Semiosis and reflectivity in life and consciousness

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Semiotic relations in living systems

Biological systems are characterized by the presence of a semiotic structure in the absence of a subject, i.e., of the language's owner separated from the language itself. Significative structures are expressed inside the generalized model of a biological system, the hypercyclic structure, in which the devices (catalysts) realize the production of the matrices for their own reproduction (Eigen and Schuster 1979). In such a structure, the symbolic relations are reproduced continually (Igamberdiev 1997). Biological systems therefore possess an essential self-referential semiotic property which determines its autonomy from the environment (Maturana 1970; Varela 1979).

How can semiotic features of a system be deduced from its dynamic properties and what physical precondition underlies the emergence of biological symbolic structures? This question corresponds to the problem of the relation of life to inorganic matter. The non-linearity itself cannot contain the basic pattern from which the semiotic structure logically evolves. It is preconditioned by the quantum non-demolition measurements providing the 'dualization' of the reality into the measuring one and the one being measured (Igamberdiev 1992). In living systems, we face the necessity of the general criterion for quantum reduction (Penrose 1989: 367–373) which is absent in the contemporary quantum mechanical paradigm.

The choice of a definite set of quantum reduction parameters should be determined by its consistency and optimality in the whole system. It may be based on some selectionist principles (Stapp 1993). Semiotization arises as a mapping in the course of the reduction (actualization) during quantum measurement. A measuring device (e.g., the biological catalyst — enzyme), catalyzing a certain reaction and therefore selecting a certain property of the reality, signifies this property. In such a way, the structure of imprint for biology arises: the sign appears as a relation by which a certain property of reality is fixed (imprinted).

The problem of the arising of semiotics from its physical basis was analyzed in the dynamical theory of information processing developed by Barham (1990, 1996), who realized that every act of knowing involves a low-energy interaction between a component of a non-linear system and an environmental input signal that causes the component to undergo a state transition. Barham regards living cells as 'epistemic engines', in which a low energy or regulation (epistemic) stroke and a high energy or work (pragmatic) stroke constitute the work cycle. Both phases of the cycle are connected in such a way that the low-energy (informational) constraints act as signs with respect to high energy (pragmatic) constraints, leading to semiotic correlations that have predictive value.

Such a model corresponds to our model of quantum non-demolition measurements (Igamberdiev 1993). Biological oscillators possess the ability to measure certain low-energy environmental signals which are transformed into actual work. It is essential that correlation between such a signal and the response is a semiotic (epistemic) correlation. In accordance with this, every biofunction contains a subsystem ('epistemon'), a sort of sense organ which acts as a trigger for the functional action of the whole system. The active site of an enzyme is considered as such an epistemon (Barham 1990).

The recognition of a certain compound by the receptor site is based on the spatial and structural correspondence which can be described by the well-known model of 'key and lock'. This correspondence is realized as being inducible, i.e., the recognizing system induces correspondence of its structure to the structure of an external object and therefore constructs its image (or imprint, or gestalt). Therefore an external object is imprinted via the fixation of the characteristic features of its structure. The reaction of a system caused by an external object cannot simply be deduced from its structure, and these two components are joined by a relation possessing semiotic character.

The consistent reproduction of this relation is possible via operation of the second semiotic subsystem — the encoding (digital) system. Biological systems therefore include two semiotic subsystems, one based on the structure of imprint and on the recognition of three-dimensional shapes (images), and the other based on the digital linear structure of code. The appearance of consciousness is connected with the formation of a digital system of human language. Two hemispheres of the human brain realize different functions (logical and imaginal thinking), and the semiotic system of human culture as well is subdivided into two subsystems: scientific and humanitarian knowledge. This 'dialogic' structure provides the possibility of self-growing a semiotic system (Lotman 1990: 143–150).

Peirce (1955: 274 ff.) probably was the first who realized that the path from the sign to the object it signifies is different as compared to the way

from the signified object to the sign, and therefore the significative system is based on an essential dissymmetry. The signification in a biological system can be considered as an imprint of casual choice, but it is preconditioned by the pre-existing structure which puts limitations on the possible ways of further development. Nevertheless, the newly generated symbolic system cannot be considered as corresponding to the pre-existing inert reality, as in the course of its development (characterized by the indefiniteness of boundary conditions) it forms some new reality to which it relates.

