

# The Birth and Life of Species–Cultures

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**Abstract** Evolution and life phenomena can be understood as results of history, i.e., as outcomes of cohabitation and collective memory of populations of autonomous entities (individuals) across many generations and vast extent of time. Hence, evolution of distinct lineages of life can be considered as isomorphic with that of *cultures*. I argue here that cultures and culture-like systems – human culture, natural languages, and life forms – always draw from history, memory, experience, internal dynamics, etc., transforming themselves creatively into new patterns, never foreseen before. This is possible thanks to the fact that all forms of life are descendants of life. Ontogeny and speciation in various lineages draw from continuous re-interpretation of conservative genetic/generic “texts”, as well as from changes of the interpretative process itself. The result is continuous appearances of new lineages-cultures and/or communities-cultures, in a semiotic process of re-interpretation and inventing new ways of living. The topic is developed here on the backgrounds of ideas presented by R. A. Rappaport in “Ritual and religion in the making of humanity” and J. Flegr in “Frozen evolution”.

**Keywords** Evolution as history · Organismal communities as cultures · Plasticity and elasticity · Habits and novelty

## Life and (Cultural) Evolution – an Isomorphy

The goal of this essay is to highlight analogies between evolution of cultures and evolution of biological lineages. Floating at the interface of two great realms of human knowledge, I cannot but choose a form that may not satisfy either of two parties. At various occasions, my colleagues and I had coined the idea of biological lineages and populations as analogies of cultures, as understood in human affairs (Markoš 2002; Markoš et al. 2009). Such a braid of thinking led us to the waters of (bio)semiotics, linguistics, and philosophy of language, up to a point towards what we call ‘language metaphor of life’ (Markoš and Švorcová 2009;

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Markoš and Faltýnek 2011), or to a working definition of life as a semiotic entity (Kull et al. 2009; Markoš 2014). The principal idea of the analogy calls to mind the obvious fact that an individual (be it a cell or a multicellular organism) is *born into* a pre-existing community of its kin who stipulate the way in which the world is to be interpreted (Markoš and Das forthcoming). Genetic script, experience, presuppositions, automatisms, behavioral patterns, etc., allow the new member of the community to behave along heuristic shortcuts. This saves time for explorative behavior, experimentation, and for teasing possible deviations from the rules; all this is fully in the competence (and responsibility) of an individual – at its own risk, or its benefit. It follows that modeling a living being as nothing but a duality of genotype and phenotype is short of a third factor – belonging to a community observing such and such cultural habits.

In papers cited above, we illustrated our views on visions of thinkers like M. Heidegger (the nature of language), S. Kauffman (autonomous agents vs. biospheres), U. Eco (reading texts), J. Lotman (semiosphere), or G. Bachelard (canalization of ontogeny from the superposition of commonly held “daydreams”). Here, I develop the idea further, inspired mainly by three books, seemingly very heterogeneous, but – as will be shown – bound by a common principle in the background: (i) R. A. Rappaport “Ritual and religion in the making of humanity” (2010 [1999]); (ii) Y. Lotman: “Culture and explosion” (2009); and (iii) J. Flegr: “Frozen evolution, or, that’s not the way it is, Mr. Darwin” (2008). As titles suggest, Rappaport draws from his experience with religions, Lotman is more general as concerns human cultures, and Flegr is an evolutionary biologist. Books by Rappaport and Flegr will be kept in the foreground; the contribution of Lotman is discussed in more detail elsewhere (Markoš 2014). All scenarios can be understood as presenting semiotic evolution ending in a habit, reminding of the ideas of C.S. Peirce. The difference is in that Peirce dares to expand the idea to evolution of the whole universe, whereas here I maintain that semiosis is exclusively an attribute of the living, in agreement with T. Sebeok’s notion that life and semiosis are co-extensive (Sebeok 1994).

All three books point towards the notion expressed succinctly by K. Hart in the preface to Rappaport’s book (p. xvi): “The chaos of everyday life [...] attains some stability to the degree that it is informed by ideas representing the social facts of a shared collective existence.” Biological lineages and/or different types of ecosystems (consortia) will serve as an analogy for such shared collective existence of beings that live here and now; heirs of experience and tradition (culture) of previous generations.

