rangle \\ \Leftarrow \langle \mathrm{AM}_S: ideation\ of\ modeling \rangle \\ \Leftarrow \langle \mathrm{L}_C: systems\ description \rangle \end{cases} \right\rangle$$
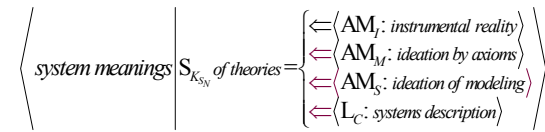
Figure 2: Axiomatic method levels: from natural sciences description to semantic in language of categories (L_C).

Geometrical notions are defined by AM itself. Now in geometry axioms can be expressed in functional languages (Artin, 1969; Bachman, 1969).

General presentations about space and time are reflected in ontological essences of continuity and ordering and strictly defined in mathematical analysis and algebra. Continuity is outcome of completion process starting from natural number object (NNO) that is infinite and perfectly ordered. Incidentally, natural numbers are regarded on as NNO symmetries. NNO is extended by means of new ideal elements coordinated with "old" ones. Natural numbers row N was subsequently embedded into the ring of integer numbers Z and into the fields Q, R of rational and real numbers correspondingly $N \rightarrow Z \rightarrow Q \rightarrow R$. The last categorical construction is based on Archimedes' axiom usage. The process is accompanied by expansions of initial linear ordering as inheritances (generalizations) chain $O_N \Leftarrow O_Z \Leftarrow O_Q \Leftarrow O_R$ of ordered algebraic systems. Unbroken real numbers object R is built as Dedekind's sections of the field Q. Speaking in L_C they are limit cones of commutative diagrams presented by cones $K_Q(q) = \{q' : q \leq q'\}$ of ordered set Q. They fill up gaps of the discrete line Q (Vasilyev, Gromyko, and Anosov, 2019).

Example 1. NNO is also starting point to apply the same MU of AM_S to build the field $Q(\widehat{Z_p})$ of *p-additive numbers*. A field can be built as factor-ring A / I if there is any commutative Euclidean's ring A and having maximum ideal $I \subset A$. Though initial ordering of A (if there was any) is sacrificed now but the field A / I just the same completion process can be continued with the help of factor-rings $A / I^k, k = 1, 2, ...$ and next chain of their natural homomorphisms (Shafarevich, 2001):

$$\varphi = (\varphi_1, ...), \varphi_k : A / I^{k+1} \rightarrow A / I^k, k = 1, 2, ... \; .$$

Figure 3 commutative diagram defines limit cone $\widehat{A}$ in the category of rings. All these factor-rings are

projected $\pi_k : A/I^k \to \hat{A}$ into object $\hat{A}$. For any morphisms $g_k : A/I^k \to B$ there exists unique one $\hat{A} \to B$ making the diagram commutative:
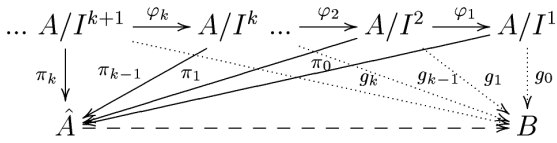

Figure 3: Projective limit $\hat{A}$ is limit co-cone.

Universal co-limit object $\hat{A}$ inherits arithmetical operations from initial ring embedded in it $A \to \hat{A}$ by homomorphism $a \to a + I^k, k = 1, 2, ...$ if kernel relation $\ker \varphi \equiv \cap_k I^k$ is zero $\{0\}$. Ring $\hat{A}$ abstraction is supported by the next coordinatization

$$\hat{A} = \{\hat{\alpha} = (\alpha_1, \alpha_2...) : \varphi_k(\alpha_{k+1}) = \alpha_k\}.$$

It helps to $\hat{A}$ arithmetic feeling. If $A = Z, I = (p)$, where p is prime then $\hat{Z}_p$ is ring of integer p-additive numbers. It worth mentioning geometrical meaning of the ring as endomorphisms system of Abel's group $p^\infty = \left\{ \sqrt[p^n]{1}, n = 1, 2, ... \right\}$ consisting of the unit circle rotations symmetries. Field $Q(\widehat{Z_p})$ of p-additive numbers is quotients field of the ring $\hat{Z}_p$. Objects $R, Q(\widehat{Z_p})$ can be also built issuing from analysis usual metric considerations. In difference from real numbers, p-additive ones are obtained with the help of $Q(Z_p)$ closure in non-Archimedes' norm

$$\| \hat{a} \|_p = \| a_1 p^m + a_1 p^{m+1} + ... \|_p = \left(\frac{1}{2}\right)^m, m \in Z .$$

In this presentation $\hat{a}$ of p-additive numbers quotients belong to Galois field $a_k \in G(p)$. It shows that ring $\hat{A}$ has fractal geometrical structure homeomorphic to Cantor's perfect set.