A number of symbolic systems, relating each to another as external, can enter into 'the language game' and reveal the truth or falseness via the falsification process which cannot be predicted beforehand. This indeterministic or probabilistic aspect of evolution arises in its physical background from the non-absolute character of quantum non-demolition measurements (for their absolute predictability, the infinitely long intervals of measurement according to Heisenberg's uncertainty ratio 'energy-time' are necessary) (Igamberdiev 1993).

The formal symbolic structure, which is intrinsic to biological systems, possesses, according to Gödel (1986), the essential property of any sufficiently powerful consistent formal system, the property of incompleteness. This means that certain relations in it ('statements') could be allotted by the sense, i.e., by the validity (truth or falseness), only during the process of evolution of a given system which could not be predicted beforehand. Initially these statements are not demonstrable or refutable in the given system, but in principle they could be allotted by the values. This is a logical precondition of evolution of biological systems which provides the essential indeterminism of an evolutionary process (Heisenberg's uncertainty ratio is its physical precondition).

Thus, in biological systems, complex symbolic relations arise as unfoldings of the imprint structures. The structures of animal societies are also based on imprints and this provides the impossibility of the social evolution of these societies.

The 'expansion' of biological systems via the inclusion of new objects of the external world in 'the sphere or competence' (the Umwelt) of biosystems takes place during biological evolution. But this Umwelt cannot even potentially include the whole Universe, because there is no semiotic structure symbolizing the actual infinity (i.e., class of all classes, the wholeness). Social evolution takes place only when such a structure appears.

The reflective structure of the psyche (the Oedipus complex)

The transformation and complication of a symbolic structure during evolution ultimately leads to the appearance of the possibilities of its own

description. This property cannot be deduced from the formal structure of biological semiotic relations. It arises as a creative action, being a non-determinable transfinite leap. The biosemiotic reality in the apparent higher organization represents a lower level of a new, more complicated structure. It corresponds to the Freudian *unconscious*.

The biosemiotic level possesses a certain structure preserved when a new level appears, and therefore, the unconscious consists of biological imprints in agreement with Lacan's statement 'the unconscious is structured like a language' (Lacan 1981: 20). The structure of the unconscious itself becomes more complicated via the influence of the other levels of the psyche on it. Imprints are united into structures which correspond to the collective reflections of a socium leading to the appearance of archetypes of the unconscious (Jung 1968). Thus, the initial level of the unconscious is the level of biological imprints. The second level of the unconscious, archetypes, is of a social origin. Ethological 'imprinting' means simple identification of the first perceived object as the image of mother. But the realization of the external world appears when the image of the other, who is also identified with mother and in whom the earlier identification is reflected, i.e., the symbol of father, is included in the structure. The Oedipus complex arises as a result of this identification.

The inclusion of the external world comes into the semiotic structure with the symbol of father. While in the structure of the Oedipus complex, the symbol of Father prevents the total possession of Mother. This is equivalent to the selection of meanings from the unconscious via the suppression and structuralization of lust, i.e., via archetypes of the imprints, of which the unconscious consists. In the formal structure of the unconscious, the indefinite statements are allotted by meanings; therefore, the formation of archetypes can be considered as a reduction of the incompleteness of the formal system of the unconscious via the action of the external reality. In biological evolution, this reduction is casual or indeterministic, but in the social realm this process is inherent to the structure of subject.

The allotment of the indefinite (not proved) formal statements by the values is an action of a symbolic nature. This *symbolic* (Lacan 1977: 67) or *Superego* (Freud 1966: 573) is associated with such an external reality, which is always present as a sign (determinant) being absent at a given moment as a material object. It selects meanings from the unconscious, which is 'the discourse of the Other' (Lacan 1981: 131).

Thus, in the structure of subject, the symbolic is equivalent to the name of Father in the Oedipus complex and is represented as an external. In other words, the structure of subject includes a symbol which designates some external reality. Initially it is identified with the Father who selects

meanings from the unconscious and who allots Ego by a certain name. The External as it is, being the Symbolic in the advanced cultures, can be identified with the Father for All (God as a Word, Logos or Symbol of the Universe). Otherwise, the inclusion of the actual infinity in its symbolic form in a semiotic structure is a premise for the appearance of the idea of God.

