SOAKED IN LANGUAGE
Hermeneutics of an ecological agency

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1. A multisystemic approach to language studies

Language is a complex system[1]. As one of the main domains of human cognition, it represents distinctly and evidently a primacy of exposition, that is, it is the preferential way for thoughts to come out physically from mind roaming. Put in this way, it might seem that language holds a record of independence among the mind faculties for what concerns the direction that it follows, from *inside* to *outside* of mind.

There is nothing more wrong than this assumption. In fact, as we will see, the complexity of language strongly relies on its dependence to the environment, understood as the set of ecological pressures and equilibria involved in human experiences, practices, and behaviors. The concept of complexity fine describes the nature of human language, particularly assuming an evolutionary perspective. Complexity does not mean that the linguistic phenomenon is hard to approach but rather that, comprehended as a multidomain set, it is formed by several subsets which are interconnected hierarchically and self-embedded, one in another in a recursive framework. Complexity is rather the theoretical filter, the *passepartout*, which permits to deeply investigate the evolutionary mosaic that presents human language as one of the outcomes.

Crucial for this study is the role of centrality played by the environment in shaping human cognition and communicative forms. Although there are different scientific fields that question the nature of language abstracting from the ecological context, we believe that such approach alone does not fully cover the basic formulations regarding language evolution, for they rather offer a theoretical model which fits only few aspects of the survey. The objective of the research is neither to explain exhaustively all the facets of the polyhedron representing the reciprocal causation of binomials like environment-language and environment-cognition, for it would be impossible to successfully describe the phenomenon in absence of a broader analysis of updated scientific data. The aim of this paper, then, is to state that the study of the *relations* among scientific domains concerning language studies is the right path to follow in order to better comprehend the nature of human language, its phylogenetic trend, and its mutual dependence with the environment. The leading question hence would be: which hypothesis describes efficiently the relation between human language and the environment in its reciprocal dialectics of causation? In attempting an answer, we will consider different queries concerning the relations between the scientific subjects, the relevant hypotheses proposed by the main areas and, where possible, the dialogue between opposite theoretical positions. The reason behind the topic and the methodology emerges from the need to shed light on

[1] The notion of *complexity* comes from the theoretical investigations of Edgar Morin. In this paper we will not cover the themes of his research; rather, we will adopt his methodology in approaching complex systems systematically, understanding the considered phenomenon as a compound of different and structured layers organized in hierarchies. In borrowing few epistemological concepts on complexity, we refer to E. Morin, *Method: Towards a study of humankind. The nature of nature*, Peter Lang, New York 1992; E. Morin, *Organization and complexity*, in «Annals of the New York Academy of Sciences», 879, 1999, pp. 115-121; E. Morin, *On complexity*, Hampton Press, Cresskill (NJ) 2008.

different aspects of human nature and its ecological place. We believe that conducting the research using language evolution as the main proxy will lead us to an improvement in understanding the degree of connection between human cognition, behavior, and the environment.

The fact that different research fields can state something about the topic might discourage the research itself, since it would be extremely difficult to have the same properties that function unanimously in a shared multisystemic space. What works in a psychological horizon might represent a theoretical failure in a linguistic context; what is explainable by cognitive biology might not show any relevant corroboration in evolutionary anthropology. Nevertheless, when the scientific demand is to theorize the functionalities and properties of a complex phenomenon, the first necessity is to be aware that, ultimately, every formal theory, or attempt of formalization, is necessarily *partial*. Scientific theories are *scientific* if and only if they admit the possibility to be enhanced or even changed by different sibling formulations. Several philosophers of science, such as Karl Popper, Thomas Kuhn, and Imre Lakatos, have spent rivers of ink on the ontological validity of scientific formulations: for instance, Lakatos suggests that a theory B can substitute a theory A given the scenario where B includes all the central properties present in A, the *core*, and its formulation is able to provide inclusive explanations about events not described in A[2]. Blueprinting a Lakatosian research program on language evolution and its relationship with the ecological pressures requires more than two theories to be considered: in fact, assuming the possibility to accurately summarize the main research programs on language evolution – and their elements of similarities and collisions – a quite hard demand would be to present a virtuous hypothesis able to include more empirical elements in a wider theoretical formulation.