A common ground for systems characterized by birth and evolution is discussed below, followed by some examples of biological phenomena such as ontogeny, phylogeny, and symbiosis, viewed from the perspective of knowledge drawn from previous parts. A disclaimer is needed at this point: the aim is to highlight similarities, not differences: I have no difficulties distinguishing specificities of different lineages (e.g., humans vs. the rest of life), but these are not discussed here.

## Appearance of Living Beings and Their Communities: A Phenomenon Bound To a Ritual?

Rappaport introduces a notion of Ultimate Sacred Postulates (USPs) that are characterized as follows (Rappaport 2010: 6):

The preservation of ‘the truth’ of these propositions is associate with, or even definitive of, the persistence or perpetuation of systems of which they are elements. In organisms, these ‘propositions’ are, as it were, genetically and physiologically encoded descriptions of their structure and proper functioning. In human social systems, however, regnant ‘propositions’ may be propositions properly so-called: ‘The Lord our God the Lord is one,’ the invalidation of which would signify the demise of Judaism.

I do not fully agree with such mechanistic characteristics of organisms; however, I do stress the importance of “regnant propositions”. In other words, I invite the reader to transfer Rappaport’s basic ideas to all life, of course not at the expense of suppressing typically human characteristics into the background. A necessary warning at this point: Rappaport deals with human communities; my usage of his ideas as an umbrella for *any* community of living beings would probably arouse his strong disapprobation.

In accordance with semioticians (e.g., Eco 1976, 1995), Rappaport argues that the appearance of symbolic communication brings about two peculiarities the community must cope with: the possibility of lie, and the “confusions of Babel” (Eco 1995: 24), i.e., polysemy. As an antidote against such “anything goes” temptations, endangering its very existence, the community developed rituals. Common performance of rituals serves to petrification of the Ultimate Sacred Postulates. Hence, religions (based on such USPs) “fabricate the Word, the True Word upon which the truths of symbols and the convictions that they establish stand” (Rappaport 2010: 21). The USPs establish conventions upon which the community develops its ways of living, such as morals (sanctification of conventional order), construction of time and eternity, or the awareness of divine and the holy: “Certain meanings and effects can best, or even only, be expressed or achieved in ritual” (Rappaport 2010: 30). What is important in connection to our biological quest is that ritual is not a novelty, it has been established by others (i.e., not by the actual performers of the ritual), it is formal and invariant, and must be *performed* (i.e., not only read, or learned, from the holy books). The ritual is a punch penetrating the world and helping the society to establish basic discriminations and arrangement of world’s contrivances. The resilience of rituals towards external inputs is the guaranty of the continuance of the community, of their *genidentity* sensu Lewin (1922). The evolution of the society becomes frozen, sensitive only to stimuli that can be squared – in a given context – under the paradigm of Ultimate Sacred Postulates: “[T]he fundamental question to ask about any evolutionary change is ‘What does this change maintain unchanged?’” (Rappaport 2010: 7) The following quote bring us even closer to the message of my paper:

“The survival of any population, animal or human, depends upon social interactions characterized by some minimum degree of orderliness, but orderliness in social systems depends, in turn, upon communication which must meet some minimum standard of reliability if the recipients of the message are to be willing to accept the information they receive as sufficiently reliable to depend upon.” (Rappaport 2010: 15)

In very similar lines goes the theory of “frozen evolution” coined by the evolutionist J. Flegr (2008). He calls to mind that biological species (I add: also lineages,

populations, consortia, biota) appear on the scene suddenly and undergo relatively short period of quick advancement characterized by introduction of numerous novelties, to subsequently persist in practically unchanged form for several millions years:

“A species should respond to sufficiently strong selection pressure like elastic: it should initially give way very readily but, the further away it gets from its original phenotype, the less and less readily will it respond to the same pressure until, from a certain instant, it stops responding completely. After the end of the selection pressure, it should return to its original state, to its original phenotype” (Flegr 2008: 139).

Flegr asserts that gradualistic, Darwinian way of selection is at work only during the initial period of “lawlessness”, when a given population responds plastically to external pressures and remains in whatever position to which natural selection has pushed-and-pulled it. As soon as, however, the species gets established (its “USPs” being defined), it may yield to external challenges only to return to its original “state space” as soon as the pressure has ceased. Recall paradigmatically plastic species such as dogs; compared to elastic pigeons, cats or horses who return to their “wild” appearance soon after cessation of the pressure from the breeder; or even unbendable, “fundamentalistic” species such as cockroaches or rats that retain their likeness throughout the globe, in spite of manifold pressures from various environments they live in. The appearance of individuals belonging to a particular lineage or community comes out here as a cultural phenomenon, its unity rooted in acknowledging common rules — “Ultimate Sacred Postulates”.