3 NATURAL INTELLIGENCE

DL I_A building leans on the model of natural intelligence (I_N) as person living in SIC.

3.1 Rational Universality Mind

First of all, subject must possess synoptic view on natural sciences achievements in their making. Proto-knowledge of noosphere semantic gives long-term outlook. Theories dynamics conceals an intention and origin of idea-thinking to be discovered. Intuitive objectivity is insufficient for complex science. It is necessary to master intellectual tools given by strict linguistic means. Vague humanitarian view must be replaced by them because *forma dat esse rei*. Definition availability signifies existence of a thing synthetic *a priori* (Kassirer, 2000). Semantic allows also getting rid of excessive discursiveness of narrow specialized rational education. "Algorithmic" approaches and postponed understanding in teaching must yield to labour with meanings with the help of meta-mathematical investigation. They require T_U.

All advantages of humanitarian and rational origins can be united in super natural knowledge SK_N of MU which is synthesis of mathematics, informatics, and programming. Rational consciousness self-building needs thinking for consciousness (Vasilyev N. S., et al., 2018). Maps universality allows expressing other ones in concise constructive form (McLane, 2004; Goldblatt, 1979).

Example 2. Geometry meanings are presented by different algebraic systems (Artin, 1969). Their auto-morphisms themselves as space symmetries can be regarded on as points and lines (Bachman, 1969). Underlying axioms give origin to diverse geometries (Hilbert, 1948). Public laughed at Lobachevski's "imaginary" geometry considering Euclid's one as the only possible. Its existence was proved as soon as Klein and Poincare constructed non-Euclid's geometry models. So, both geometries are consistent. Riemann's geometry imparted the space-time unity with the reality. Now different theories can be coordinated by general description and factorization.

Example 3. MU of equivalence relation $R_A \subset A \times A$ can be regarded on as object $A \in Ob(A)$ of a category A. In L_C it is defined as morphism $\varphi : A \to C, \varphi \in H_A(A, C)$ inverse image. By means of commutative diagram from Figure 4 equivalence introduces factor-object
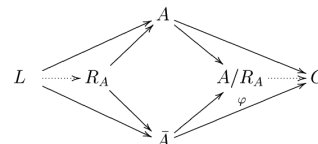

Figure 4: Universality of objects $R_A, A/R_A$.

New object $A/R_A \in Ob(\mathrm{A})$ possesses universality properties being Descartes and co-Descartes square simultaneously (Goldblatt, 1979). Morphisms $\psi \in H_A(A,B)$ connect pairwise homomorphic theories presented by objects A, B. Due to relation R_A, it is more suitable to work in category B having objects $\{\tilde{A} \equiv (A, R_A)\} = Ob(\mathrm{B})$ and morphisms $\tilde{\psi} \in H_B(\tilde{A}, \tilde{B})$. Each map $\tilde{\psi}$ transports relation R_A from object A into object B and answers to some $\psi \in H_A(A,B)$. It defines equivalence on B as image $R_B = (\psi \times \psi) R_A$ of relation R_A. Then category A can be regarded on as sub-category of B due to the equality $A = (A, 0_A)$. So, theory A generalizations are presented by B objects obtained as result of factorization $A/R_B, R_A \subset R_B$. In notations $M = R_A, K = R_B$ and $\psi : A/M \to A/K$, epi-morphism $\tilde{\psi}$ makes the next transformation

$$\tilde{\psi} : (A/M, K/M \times M) \to (A/K, K)$$

resulting in the generalizations law:

$$A/K \simeq (A/M)/(K/M \times M).$$

It explains knowledge coordination under generalizations. In algebraic theories morphism ψ inverse image $K/M \times M$ is presented by kernel $\ker \psi$ in its ordinary algebraic meaning. It is invariant sub-object K/M of object A/M. So as invariant objects $M \subset K \subset A$ then discovered law takes habitual symmetric form $A/K \simeq (A/M)/(K/M)$.