From an evolutionary perspective, both Charles Darwin and Alfred Russel Wallace have remarkably debated on the role of natural selection played as factor in language evolution[3]. Within the same tradition of thought we witness, at least in the last thirty years, a continuity of the argument brought up by different scholars: some of them, such as Steven Pinker, Paul Bloom, and Ray Jackendoff, bear that language would represent an adaptive trait, resulted from the process of natural selection[4]; on the other hand, Marc Hauser, Noam Chomsky and Tecumseh Fitch suggest that certain traits of language evolved punctuationally[5] and rapidly in recent *Homo sapiens* evolution, by ecological constrains

[2] I. Lakatos, *The methodology of scientific research programmes: philosophical papers*, Vol. 1, Cambridge University Press, Cambridge 1978.

[3] We directly refer to C. Darwin, *The descent of man and selection in relation to sex,* John Murray, London 1871, and A. Wallace, *The limits of natural selection as applied to man*, in *Contributions to the theory of natural selection. A series of essays*, Macmillan, London 1870.

[4] The research conducted by Pinker, Bloom, and Jackendoff would require more space and a deeper analysis. In this place, we cite only few works that, in our opinion, are essential for a first comprehension of the topic: S. Pinker, *The language instinct*, William Morrow and Company, New York 1994; S. Pinker and P. Bloom, *Natural language and natural selection*, in «Behavioural and Brain Sciences», 13, 4, 1990, pp. 707-784; R. Jackendoff, *Possible stages in the evolution of language capacity*, in «Trends in Cognitive Science.», 3, 7, 1990, pp. 272-279.

[5] M. D. Hauser, N. Chomsky, W. T. Fitch, *The faculty of language: what is it, who has it, and how did it evolve?,* in «Science», 298, 2002, pp. 1569-1579; W. T. Fitch, *The evolution of language*, Cambridge University Press, Cambridge 2010.

which led to functional adjustments, such as a rewire of the human brain or genetic alterations[6]. Although the parties do not share several views, they both accept the primacy of biological modifications of natural selection, over those scholars who outlines the primacy of a cultural and gradual process in evolution, and specifically for the evolution of language. To avoid any misunderstanding, it should be noted that «any component of language, even the most novel and apparently adaptive, needs to be characterized within a context of historical constraints, deriving from developmental and phylogenetic constraints on form and physiology»[7].

Contrary to the researchers that confirm language as a product of *exaptation*[8], rather than *adaptation*, Michael Tomasello and the sociopragmatic tradition hold that the human language emerges a cognitive property and, as a phyletic trait, it evolved from basic forms of gestural communication which conventionalized as verbal language under a process of culturalization[9]. Tomasello explains such cognitive shift across several scientific works, shedding light both on ontogenetic and phylogenetic aspects of language, suggesting that language as such is nothing but the cognitive tool responsible for normativity in cooperative scenarios. Moreover, his ontogenetic studies show that communicative conventions spring up during early ontogeny in social contexts involving mental simulations, self-monitoring, and cooperative agency. The deep symmetry between ontogeny and phylogeny of language is quite evident, as it presents the same theoretical mechanism occurring in different intervals of temporality.

The term *punctuationally* comes from N. Eldredge and S. J. Gould, *Punctuated equilibria: an alternative to phyletic gradualism*, in T. J. M. Schopf (ed.), *Models in Paleobiology*, Freeman Cooper, San Francisco 1972, pp. 193-223.

[6] F. Suman, T. Pievani, *The evolution of human language. An alternative scenario*, in «Paradigmi», 2, 2015, p. 173; N. Chomsky and R. Berwick, *Why only us. Language and evolution*, The MIT Press, Cambridge (MA) 2016.

[7] T. Fitch, *Evolutionary Developmental Biology and Human Language Evolution*, in «Evol Biol», 39, 2012, p. 614.