The existence of the unconscious (or *Real*, according to Lacan, i.e., of the substrate on which the psychological semiotic structure is unfolded) and of the *Symbolic* implies the urgency of the third component of the structure of subject, which is named by Lacan as the *Imaginary*. The external world in the structure of subject is therefore divided into the symbolic reality and the non-structured, or 'material', reality. The latter is identified in the Oedipus complex with Mother. It is an object (*identifié*) of the imprints of the unconscious (of lust).

Initially (as in the ethological imprinting), the Ego associates itself with Mother, and ethological biosemiotic structure can be considered as such a structure which does not include the 'Superego', therefore, biological 'subject' is essentially non-separable from the external world. Strictly speaking, the Ego (Subject) is still not present in the biosemiotic system. The Ego (Subject) appears as a projection of the Superego into the unconscious, which forms a gap between lust and the object of external world. Therefore we can find in absolute categories of religious systems not only the image of God-Father, but also the absolute female idea, *das Ewig-Weibliche* (Goethe), which is personified in different religions in different ways.

The structure of subject being initially the structure of the Oedipus complex means the potential inclusion of the entire external world in the semiotic system. This structure is trinitary and it fixes the contradiction appearing in the projection of the infinity into a finite set. Such a projection can be realized only as a contradiction established on a finite set (Gunji 1994). The contradictory structure of the Oedipus complex is a result of the presence of infinity within it as a sign. The Umwelt (i.e., the internalized external space) acquires the ability of infinite expansion, and that means the origin of consciousness, as this structure really permits the inclusion of other subjects into the semiotic relations and permits one to see himself in the other's place.

What does it mean 'to see himself in the other's place' and 'to realize the other as a subject'? The answer is contained in the structure of the Oedipus complex. The Symbolic determines the relation to the object of lust, i.e., the external is included in the structure of subject as a symbol, which determines the structure of a system, being actually absent in it. This corresponds in the Oedipus complex to 'the name of father' resulting in the appearance of the symbol of Father. A certain object in the system replaces father being allotted by his name, and becomes the object of

worship. The relation to this mythological 'event' determines the structure of different religious and cultural systems. In Christianity, the initial event of the Oedipus complex (the Father's murder) is reconciled in the victim of the Son, and such a structure provides the infinite development of the Christian cultural system.

Thus, the Oedipus complex contains 'the replaced object'. Father is absent (killed) and at the same time is present (as a symbol). Existence and the non-existence are present simultaneously in one sign. The essential reflections of the human person, particularly the feeling (reflection) of his own finity (death), are based on this structure; nevertheless, this structure also contains the possibility of reconciling this contradiction. The idea of resurrection could be interpreted via the clearing up and understanding of such a structure.

Absence (non-existence) and presence (existence) coinciding in the same symbol provide the combination of different levels in one object. The structure of the sign therefore contains non-existence, which divides the *signifié* and the *signifiant*. This gap corresponds to the appearance of the past and the future in a semiotic system. One part of a system is semiotized as a symbol of the past (this corresponds in cultural systems to the appearance of burial places), and the other part as a symbol of the future (the ideas of possible worlds, of Doomsday, etc.).

The structure of subject appears, according to Lacan, when an infant begins to identify itself with its reflection in a mirror. The ability originates from this moment to put itself in the place of the other. The idea of the Other is necessary for such mental substitution, which is realized via the formation of the semiotic structure of the Oedipus complex.

The Oedipus complex, being interpreted as a reflection of a subject, is a non-trivial semiotic structure which determines the internalization of the external world and, finally, of the actual infinity (via their semiotization). It can be considered as a logical structure describing interrelations between the consciousness and the external world which determines the fixation of somebody's image into the other, i.e., the possibility of substituting the other. The incompleteness of the biosemiotic system (i.e., of the unconscious) is a precondition of the appearance of the Oedipus complex; therefore, the latter acts as a metalanguage in relation to the biosemiotic structure in which the translation of the biosemiotic level into metalanguage is realized.