Human sophistication occurs with the help of mind equipping with suitable linguistic forms and tools. Adaptive help humanizes inevitable intellectual breaks to be carried into effect under cognition. Direct problem of education is transcendentality attaining (Vasilyev N.S. et al., 2018). Subject's working place (WP) is to be created to cherish and grow up knowledge about MU though ontological but difficult for identification and apperception.

3.2 Partnership Is Enough for Mutual Deep-learning

Being of the second order L_C supports reasoning in functional form. Its great expressive possibilities

ensure strict meta-mathematical investigation to develop rational objectivity (Popper, 2002). Life in ideas is as natural as one in emotions. It can be controlled on WP as "ideated" thinking. Self-reflecting person will take into account the efficacy of self-building results. Subject's auto (self) - development is secured by DL I_A that maintains and initiates natural processes in his consciousness. Inverse way of education − *generalia praecedunt, specilia sequuntur* gives a person opportunity to embrace the highest semantic levels of knowledge (Vasilyev, Gromyko and Anosov, 2018 - 2019). Subject is able to do it applying AM_S of modelling. It is up-to-date manifestation of without premises knowledge principle. Besides, person is constantly influenced by noosphere. Clever tools require clever users. T_U does not pursue the aim to know about everything but is focused to evolve transcendentality.

Example 4. *Orthogonality concept universality.* Meaning of this notion can be depicted in L_C. A plane S symmetries are morphisms of underlying algebraic system. The maps conserve relations among lines and points. Orthogonal lines $U \perp V$ possess the next property expressed by commutative diagram from Figure 5:
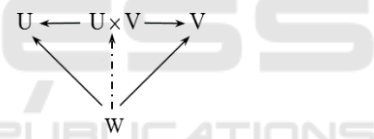

Figure 5: Plane $S \simeq U \times V$.

It describes functor − Descartes product $S \simeq U \times V$ (McLane, 2004). Orthogonal lines extend space dimension and allow introducing Descartes' coordinates. In non-Euclid's geometry they define not one but two interconnected orthogonal coordinates systems (Kagan, 1949).

Different approaches to the same thing study can be adaptively singled out by DL I_A. It is to a person to decide on his WP which of them is more suitable for him. His current intellectual state and attempts to overcome arising intellectual difficulties are to be remembered in his personal CogOnt with the aim of adaptation.

4 PARTNERSHIP TECHNOLOGY

Absence of semantic rational learning is the reason of modern educational crisis. It will be eliminated by the technology of partnership with DL I_A under T_U, see

Figure 6. Only DL I$_A$ can assist man to co-process and compress semantically big data of Internet files. T$_U$ applies AM$_S$ using abstract types of data (ATD) for constructive knowledge presentation. ATD play the role similar to tools in geometry. Diverse algebraic systems are general tools of thinking implanted in program systems in the form of ATD. Auto-poiesis happens with the help of CogOnt, see Figures 1, 6.
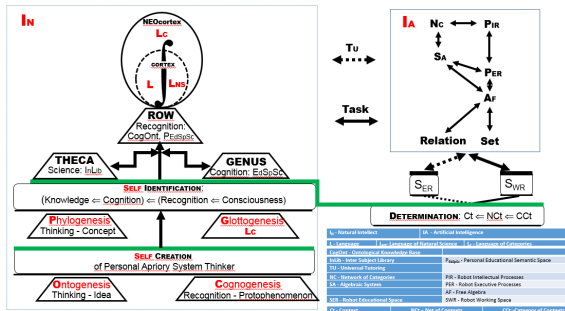

Figure 6: Partnership model.

In distinction to teacher artificial assistant can be universal and tutor man continuously and tirelessly using general mathematical tools, see Examples 1, 2, paying attention to consciousness rationalization.

4.1 Principles of Universal Tutoring

Partnership technology supporting man's universal development leans on principal of knowledge without premises (Husserl, 2009) assuming form of system axiomatic method (AM$_S$). Its efficacy is stipulated by principle *de docta ignorantia*.
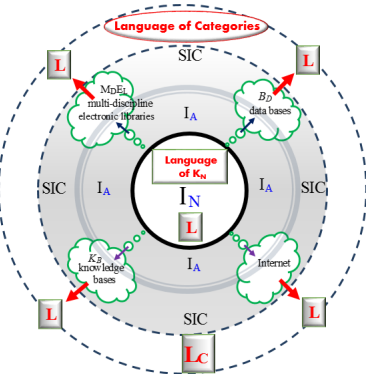

Figure 7: Hermeneutic circle of noosphere.