## The Law?

Complex systems – albeit always unique and unrepeatable (compare to most models in science), reveal some surprising regularities. One of them is the “power law” estimating the frequency of a given class or event, in dependence on the size or some quality of such an event. Examples embrace phenomena otherwise incommensurable, e.g., distribution of extinctions in evolution; intensity of earthquakes in time; scale-free patchiness of ecosystems; values of physiological parameters in response to body size; crises in econosphere; self-organized criticality; or even Zipf’s law in linguistics. I suggest here that Rappoport, Lotman and Flegr came upon another class of universal regularity behind the evolution of living systems, i.e., systems born from a similar progenitor.<sup>1</sup> Both human cultures and lineages of living beings belong to this category of complex systems. Recognizing such evolutionary patterns would indeed put cultural and biological evolutions above a common denominator, and will help pinpointing important facets of such processes:

- (i) A newly appearing (born) system is in the state of chaos, with no apparent regularities; its state space of future possibilities is very rich. One or more singular events (contingencies, but also decisions – like in economy or politics) impose some of many conceivable kinds of order. As a consequence, the system hits one single trajectory (out of many possible) of development. The Book of Genesis (Gn1) is a paradigmatic description how to set up a unique path of evolution out of

<sup>1</sup> As to differences between complex systems (i) born and (ii) emerging *de novo*, see Markoš and Das (2016).

primordial chaos (e.g., Gn 1.6: “And God said, Let there be a firmament in the midst of the waters, and let it divide the waters from the waters”). The semiotic process starts, to carve system’s own world.

- (ii) A clearly recognizable group (lineage, people, language, taxon) sets out to the evolutionary trajectory. Its evolution is quick but sensitive to both external and/or internal jogs: the trajectory may bend in many unexpected directions (even towards extinction, or the return to the chaotic state) in such a *plastic* phase of system’s development.
- (iii) In the *elastic*, habitual (sensu Peirce) state, the system becomes resilient towards disturbances: after such a disturbance (even long-lasting and drastic) fades away, the system quickly returns to the state close to that preceding the disturbing event. The system spends the greatest part of its life in such a stable state. Consequently, its regularities and lawfulness can be recognized and studied scientifically. The semiotic system in usage in such a habit-driven phase is sophisticated, full of metaphors and rituals that resist any reformulations or novelties.
- (iv) Extinction, or return to the chaotic (but not plastic) state of affairs, again caused by external or internal reasons.

It is important to distinguish between systems endowed with history and semiosis from so called dissipative systems of physics (Markoš and Das 2016). Briefly, dissipative systems such as tornadoes or flames will repeatedly emerge *de novo* from homogeneous substrate whenever that substrate is placed into an external gradient of energy. Such a homogeneous substrate, however, is not identical with chaos as meant above: it has no historical memory, and dissipative structures that emerge from it are in no way influenced by previous occurrences of such states (a hurricane raging in the Caribbean has no memory of past hurricanes’ doings). Hence, properties of dissipative structures are predictable to a great extent, and no semiotic processes take place between elements of the system (e.g., molecules). In contrast, in historical systems described above, the chaos keeps the memories of systems past, and systems born from it interpret them in their unique way.

## Levels of Meaning

Rappaport distinguishes three levels, or orders, of meaning (that not always meet in a comity):

- (1) The low-order meaning concerns the levels of dictionary or taxonomic distinctions (e.g., dog vs. cat); it is a realm of information theory.
- (2) The middle-order meaning is the semiotic realm of signs, metaphors, etc. – the realm of “What does it all mean?” questions.
- (3) Finally, the high-order meaning roots in the radical identification of self with other, identification of the individual with its community, i.e., accepting the Ultimate Sacred Postulates of the community and acknowledging the fact by participation on the rituals.