[8] The biological notion of *exaptation* is widely explained in: S. J. Gould and E. S. Vrba, *Exaptation – a missing term in the science of form*, in «Paleobiology», 8, 1982, pp. 4-15; S. J. Gould, *Exaptation: A Crucial Tool for an Evolutionary Psychology*, in «Journal of Social Issues», 47, 1991, pp. 43-65. It should be noted that authors like Tecumseh Fitch or Marc Hauser do not refuse the process of adaptation in the evolution of language: rather, they accept the graduality of evolution but highlight that some traits evolved under a process of exaptation. It is useful to cite a passage from Fitch (2012, 615) to escape any doubt concerning the terminology on *exaptation* and the relative Gouldian nomenclature: «Exaptation captures the notion that evolved traits can change their function, being (in Darwin's terms) co-opted from an old function to some new one. Constraints is a covering term for diverse factors that prevent natural selection from fully optimizing a given trait to its function, and that thus restrict, limit, or scaffold the course of evolution and the nature of evolved trait. Because of constraints, selection on one trait may lead to changes in other traits that are not adaptive, but are merely correlated with the selected traits. When such non-adaptive traits appear due to physical or developmental constraints, Gould & Lewontin suggested the term spandrels, by analogy to geometrically necessary aspects of architecture. Spandrels in the biological sense are non-adaptive by-products of developmental processes, sometimes present by physical necessity. Exaptation can occur in two forms. In the first, an adaptive structure constructed by natural selection for one purpose can be put to new use—a form of "adaptation recycling". In contrasts, type II exaptations co-opt previously useless spandrels for some use, giving rise to a true novelty».

[9] M. Tomasello, *The cultural origins of human cognition*, The MIT Press, Cambridge (MA) 1999; M. Tomasello, *Origins of human communication*, The MIT Press, Cambridge (MA) 2008.

Even if these two perspectives do not share the majority of assumptions, it is undeniable that the environment plays in both the crucial role of *otherness*, namely, the contingent and incidental factor that has to be present in order to let language emerge and evolve. Thus, a multisystemic approach to the topic is nothing but necessary and required, for it permits to navigate in the weaved map of cognition holding several and contrasting perspectives that present as former scientific exigency the investigation on human language in all of its facets. In this framework, the environment has many forms and faces: individuals live in a particular environment, affecting it, shaping it, and being shaped by it. Language is that particular *tool* that does not directly affect the ecological equilibrium; rather, it shapes individuals and groups incisively enough to assume the role of precondition for the individual-environment mutual shaping to occur. The preferential methodology is the one that attempts to disclose such set of relations in an open and wide horizon of systems.

2. Agency: cooperation *in* the environment.

In large games, humans perform highly complex and joint behaviors in order to succeed. Paleontologists do not know exactly when to pose such cooperative turn in human phylogeny; however, archaeological records suggest that large-game hunting was a regular practice around 400-200 Kya: hominins from the late Lower Paleolithic period used to hunt and butcher in a cooperative way, following ritual processes involving roles and a shared intentionality. To corroborate such hypothesis, fossil records from the site of Qesem Cave in Israel demonstrate that the consumption of the fine parts of the pray proceeded with specific rituals and shared with all the members of the group[10]. To which degree human cognition had to evolve to successfully perform joint activities?

This is one of the leading questions that accompany Tomasello's psychological research[11]. He believes that cooperation, understood as a unique social feature of the genus *Homo*, emerges in a social context from the capacity of inferring and recognizing mental states in individuals, either belonging or not to the same group. Further, he claims that language emerges through actions, that is, from a goal-directed joint agency performed by members of groups that share the intention to pursue jointly and strategically a high rewarded task. Language represents the communicative and cognitive tool that regulates simultaneous activities with the most economic trend. In order to draw a strategic description of human cooperation, Tomasello states that:

> early humans «cooperativized» great ape individual intentionality into human joint intentionality involving new forms of cognitive representation (perspective, symbolic), inference (socially recursive), and self-monitoring (regulating one's actions from the perspective of a cooperative

[10] M. C. Stiner, R. Barkai, A. Gopher, *Cooperative hunting and meat sharing 400-200 kya at Qesem Cave, Israel,* in «Proceedings of the National Academy of Sciences of the United States of America», 106, 2009, pp. 13207.

[11] Above all, we refer to M. Tomasello, *A natural history of human thinking*, Harvard University Press, Cambridge (MA) 2014.

> partner) which, when put to use in solving concrete problems of social coordination, continued a radically new form of thinking[12].

The quote proposed is one of the formulations of the «Shared Intentionality Hypothesis», a psychological theory proposed by Tomasello with the objective to outline the role played by coordination in social activities. The uniqueness of human coordinative ability concerns a structure built on joint goals and second-person joint intentionality, which eventually evolved in a *we-intentionality*. It is gained a *shared intentionality* with the occurrence of two conditions: (1) every member of the group has a personal perceptual perspective and shares it with his fellows; (2) every member of the group benefits from the availability of fellows' perspectives, so the single member is able to mentally simulate everyone's behavior. Other species are able to cooperate, but only humans do so with a high awareness of the social environment, that is, knowing that they – as individuals – are part of a wider social net where peers see them the same way. The outstanding feature of such behavior does not solely regard cooperation, but rather the way in which cooperation is presented; saying it differently, which shades of coordinative activities produce the higher outcome. In order to get the best reward, intentionality needs joint goals and joint attention to be socially in place, both ontogenetically and phylogenetically[13].