Semantic glottogenesis directs reasoning on the way of universalities identification, understanding, and specialization. Man's self – development occurs by mind equipping with semantic functional language

L$_C$ (McLane, 2004). Genus has discovered this *mathesis universalis* to use for T$_U$, see Figures 6, 7.

This powerful linguistic tool is to remove discoordination of man's presentations with the third world. The latter consists of real documents that are virtual due to their conceptual complexity. Functionality of DL I$_A$ leans on AM$_S$, L$_C$ and meta – mathematics.

4.2 Neuro Object

It is discovered that thinking as neuro-network physical processes is unchangeable and similar for all people. On the basis natural neuro-object (NO$_N$) embraces meanings applying crossing-over and auto-folding operations between languages − natural and L$_C$. They correspond to knowledge generation and compression with the help of new concepts, see Figure 4. DL I$_A$ realization can be grounded on the concept of artificial neuro-object (AO$_N$). The latter is versatile neuro-network of cognatoms (CogA). Each of them presents a theory expressed in L$_C$ and saved in CogOnt being dynamic open system. All CogA are interconnected by functors admitting their comparison. AO$_N$ structure is represented by a graph $G = (V, E, R)$. Its nodes are cognatoms, edges answer to functors, and R is incidence relation among them. AO$_N$ reflects current intellectual state of subject. AO$_N$ growing up is result of person's consciousness double helix (CDH) crossing over processes that are encouraged by I$_N$ − DL I$_A$ interactions, see Figure 6 (Vasilyev, Gromyko, Anosov, 2019).

Rational consciousness auto (self) – building is controllable process. DL I$_A$ is answer to coming cognitive revolution challenges, see Section 2, Figures 1, 6, 7. From time to time, neural network of AO$_N$ is also compressed in accordance with CDH auto-folding processes happening in person's mind. They are modeled by graph G compression on some subset of its edges (Tutte, 1984). This operation corresponds to personal CogOnt factorization (Vasilyev, Gromyko, Anosov, 2018).

CDH auto-folding accompanies person's intellectual breaks connected with meanings understanding and knowledge generalization, see Figure 8. For instance, additive category discovery can be regarded on as result of CDH auto folding on the basis of correlations among fields, commutative groups, vector spaces, and modules (McLane, 2004; Shafarevich, 2001). So, under T$_U$ one must carry out

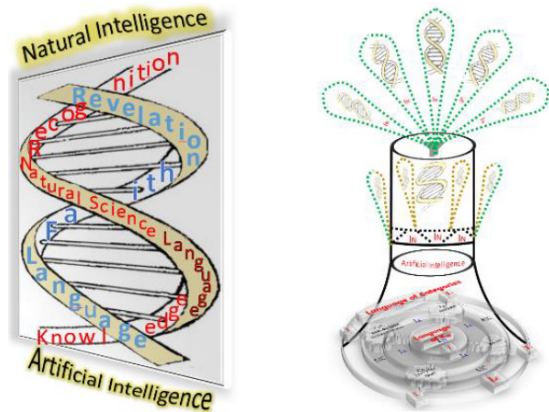comparative analysis of different theories (Goldblatt, 1979).

Figure 8: Hermeneutic circle - cylinder of noosphere.

4.3 Cogno: Ontological Knowledge Base Application

DL I_A tutoring uses functor $CogOnt : SBD \to SK_N$ transforming scientific big data of computer applications into super natural mathematical form. The functor is to be implanted and take adaptive personal form PCogOnt used on WP.

Independent vectors idea was born when lines orthogonality (*Ort*) was studied, see Example 3. Afterwards, rectangle was replaced by parallelogram. Descartes connected number with Euclid's geometry thus connecting notion of area with apparent independent concept of number. In calculus of segments Hilbert applied finite method (Hilbert, 1948). System of independent axioms (expressed in L_N) gave him freedom to build different geometries. Meta-mathematical investigations united geometry, algebra, and logic.

Mathematics allows doing it now applying AM$_S$, L$_C$, and ATD. Let $\{f_1, f_2, ..., f_k\}$ be any set of elements. They can be regarded on as generators of free object D. It means that for any map ψ there exists unique morphism φ, doing commutative diagram from Figure 9. Let $\ker \varphi$ is kernel relation in free object D (McLane, 2004) and $f_i' = \psi(f_i) \in A$.

Definition 1. Elements $f_i', i = 1, 2, ..., k$, are called *independent* in object A if $\ker \varphi$ is trivial.