I have some difficulties to assign “meanings” to the items from the lowest, i.e., information theory level (see my polemics in Markoš 2010), but here I put the topic aside, to concentrate on levels, wherefrom the system’s world becomes established:

“If there are going to be any words at all it is necessary to establish The Word. The Word is implicit in ritual, for every invariance of canon is a meta-message concerning the words it includes: these words and not others” (Rappaport 2010: 166).

This statement can – and should – be understood in a way that some meanings and activities ought to be frozen into *mechanisms* to bestow the world a structure; or better, the structure will emerge, or will be “revealed”, through “disciplining the world” by the Word (via USPs). By rituals, then, the participants “do not simply *communicate* to each other *about* that order but *commune with* each other *within it*” (Rappaport 2010, p. 220). For an individual, deviating from the rule means risking a conflict with the established world external and internal. Before all, this world is represented by one’s own community, and the deviation may lead to the benefit, or harm, of those who dare to try it, or to their community. This does not mean, argues Rappoport, that communing individuals are saints following piously all the minutiae of the Postulates. He illustrates it by the sentence “Crime does not pay”. Such a sentence may belong among the Commandments included in the USPs, and the community eagerly admits the fact during periodic rituals; yet in the everyday life, the same individuals more than often sin against the rules – after all, in everyday life the semantic field of words like “crime” are subject of endless negotiations. In other words, in the everyday life the rule can be given some probability of validity. In contrast, the same rule if part of Ultimate Sacred Postulates is not, and *should not*, be tested: it is a norm for the “phenotype” of all those who take part in the communion. Being a USP, the rule is not a logical proposition anymore; its probability is “higher than 1.0” (Rappaport 2010: 296), akin to a postulate in mathematics. Elsewhere we read:

“Ultimate Sacred Postulates not only stand beyond the reach of falsification by the rigorous procedures of logic of science, but are also impervious to disproof by the less formal but more compelling rigors of daily life. Their independence from ordinary experience, moreover, makes it possible for people of widely divergent experience to accept them.” (Rappaport 2010: 309)

Postulates of highest meaning bear no “information”, as no alternative is, and cannot be, at hand. In this way, a community protects itself from the “erosion with which ordinary usage – daily practice – continuously threatens them” (Rappaport 2010: 323). The danger of such an approach lies, of course, in profanation, in an establishment of a rigid worldview which does not allow any novelty. Such an absolutely “frozen” state is – sooner or later – lethal both to living communities, such as species or cultures.

I end the excursion through Rappaport’s book by a quote revealing his belief in a profound difference between humans and the rest of the biosphere:

“Species are distinguished by the criterion of genetic discontinuity, that is to say, by ruptures in genetic communication. Liturgical orders, and the communities in which they are enacted are separated from each other by ritual distinctions which also reflect attenuations or even ruptures in communication” (Rappaport 2010: 341).

I argue that communication – and ruptures thereof – is as important for the existence of different lineages of *all* living beings, not only in human cultures. In this context, the notion of “ecclesiomorphic structures” i.e., structures built at similar principles as the Church (Komárek 2009) comes to mind.

It should be stressed that the pattern (of creating the world) is repeatable not only on highest, sacred levels. In a similar way, R. Harris (2009:162) succinctly characterizes workings of banal institutions like offices:

“All macrosocial forms of organization require the integration of activities by individuals and teams of individuals. [...] This imposes a local rationality on those working in them. It may not be very efficient. It may have grown up as the accumulation of practices that were once convenient but are now hard to justify. It may be swept aside tomorrow by the arrival of a new boss. [...] The point is that the current integrational structure – however ‘good’ or ‘bad’ it may be – is what imposes (some) limits on the ‘meaning’ of (some of) the actions of individuals operating within that framework, i.e., on the signs that is important to understand if you are working in that organization.”

### “Contamination” of The Timelessness of Rituals by the Written Word

As Rappaport states at many places, a ritual (i.e., “lineage-specific” appearance of the culture) cannot be realized in the written form – it must be *performed*. The performance, and its interpretation (i.e., extraction of meaning, *idia phronesis*), is the job of the whole community. It is performing that makes the community one, and during which the common meaning emerges. The form of a given ritual may or may not undergo any change in flow of generations (after all, nobody will remember the “true”, “original”, wording): also shifts in the “tuning” of participants, in meaning perceived, will necessarily occur in flow of generations. The legacy of the tradition will always weld with the challenges and expectancies of the present.