The logic of a transition to a new level (the logic of the psychosemiotical)

The psychosemiotical reality is realized via the structure of reflection of the Ego-in-the-Other which arises in the universal triad of the Oedipus

complex. The relation of the object to its symbol (to the initial imprint) in the social structure is represented as a semiotic object of a higher structural level, as a symbol interpreted in some other symbol. This is realized in the frames of the structure of the Subject. The Ego enters into the Other (or the Other enters in the Ego) not substantially but as a Symbol, resulting in the appearance of the semiotic relation. Therefore the Ego is present in the Other as a Symbol, being absent as a material object, and the structure of the Subject non-trivially combines existence and non-existence. Such a structure (represented in the Oedipus Complex as an imprint of itself in the absent Father) makes possible the non-limited expansion of the psychosemiotic Umwelt towards infinity and the inclusion of the world as a whole entity in it.

Any external object can be included in the structure of Subject as a Symbol being transformed via some other object. A biosemiotic structure cannot allow the possibility of such an expansion. The conversion of the possible sign (i.e., of the imprint which is reproduced via hypercycle) into the obligatory sign (the encoded Symbol) is realized via its interpretation in the other object. The imprint represents a semiotic object at a higher semiotic level. External objects are the materials for the fixation of reflective arrows of the psychosemiotic structures. Therefore, the human language originates simultaneously with socially organized activity. An external object becomes the tool of labor only when it is named, i.e., when it is reflected in the other object (word). The social (collective) memory arises with this activity, determining the development of social evolution. A social group possesses a memory as a 'sign-creating activity' (Hegel 1971: 213), which leads to 'the practical assimilation' of the Umwelt expanding via social activity.

Language, besides the words designating the external objects included in the psychosemiotic structure and operations which could be conducted by them, should unavoidably include the designation of an ability to signify the external objects. This ability makes it possible to include objects in the expanding Umwelt. Thus the designation of the object which determines such a possibility of semiotization of the whole world appears. This 'object' does not exist at the same level as the objects of the external world, and thus it is absent and simultaneously present in all, contradictorily combining existence and non-existence and determining the existence of all objects included in the semiotic Umwelt as being non-present in the set of these objects. This object is represented in the Oedipus complex as 'slain father', and in religions (possessing a structure of the Oedipus complex) it corresponds to the higher reality (God). Definition of this reality in a whole structure results in the mode of organization of social groups and cultural systems. Sacrificing the Son in Christianity

removes the fault of murdering the Father and opens the possibility of infinite development of the cultural system which is built on the basis of this structure. Cultural systems are constructed according to the modes of solution of the initial contradiction of the Oedipus complex, and their diversity corresponds to the diversity of neuroses. A neurosis itself can be interpreted as a private form of religion (Fromm 1950: 27).

In relation to the objects of the psychosemiotic system, the object which determines their designation (symbolization) represents actual infinity in relation to the finite object. The subject via internalization of external objects and their inclusion as symbols in its own structure establishes itself in relation to external reality by the generation of a non-enumerable set. Absolute reality is a basis for the expansion of any model. Reflection in a set of values which is not defined beforehand is possible via actual infinity.

How does a subject place itself in relation to external reality? The initial moment of the establishment of the connection between the subject and external reality is the formation of a statement, which structure includes the designations of elements of the external reality by the subject. The generation of such a statement is a creative act and it cannot be deduced deterministically from the structure of subject or from the external reality. The formation of a statement whose structure contains actual infinity reveals (or generates) contradiction, which subdivides the system into different levels connected by the semiotic relation.

This can be cleared up via the analysis of the contradictory statement (semantic paradox) of Epimenides, 'All Cretans are liars', and of its possible consequences for Epimenides and for the Cretan society.

By the arrangement of the construction 'All Cretans are liars', which characterizes the whole system (all Cretans), Epimenides allots to the system the significative property ('liars'). As a result, Epimenides finds himself in a distinguished state: he is in a position other than simply one of the Cretans, and thus reveals an essential logical contradiction. Epimenides is an object that characterizes the whole system (via the manifestation of its essential property) by simultaneously belonging to and non-belonging to it. The system subdivides into levels (Epimenides and the Cretans are separated by non-existence: Epimenides is a signifier, and the Cretans are signifiants). The logical contradiction appears when we realize one-level formalization of this system.

