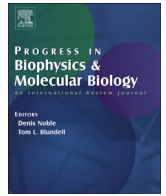




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Evolutionary transition from biological to social systems via generation of reflexive models of externality

Abir U. Igamberdiev

Department of Biology, Memorial University of Newfoundland, St. John's, NL A1B 3X9, Canada

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ABSTRACT

Evolutionary transition from biological to social systems corresponds to the emergence of the structure of subject that incorporates the internal image of external world. This structure, established on the basis of referral of the subject (self) to its symbolic image, acquires a potential to rationally describe the external world through the semiotic structure of human language. It has been modelled in reflexive psychology using the algebra of simple relations (Lefebvre, V.A., J. Soc. Biol. Struct. 10, 129–175, 1987). The model introduces a substantial opposition of the two basic complementary types of reflexion defined as Western (W) and Eastern (E). These types generate opposite models of behavior and opposite organizations of societies. Development of human societies involves the interactions of W and E types not only between the societies but also within one society underlying its homeostasis and dynamics. Invention of new ideas and implementation of new technologies shift the probability pattern of reflexive choices, appearing as internal assessments of the individual agents within a society, and direct changes in the preference of reflexive types. The dynamics of societies and of interactions between societies is based on the interference of opposite reflexive structures and on the establishment of different patterns during such interference. At different times of the history of human civilization these changing patterns resulted in the formation and splitting of large empires, the development and spreading of new technologies, the consecutive periods of wellness and decline.

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1. Introduction. Internal signification of externality

Evolutionary transition from biological to social systems, which

corresponds to the origin of human civilization, is mediated by the appearance of reflexive image of the external world that arises through communication of the agents constituting social systems. In human reflexion, the image of objective world is introduced via a specific type of reflexive loop. This structure represents a logical pattern that describes the interrelation between the self and the

E-mail address: igamberdiev@mun.ca.

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external world and can be modelled on the basis of referral of the self to its symbolic image which is recognized as an external agent that defines basic modes of the subject's behavior. Self-reference is the main property of life, constituting the basic foundation of the logic of biological structures (Rosen, 1985, 1991; Kauffman, 1987, 2015), and the transition to social systems is consistent with the origin of a new level of self-reference which involves an active anticipatory transformation of externality.

In the biosemiotic concept of Jakob von Uexküll (1926) the internally signified part of external world, defined as the *Umwelt*, is perceived by the agents inhabiting it. The *Umwelt* represents a flexible environment positioned between the self (*Innenwelt*) and the outer non-recognizable world (*Außenwelt*). Biological evolution leads to the expansion of the *Umwelt* via potentially infinite recursive embedding process, in which life evolves through the measurement of environment, and living organisms become embedded into this expanding environment, which affects their further evolution (Igamberdiev, 2014). When biological systems acquire consciousness and become social beings, virtually the world as a whole can be signified and recognized. This perpetual activity corresponds to the growth of knowledge in which externality becomes embedded into the cognitive system and its elements acquire properties of the utilitarian tools possessing pragmatic value. The agents inhabiting the external world perceive it via the internalization of externality when the external objects become recognized in terms of their affordance (Gibson, 1977). Affordances require a relationship in which the environment and the agent inhabiting it can work together.

Fundamental aspects of the actions like playing and experimenting or exploring the environment to become skilled appear in animal behavior, which naturally leads to the ability to acquire more specific knowledge of using objects as external tools and to the development of social organization. At the level of nervous system, the idea of externality is reflected in the structures that can generate similar activity both in the case of the subject's action and in the case of the subject's substitution by the other, i.e., in the observation of the same action as external (e.g., performed by another subject). Mirror neurons are such structures that can fire through the observation of behavior of the other, as though the observer were itself acting. They form a system that generates the "language-ready brain" (Arbib, 2017). In fact, a consistent use of labor tools is possible when they are defined in the language as signs. Externality, being internalized in the structure of human language, becomes the starting point of endless social evolution. Fundamental reflexive operations, being memorized and repeated in the language, establish the basis for creating and maintaining the elaborate structures of human social institutions (Searle, 2010).