The introduction of alphabetic script introduced, however, a new dimension into the dynamics of culture. The text of sacred words and the external paraphernalia of the ritual can be petrified for millennia – whereas the culture, its language, ways of living, external facts etc., may drastically change during that period. A literate culture, then, emerges from a tension between habits (changing albeit taken for immutable), demands and tensions of everyday life, and unchanged text. Very early in history of a literate culture, hermeneutics must have come to word, to explain to the contemporaries the meanings of the ancient Scripture, and to reconcile the complementarities into one. I argue that the situation is similar in other groups of living beings (such as ecosystems, or symbiotic associations): on one hand they are controlled by their “sacred (i.e., genetic) script”, on the other they are in command of its interpretation in the everyday life.

Of course, literacy deeply influences the worldview of a given culture. As the linguist R. Harris (2001, 2009) argues, literacy (especially after Aristotle) introduced a fundamental shift in the way of thinking of Western culture: “Aristotle taught generations of Europeans not only how to reason but, more fundamentally, *what rationality was*” (Harris 2009: 79). Such a rationality based in syllogisms (assumption that logical relations are relations between forms of words) could get hold only with the arrival of alphabetic script. Progressively, it penetrated our ways of thinking, our language, and our worldviews. All is rooted in “scriptism” – a belief in the superiority of written languages over spoken ones; superiority of writing over mere command of

speech, of “digital” codes over appearances of life. The savage mind as if became “domesticated” by writing. As a consequence, in our culture language decayed into words, with words becoming but sequences of elementary characters – be it phonemes or letters (or nucleotides in DNA, for that respect see Markoš and Faltýnek 2011). All this has pushed the role of ancient rituals (i.e., habits) into a background, and instead the written word became the glue of the society. Yet, the polysemy and lie could not be eradicated and endless clashes and wars punctuate our history, even if all participants argue on one single version of basic scriptures. The blame usually is on natural languages considered imperfect, and the ethos of the culture is to create (or restore the primeval) unequivocal, formal language (Eco 1995). Such an approach leads to perceiving living beings as contraptions built according to a program, or instructions, written in formal genetic language.

Below I suggest taking also the lineages and communities of non-human beings for an analogy of the real “communion”; the appearance (phenotype) of its members being the result of “performing a ritual” according to the present understanding of its wording by the community. Such an approach would allow very extraordinary, yet not senseless, questions, like “Could it be that a new appearance (phenotype) would evolve without any shift in the genetic script of its predecessor?” Epigenetic markers on DNA are well known and can result in different ontogenies; what I have in mind here, however, is going beyond such genetic “scriptism”, to acknowledge changes in understanding even while keeping genetic scripts unchanged (as, e.g., in seasonal polyphenism of many insects, or neoteny in axolotl).

## Natural Selection as Censorship over Interpretations of the Script

Modern science is a powerful tool of constructing objective reality, i.e., models of external world that are testable against that world; in principle, science constructs deterministic models that can be subsumed under the term *mechanism*. M. Barbieri (2011) recently gave a concise survey of transmutations of the very concept of *mechanism* in the history of science – from machine-like contraptions up to semiotic machines. Within such a framework, living organisms come out as programmed contrivances, equipped with numerous subroutines of program available and applicable. Programmed but – in the simplest versions of contemporary model – not self-programmable. The output of the machine is the *phenotype*, i.e., the self-structured programmed machine itself. In multicellular eukaryots, completing such a machine means typically (even if not always – see, e.g., ant workers) making it capable of reproduction.

“Self-structuring” is of central concern in this essay: but how much “self” is allowed in a mechanism, especially regarding its coming into existence? The “self”-assembly of a crystal (“mechanism of crystallization”) depends on invariant properties of molecules involved, and is driven by energy dissipation. An assembly line presupposes the existence of an external engineer-creator who is not part of the mechanism created. Dissipative structures (flames, gyres, reaction–diffusion systems) start *de novo* whenever an appropriate energy gradient appears, they exist in that gradient and disappear with its cessation; but is it reasonable at all to call a dissipative structure “mechanism”?