The following consequences can be deduced from this consideration. Epimenides can be regarded as similar to the Father in the Oedipus complex. He is an element of the set which signifies this set. The set (the society of Cretans) acquires its own dynamics via obtaining the property 'liars'. Different possibilities of the dynamic behavior of a system arise

from this. The society can reject this property, which will be followed by the murder or expulsion of Epimenides. Then it is realized as a reflection of admission of wrongdoing and guilt, and Epimenides (or his name, Symbol) becomes a subject of worship (maybe posthumously). Another possibility appears when society realizes the truth of Epimenides' words instantly. In this case, Epimenides is also separated (transferred) to the other level, being proclaimed as a prophet or king. The change (reformation) of a society is a consequence of such a reflection: the Cretans admit themselves as liars and want to change for the better. Therefore, the statement of Epimenides is a real reason for movement in which physical space and time are only its preconditions. Thus, movement is possessed by a semiotic character.

The contradictory construction of Epimenides being internalized in the Cretan society leads to its evolution. This consideration is only a model example which does not correspond to the concrete historical reality, but it clearly shows the operation of semiotic principles in the social structure of society. The construction of Epimenides is inwardly contradictory if Epimenides is considered as an element of the set of Cretans, but such contradictory statements can organize and change the whole system. The Sermon on the Mount is also contradictory, and this determines its high internal energy received from He who pronounced it.

The temporal and spatial structure of a system is a result of creative work (i.e., of a novel semiotic construction such as 'All Cretans are liars'). The semiotic origin of the temporal and spatial structures will be analyzed via consideration of the well-known Zeno paradox, 'Arrow'. This paradox claims that an arrow stands in each point of space, but this means that it cannot move.

The construction 'All Cretans are liars' arises from the possibility of the relation of Epimenides not only to the set of Cretans but also to the set of all people. From this the possibility arises that Epimenides is not a liar ('Cretan' is only a name, which it is possible to abolish). The unpredictable transition to a new level is possible, therefore, by means of the creation of a new semiotic formula 'All Cretans are liars'. Epimenides associates himself not with 'Cretan', but with 'Human Being' in the general sense (we can also remember Christ).

The Zeno paradox at first sight has nothing in common with the paradox of Epimenides. The paradox in the aporia 'Arrow' is really that at the same moment the arrow moves and stands. The essential reason for this is the irreality of the physical initial cause of movement, as the reason of movement is not in the arrow itself but in he who flings it (i.e., in the shot). The formal spatial and temporal structure is a result of the shot's action, as the arrow does not move itself. If we introduce a shot into the

structure of the Zeno paradox, we can realize its conversion into the Epimenides paradox. Really, the shot realizes movement by the introduction of a formal construction which is contradictory when analyzed in a single-level manner (space-time), but each point of the space-time interval (the track of the arrow) is signified by the action of the shot. Therefore, at a concrete moment of time, the arrow is present at a certain point in space and at the same time it is absent there, leaving the semantic field signified by the shot, and via time this contradiction is introduced into real world. Contradictory statements — 'the Arrow is at point A' and 'the Arrow is at point B' — are separated by the time interval consisting of an imaginary point. Similar to this, the Cretans, under the action of Epimenides' construction, become no longer liars.

Epimenides constructs the contradictory statement and therefore realizes a movement via its temporal implementation. The shot relates to the arrow in such a way as Epimenides to the Cretans: this relation is a semiotic relation of the signifier and the signified object connected nonlocally, but when we separate them, we introduce the temporal interval between them. When we introduce time, which separates contradictory statements, we sink into the physical world and face infinite regression, avoiding simultaneous existence of opposite definitions.

The subdivision into different levels clears up the semiotic nature of both paradoxes. It is evident from this that the physical picture of the Universe cannot be complete: biology and especially psychology are more complete than physics, and they determine physical parameters semiotically. This is the essence of the anthropic principle. Physical parameters should be determined in a way providing the possibility of a direct isomorphism between certain physically embodied information spaces and certain phenomenal (or experiential) informational spaces which is characteristic for consciousness (Chalmers 1996).

Reflection and polysemantic structure of consciousness

The subject realizes himself via reflection. Reflection possesses a certain structure defined as a *Strange Loop* structure (Hofstadter 1979: 684–720) which allows the construction of a formal model of reflective action. The model of reflection suggested by Lefebvre (1990) is based on the fact that the subject's estimation of himself and feeling of this estimation as negative or positive take place without the effort of consciousness, i.e., automatically, and the trinitary semiotic structure of the psyche can be reduced to the recursive Boolean scheme. The structure of reflection was modeled using Boolean algebra, and this resulted in the understanding of

concrete formal laws of reflection determining human behavior. Lefebvre established Boolean algebra in the set of reflective mental structures, and this allowed him to find successful models of their operation. In the model of Lefebvre, all reflective aspects of semantic paradoxes (as 'the Liar') are cleared up, and the formal structure of the 'development' of paradoxes is constructed.