2. Objective patterns of reflexive consciousness

The process of reflexion, taken not only within the logical framework of consciousness (*res cogitans*) but also in relation to the observable spatiotemporal physical world (*res extensa*), establishes the structure in which the physical event and its sensor representation appear as dual constituents of the wide-ranging physical reality held as a whole unity by *cogito*. This fundamental structure acquires its particular shape in the human reflexion, being generated in the process of establishment of the "language-ready brain" (Arbib, 2017). Basic patterns generated in conscious events are associated with the certain types of reflexive loops. The fundamental reflexive structure for human social behavior was metaphorically described by Freud (1917) as the Oedipus complex. This structure represents a logical pattern establishing interrelations between consciousness and the external world and thus determining a fixation of somebody's image into the other, which

appears as a possibility to substitute the other (Igamberdiev, 1999). The structuralist interpretation given by Jacques Lacan (1970) discovers in the basic subject structure a flow of the signifier and the signified, united by a "common denominator", via which "the meaningful stops the shift in meaning" and thereby specifies the object of desire. This "denominator" is, in fact, a generalized Cartesian *cogito*, holding the structure of the subject in its totality. Évariste Galois employed the notion of structure for designation of transformations within a totality (see Kristeva, 2000). Incorporation of the image of total world (corresponding to the notion of the absolute) into the dynamical process of acquiring knowledge can be viewed as a starting point of social evolution (Igamberdiev, 1999).

In the structure of subject, the image of totality is semiotically encoded and undergoes a dynamical transformation and modification to overcome its incomplete identification. The dynamical structure of subject can be represented topologically as suggested by Lacan (see Blum and Secor, 2011), although these representations remain useful metaphors rather than strictly formalized scientific models. Lacan used such figures as torus, cross-cap, and Möbius strip to demonstrate how the image of subject is formed through internal exclusions and external inclusions. Similar phenomenological illustrations have been successfully used by Steven Rosen (2004, 2006) in his books "Dimensions of Apeiron" and "Topologies of the Flesh" and in the current issue (Rosen, 2017) to substantiate basic principles of shaping real world from the potential reality. The entity of not only a biological organism but also of a social subject incorporated into the social system should be analyzed as a dynamic whole (Simeonov and Ehresmann, 2017; this issue).

The scheme (Fig. 1, panel I) shows the constituents of the structure of subject in which the imaginary relation links *Ego* (self) to the *Image of the Other* (symbolized externality) and the line connecting the Freudian *Id* (unconscious) to the *Other* (externality) is interrupted by the first one. This structure of subject determines the structure of perception (II), where *Ego* corresponds to an *Agent*, *Id* to the *Field of Meanings*, *Other* to the *External Object*, and the *Image of the Other* to the *Object* taken as a *Signifier*. The structure of perception, in turn, generates the structure of social activity (III) in which an *Agent* appears as a *Social Being*, the *Signified Object* as a labor tool (*Technos*), the *Object-Signifier* as a conceptual tool (*Eidos*), and the *Field of Meanings* as a *Functional Set* which is realized through the labor activity. The biological level in this reflexive structure relates to the unconscious (*Id* in Freudian terms or *Real* in Lacan's terms, i.e., the substrate on which the structure of subject is unfolded), while the two other components of the scheme (*Ego* and *Super-Ego*), represent the psychological reality which uplifts the biological reality into a new level of structuration where the *Super-Ego* or *Symbolic* (in Lacan's terms) appears as a socially determined external codification of the subject's dynamics. The entity of conscious subject has the biological foundation in its background, while its awareness as a self (*Ego* or *Imaginary* in Lacan's terms) is formed through the social symbolic codification (*Super-Ego*). While the reflection of *Ego* is efficiently computable, the *Super-Ego*, in fact, is a result of the inverse Bayesian inference (Gunji et al., 2017a,b; this issue) and presumes a "robust computation" which operates with the metaphorical representation of a new kind of determination that corresponds to the structure of conscious subject.

Topological depiction of the subject by Lacan, although more generalized than the initial Freudian mytho-semantic representation, remains mere illustrative than strictly formalizable, therefore it requires further analysis to match the formal framework of mathematical logic. This new development has been undertaken by Vladimir Lefebvre (1982, 1987) who suggested a powerful model of human reflexion via mapping of the components of the structure of

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