Let us forget about beginnings for a while, and follow the workings of another contraption, the “semiotic machine” whose functioning is controlled by a program. The



program resides in the virtual realm, and proceeds through multifarious cybernetic transformations, digressions, and loops. As the cybernetic “space” has no limits, the program may endlessly produce a plethora of patterns presupposed by its structure (combinatorial, like in a kaleidoscope), and new versions can be introduced by “genetic algorithms” or random mutations of the program. The space allows a bonfire of variations created automatically, without external intervention, and limited only by occasional freezes or crashes of some of program variants. “The Glass Bead Game should admit of everything, even that a single plant should chat in Latin with Linnaeus” (Hesse 1990: 140). An absolute, unlimited “mechanistic” polysemy is at work, but unable to distinguish values, to create meanings.

Such a “polysemy” becomes limited by the necessity of “enslavement” of our program into a material medium: restrictions given by physical properties of the flesh will somewhat channel the functioning of the resulting machine: a mere necessity of reproducing the machine will drastically reduce the space of phenotype possibilities. At this point, the capacity of available physical space enters the game, and Natural selection with its invisible hand will weed such program variants that do not stand the test of fitness upon their “incarnation”. Even then, *endless forms most improbable* (Darwin) will flourish on the Earth. Such is, I believe, the state of contemporary Darwinism: mechanistic evolution censored by impersonal limits of the external world, with the odd exception of sexual selection limited to animals. No semiosis is assumed, or needed, to make the theory complete. Living beings in such a model can be compared to chess pieces placed in their environment (chessboard), and moved by *external* forces: they have no say altogether concerning the choice of the niche. It is given by strict rules imposed from outside, and evolution of those rules is also the matter of external forces.

I insist here that the parable should be broadened to games with living players (like ice hockey, basketball, etc.), to allow semiosis enter the field. To make the parable more realistic, the game is without beginning and end, and players are born into teams and die out of them during the game. Model of *autonomous agents* creating their *biosphere* (Kauffman 2000), or the concept of *being together* (Heidegger 1995) comply with such views (see also Markoš et al. 2009). Our goal should be to digest properly the concept of the players and their biosphere (or better, semiosphere), their working with the thesaurus of organic information based in the historical experience (this is the way how I understand the notion of *organic memory* coined by Barbieri 2003) of the lineage of “players”. The actual state of such experience (be it inscribed in the genetic text or not) – here and now – decides the actual interpretation of the world affairs by the individual, and the community. Z. Neubauer (personal correspondence, my translation from Czech) formulated the idea as follows:

Under ‘organic matter’ I understand what used to be called plasma (see protoplasm, cytoplasm, etc.): a coherent field of mutual relationships. The field is subjective (endowed with self-perception and self-reference) hence able of unprompted self-structuration; of governing (channeling) over the ways and course of such self-organization, and of controlling it. All this presupposes an endeavor and a tendency of overlooking, of keeping present its own reality, and of displaying it as its actual appearance, i.e., likeness realized. [...] Hence, the nature of plasma lies in the self-featuring, it is the demonstration of bodily (carnal?) subjectivity.

Such a view is close to the concept of evolution by I. Schmalhausen (1986 [1946]) who preferred cytoplasmic memory before genes. Note that his theory falls into the “preliterate” period of biology, before the structure of DNA was “deciphered”. This brings us closer to the language metaphor of life, as developed elsewhere (Markoš and Faltýnek 2011).

## Born From and Born Into

We concluded above that a living being is not a crystal. Neither is it a product; in this context I must disagree with the catchy slogan coined by M. Barbieri (2008: 579): “All biological objects are artifacts, and we arrive at the general conclusion that life is artifact-making.” Biological objects like shells, stromatolites, or anthills, obviously represent artifacts – made by living beings who themselves, however, are not artifacts. They are not *produced*, they are *born* – from creatures of similar likeness and complexity, into the complex biospheric web of established interactions. They act as *co-creators* of that web as it advances from the *actual* into *adjacent possible* (Kauffman 2000, *passim*). As we discussed in more details elsewhere (Markoš 2014; Markoš and Faltýnek 2015), they interpret their position in the web according to the “tradition” passed down from their parents; the tradition (organic memory) involves the ways of interpretation of genetic script (either inherited or acquired by the horizontal transfer), to build their own body in ontogenesis, or to interact with other beings in symbiotic relations.