Reflection consists of the following components: a_0, the intention of the subject A, which he does not feel (it corresponds to the unconscious); a_1, the intention of the subject's own image, which transfers the initial intention into the action — behavior (it may correspond to the Ego); and a_2, the subject's representation, i.e., how he represents (estimates) his own intention (corresponding to the Superego). Every component of reflection can be characterized by the one of two values (0 or 1), and the combination of these two values represents a concrete structure of subject. The structures consisting of two subjects, A and B, characterize the situation in which the reflection is realized via the second subject (B). The construction of formal models of reflection leads to the conclusion about the existence of the two principally different ethical systems (the 'western' and the 'eastern'), in one of which the combination of events characterized by different estimations is estimated as a negative, whereas their separation is estimated as a positive, and in the other the combination of 'the bad' and 'the good' is estimated positively, whereas their separation is estimated negatively.

The formal consideration of reflection results in the appearance of mathematical constants characterizing human behavior, e.g., the constants of binaric choice, when the tested person selects from approximately the same objects about 62 percent of the time as satisfying the positive criterion of choice. The model of reflection also explains the pattern of musical intervals in the European culture, as well as the golden section in architecture or painting.

In the formal model of reflection, the subject's structure is modeled by the triads of binaric oppositions (intentions of the subject), and the total quantity of formed structures is divided into four (it is eight in the simple structure including one subject A). In a certain sense, these combinations are similar to the structure of the genetic code.

The structure of the reflective choice provides the fundamental property of human consciousness — its operation as a filter during its action with the meanings of words. In contrast to the monosemantical formal languages, any word of common language is characterized by the probabilistic pattern of meanings, which is reduced during the use of the word. The possible pattern of meanings can be expressed by the distributive function described by its characteristic curve (Nalimov 1981: 53–56). During the

use of words depending on the context and on the inclusion of a subject into a concrete situation, the selection of meanings takes place. This selection is realized from the wide field of meanings in which certain meanings are more probable, whereas others are less probable. This selection (choice) is non-programmable, and it cannot be simply formalized. This choice can be presented as a result of a non-formalizable dialogue, during which the intertranslation between the two semiotic systems referred to the different hemispheres of the brain is realized.

The probabilistic model of language suggested by Nalimov (1981) explains this spontaneous nature of the reduction of the field of meanings. Its pattern cannot be totally determined beforehand, and the creative activity of consciousness, i.e., of the spontaneous process overbuilt over the mechanisms of reflection and transformation of verbal information, provides the allotment of words by the new meanings non-determinable beforehand.

The process of selection of meanings was investigated by Matsuno (1992). He proposed that the human brain works as a non-programmable computer, realizing the selection of meanings non-predictable beforehand. A word potentially contains a larger quantity of information than an element of formal system in which polysemantic possibilities are strictly limited. According to Matsuno, the natural language processor in the brain generates information when it gives meanings to words while reading a text in which information generation refers to making sematic commitments. Revising the previous semantic commitments is an intrinsic functional property of the language processor in the brain. The capacity of making semantic choices cannot be strictly formalized, and attempts to make such a formalization lead to the generation of semantic paradoxes.

Generative properties of the semiotic system of consciousness

Consideration of paradoxes leads to the conclusion that the formalized one-level representation of the subject structure is internally contradictory, and it cannot adequately express this structure. How is it possible to settle the logical contradictions that arise when the structure of subject is expressed symbolically, and to work out semiotic constructions, describing such a structure in an adequate way? In the previous consideration, an example of such a structure was represented as the structure of the Oedipus complex, i.e., as the structure of myth.

What is most essential in the structure of myth? According to Lévi-Strauss (1967), the essence of myth is a story, the aim of which is to give a logical model of settling of a certain contradiction. This determines an

infinite number of strata, appearing in the process of myth repetition which reveals its structure.

In contrast to its structure, the growth of myth is contingent until the original impulse generating myth is exhausted. But if the reason for such an impulse arises to actual infinity, the history (corresponding to the unfolding of myth) can also be infinite. Thus, the actually infinite foundation of Christian religion determines the potentially inexhaustible development of Christian culture and civilization.