Example 5. *Independence concept universality.* Number of independent elements is tightly connected with notion of object dimension. Independence manifests itself in various ways. *Linear* independence (*Lin*) is identified in Figure 8 if $D \simeq A$. The objects fall under the category of vector spaces K=*VECT*.

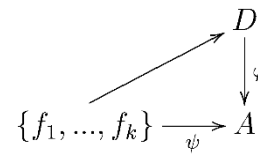Besides, $D = U_1 \times ... \times U_k$ is Descartes' product of spaces $U_i = Lin\{f_i\}, i = 1, ..., k$.

$$
\begin{array}{ccc}
 & & D \\
 & \nearrow & \downarrow \varphi \\
\{f_1, ..., f_k\} & \xrightarrow{\psi} & A
\end{array}
$$

Figure 9: Free object D.

In category K = *RING* free object $D \simeq P[x_1, ..., x_k]$ is ring of polynomials in k variables with natural coefficients. According to Definition 1, system of independent elements $f_i' \in A, i = 1, 2, ..., k$, satisfies to the property $\forall p \neq 0, s\, p[f_{i_1}', ..., f_{i_s}'] \neq 0$. Thus, linear independence is particular case of algebraic one (*Alg*).

Maps $f_i' \in A, i = 1, 2, ..., k$, having the same domains and co-domains are *functionally independent* (*Func*) if Definition 1 is satisfied in algebra with operators Φ' (Shafarevich, 2001):

$$F' \circ \Phi', co - domF' = dom\Phi'.$$

Here $F' = f_1' \times ... \times f_k'$. Expressions from free object D are transformed in functions by morphism $\varphi : F \circ \Phi \to F' \circ \Phi'$. The property is usually investigated locally in respective subcategories $SET \downarrow R$ and applied to classes of smooth real-valued functions in a neighbourhood of a point x_0 Then functional independence is equivalent to linear independence of gradients $\{\nabla f_i'(x_0)\}$. So, maps system $\{f_i'\}$ is functionally independent if

$$F \circ \Phi : domF \to 1 \Rightarrow \Phi : co - domF \to 1.$$

In category of casual values (c. v.) *CAS* free algebra D consists of all admissible formula in algebra $\{\cup, \times; f_i, i = 1, ..., k\}$ with signature corresponding to union and multiplication operations $\cup, \times$ in algebra A, see Figure 9. Probability distributions $p_i, i = 1, 2, ..., k$, correspond to c. v. $f_i' = \varphi(f_i) \in A$. Joint probability distributions $p_F = p_F(x_{i_1}, ..., x_{i_s})$ and $p_G = p_{i_1} \times ... \times p_{i_s}$ answer to ψ − c.v. images $F = f_{i_1} \cup ... \cup f_{i_s}, G = f_{i_1} \times ... \times f_{i_s}$. The latter is product of partial ones. Only mutually independent c.v. possesses property $p_F = p_G$. Relation $\ker \varphi$ is trivial only for dependent c.v.

system. Then Definition 1 singles out dependent system instead of independent one!

Independence of elements in relational algebra (K = *REL*) means that relation $r'(f_1',...,f_k')$ is trivial if and only if relation r' coincides with unit τ'. Free object $D = \{r(f_1,...,f_k)\}$ consists of language $\langle \mathfrak{P}(A \times A) \,|\, \cup, \cap, \subseteq, \bar{\ }, \varnothing, \hat{\ }, \circ, {}^{-1}, \tau \rangle$ terms. In axiomatic theories dependence means that one of axioms f_i' can be derived from others.

It is obtained next chain of inheritances

$$Ort \Leftarrow Lin \Leftarrow Alg \Leftarrow Func \Leftarrow Cas \Leftarrow Rel .$$

It worth mentioning that Definition 1 leans on other universalities: product, kernel, and $1-$ unit. Besides, independent elements allow introducing object *A coordinatization*, see Example 3.

5 CONCLUSIONS

System world leading to man possessing second consciousness is demand on I_N transcendental phenomenology. For noosphere person it is natural to live in ideas. Info sphere of SIC and I_N partnership with DL I_A are to transform thinking on the basis of ideas images and semantic processes support. Only then obviousness of natural sciences knowledge will be returned to self-obviousness of truth. For the objective, personal working place for universal self-development is to be equipped by CogOnt for adaptive cognitive partnership with DL I_A and successful interdisciplinary activity in virtual worlds. It is person's irrational destine to achieve auto-poiesis as outcome of Lamarck's man-made free evolution for self-expression in noosphere.

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