There is, however, a special stage of early embryogenesis of all multicellular beings, when they need a shield from all external interactions. Recall how embryos (in animals and plants), or the fruiting bodies of fungi remain thoroughly insulated in sterile conditions during this period (the same, however, holds for establishment of bacterial colonies, see Pátková et al. 2012). This is the most critical and utterly intimate semiotic stage when the maternal organism passes her instructions (i.e., her experience with the world) to the progeny: she is channeling the germ from the superposed, polysemic state into safe harbor of habits of the community into which the new being is to be born. G. Bachelard (1971) portrays the role of human mother (and other tutors) in steering the child from the state of “cosmic reverie” into the state compatible with the culture, language, fashions etc. of the community it was born into. In a similar way, genetic, epigenetic, and structural information (or better presuppositions) is passed, in a splendid isolation of embryonic stage, to the new member of the community, to get it prepared to the *carte du jour* of the surrounding world.

Only later the individual will establish its links to the biospheric web, equipped already with necessary presuppositions about its affairs. The whole process must often be thoroughly coordinated. For example, all animals plant their bowels with a typical microbiome consisting of hundreds of prokaryotic and protistan species; some animals require such cooperation for their proper organogenesis (like squid-*Vibrio* cooperation in the development of light organ; or mycetome in insects); in plants, mycorrhiza or legume-*Rhizobium* symbioses belong among paradigmatic examples (examples above taken from Gilbert and Epel 2008). The research on germ-free organisms illustrates instances when establishment of such contacts fails. Some knowledge of the process has been drawn from research of gnotobiotic interactions – controlled, experimental state of interaction of two or more symbiotic organisms (e.g., animals with only one or more known symbionts in their bowels, plants with a single partner like a mycorrhizal fungus).

A growing body of information in epigenetics provides some insights into the nature of the “instructions” the new individual receives. As a first step, epigenetic markers on DNA inform the progeny about the most advisable developmental programs (the climate, nutrition, parasites, etc.; see Allis et al. 2007; Hallgrímsson and Hall 2011; Gilbert and Epel 2008). The second step of information (or experience) is represented by the ecosystem of proteins in the cell: the amount and mutual proportions of particular proteins; derivatization of protein molecules (for illustration, see Markoš and Švorcová 2009); the role of chaperon proteins (e.g., Taipale et al. 2010) etc. All this leads to multifold functional and/or developmental settings of the cell functioning, and on its interactions with other cells in the organism. Needless to say, the mother plays a decisive role in such settings of the egg. Microbial way of life will not be discussed here, even if both multispecies consortia and multicellular bodies (born, again, in isolation) deserve closer attention in a forthcoming study.

## Final Contemplation

The evolutionary lineage of horses, from three-digit *Hyracotherium* some 30 My ago, up to contemporary representatives of the family, became the iconic textbook illustration of evolution. The reigning paradigm explains the transformation through the workings of “two engineers – mutation and selection” (Lorenz 1966). The frequency of various alleles had gradually changed in the flow of ages, and correspondingly the appearance of the individuals in the populations changed as well. Undoubtedly such events had taken place – the genomes of horses, zebras, and donkeys *do* differ. Yet, such changes may have caused only minor effect, the main factor being the differences of interpretative efforts among the members of a particular community: the lineage endlessly creates its world – in a way how human culture create their own by rituals, language development, etc. The contemporary horses perhaps store in their organic memory (and try from time to time – see atavisms) the previous versions of the canon – yet they stick to the contemporary “fashion” of the species. The genomic similarity of human being and chimps raised hectic efforts to determine *the* cause of the difference. So far, however, they have led only to anecdotic results – like mutations in masticatory muscle myosin, “genes for” microcephaly, or protein FOXP2. The possibility of *cultural* shifts towards different explanations of the world seemingly did not occur to biologists. A hint towards such a possibility is the message of this treatise.

## Conclusion

As a biologist, I might easily be accused of vitalist heresy. In spite of this, I argue that inspiration by models developed in the humanities may mark out a way towards a general theory of evolution valid for *all* life. What makes all life isomorphic with what we take as human cultural features is (1) a semiotic character of individuals as well as communities rooted in the fact that they are born from similar entities, thus maintaining the continuity of lineages from ancient times. This allows both individuals and communities (2) an interpretative approach to their history – rooted in memory and experience. Moreover, it allows (3) a creative approach to their genetic endowment (“genetic script”), i.e., creation of novelties.

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