Myth is a language of the highest level, in which the sense is separated from its language basis; therefore, myth cannot be simply formalized, because it corresponds to a great number of finite formal structures put into correlation to the potentially infinite essence of myth.

The contradiction on which myth is based can be solved in different ways, and these solutions can be distinct in different cultures determining their specific features, whereas the basic initial structure of myth is the only one, arising from the Oedipus complex. Thus a number of strata in which myth's structure is revealed (i.e., of formal systems constructed on its basis) makes possible the appearance of different cultural systems. Myth in its structure contains the history which is realized as unfolding of formal structures on the basis of the structure of myth.

How do the formal structures, appearing during the unfolding of myth, interact? We emphasize that such an interaction is realized in a Popperian way, i.e., via falsification. In the process of the development of human civilization, the 'barbaric' falsification which affects lower (biosemiotical and physical) levels constituting the basis of a given psychosemiotic formal structure, i.e., the falsification which manifests itself in the form of wars, turns into the cognitive sphere and reveals itself as a competition of ideas, of theories, of *modi vivendi*. It acquires properties of the Wittgensteinian language game which possesses common basic principles with Popperian falsification (Sokuler 1988). Both the language game and falsification are based not on substantial foundations, but on social conventions, and their rules are just social establishments determined within cultural systems. During such a game, 'the familiar similarities' are formed and falsify each other, which results in evolution and association of cultural systems. This movement can be characterized as a 'logos which increases itself' of Heraclitean psyche (Heraclitus 1987: 67) arising to the actual infinity of myth's foundation, i.e., of the initial structure of the Oedipus complex. 'One would never discover the limits of psyche, should one traverse every road — so deep a logos does it possess' (Heraclitus 1987: 33).

The absence of finite foundations of game and falsification is the main precondition of the irreversibility of the unfolding of formal structures generated by myth, i.e., of its history. This process does not move towards

any correspondence to some pre-existing reality. It moves towards something which is not determined beforehand being unfolded during the process of falsification, and this makes it indeterministic and creative. Any formal structure is historically transient, being only one realization among the great number of possible interpretations of the initial myth. It is not characterized by the properties of truth or falseness, and validity resulting from the temporality of significations is its main property. Otherwise, historical process with its irreversible movement is based on the incompleteness of formal systems arising from the initial structure of myth, and on the continual overcoming of this incompleteness. It is impossible to say beforehand what values will be gained by previously non-signified (indefinite or potential, as Kantian *Ding an sich*) elements.

Thus, irreversibility arises initially from the semiotic structure, and not only from the physical foundation. Such an interpretation of irreversibility was suggested by St. Augustine, who was the first to turn attention to the symbolic character of time (the past and the future exist in the soul as signs). Finite velocity of observation propagation is just that engine which allows introduction of contradiction into the real world (Gunji 1994). Contradictory statements may exist in reality being separated by the time interval. The formal structure exists outside time, but the unfoldings and changes of formal structures are in principle (at least in trivial sense) non-formalizable processes corresponding to the irreversibility of time. The imprint ('echo') of this irreversibility can be seen in such a fact that language as a spatial structure is reversible in time, whereas speech, being generated on the basis of a language, is actually time-irreversible. The Saussurean 'linear character of the *signifiant*' is just that semiotic basis which determines unidirectionality and one-dimensionality of time.

The temporality (and, therefore, historicity) of signification corresponds to certain structures expressing general features of myth and displaced in the unconscious. These structures, being the structuralized interpretations of mythological systems, form the higher social level of the unconscious (the level of archetypes). This level exists as a result of history, therefore it is collective, and therefore different societies construct themselves in correspondence with the different solutions of the initial contradiction of myth (i.e., of the Oedipus complex). The strata ('solutions') of the Oedipus complex correspond to the different types of societies.

When the Symbolic is raised up to its initial point, i.e., to actual infinity being the only reason for it and therefore for the subject's structure, all human history acquires the absolute sense, *sub specie aeternitatis*. The experience of that sense corresponds to the timeless experience of the absolute being. Every historical temporal event, even insignificant, is allotted by the absolute significance, and the semiotic structures arising

to their essential point, reveal themselves as the expressions of the actual infinity of the foundation of the Universe, of the initial Word which was in the beginning, and was with God, and was God (John 1:1).

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