Joint goals presuppose individual roles, recursive mind reading, mutual knowledge and, usually, a common ground. Hunting scenarios are appropriate for our analysis, since respond both to phyletic and logic queries, namely, whether cooperation brings a relevant gain to the group and whether frameworks of games are suitable to explain how sociality works. The stag hunt well represents the situation in which our ancestors had to develop finer foraging strategies, starting from mental simulation of the game process, assigned roles, and a protocol of joint focused actions.

Brian Skyrms, a professor of Logic and Philosophy of Science at UCI, proposes the hunting party as example to explain different features of the evolution of sociality[14]. Imagine that hunters have to decide the prey to hunt between a stag and a hare. While bagging a hare is quite easy and does not require more than a person, catching successfully a deer is not a simple practice even for two individuals. However, a stag is a more valuable prey than a hare. Skyrms suggests that both hare and deer hunting are Nash equilibria: in a scenario with two hunters, each individual best option is to hunt what the other hunts, meaning, one will hunt the hare if the other hunts the hare, and will hunt the stag if the other has the same intention. Hare hunting presupposes almost zero risk, for it requires no cooperation. Nevertheless, such scenario forgoes the potential payoff of a successful stag hunt. The game proposes a scheme where the rationality of players is pushed to seek the scenario with the highest mutual benefit. Yet, individually, without sharing the hunting goal the parameter to take into consideration is rather the personal risk. Strategic equilibrium occurs only if communicative trades are performed between the fellows.

[12] M. Tomasello, *A natural history of human thinking*, cit, p. 33.
[13] Ivi, p. 44.
[14] B. Skyrms, *The stag hunt and the evolution of sociality*, Cambridge University Press, Cambridge 2004.

Hunters have to establish a certain degree of communicative conventions, a set of practices comprehended unanimously and similarly among the group members, in order to strategically plan and coordinate the party. Skyrms identifies a theoretical solution in the signals game proposed by the philosopher David Lewis in his work *Convention*[15]. In a social interaction, the first need is to set a basic form of communicative trade based on something arbitrary; in this regard, a convention is nothing but «a special kind of Nash equilibrium in a game that models the relevant social interaction»[16]. Further, the requirement to be in a Nash equilibrium is that each individual in the same environment follows the convention. The formulation brings with itself two questions:

- Where does a convention comes from?
- How conventions are able to remain the same (fixed at first, and then culturally ritualized)?

Specifically, we want to comprehend which features select and set the equilibrium, and which one conserves it. At a first glance, individuals must share the same expectations from the others, meaning, a form of shared knowledge must occupy the common ground of intentionality. In addition to that, an equilibrium is affected by several factors, such as prior agreement, precedent, and salience:

> a *salient* equilibrium (Schelling's focal equilibrium) is one that «stands out» to the agents involved for some reason or another. Salience is a psychological property, and the causes of salience are not restricted in any way. Prior agreement and precedent can be viewed as special sources of salience[17].

Tomasello and Skyrms use Lewisian logic since it well describes how communication is established during cooperation and *before* it is conventionalized. The American philosopher has provided in *Convention* an explanation concerning the emergence of conventions using a signaling game. The game requires two players to succeed in understanding and sharing the semantics of signals. Despite the fact that receiver does not possess the same information as the sender, it can receive the set of signals sent by the sender. The equilibrium is gained when there is an accordance between sender and receiver. The game also comprehends strategies, and whether for every state there is optimality between the sender's and receiver's strategy, the combination of the two takes the name of *signaling system*.

Since individuals have to take rational choices and infer by reasoning what the other is likely to think, probability occupies a central role in the game, for the essence of the game itself is to match a specific kind of meaning between sender and receiver[18]. The optimal match is gained when sender's strategy is based on associate states with messages sent in that specific state, while the receiver's one consists in understanding the signal of a specific state of nature as a

[15] D. Lewis, *Convention*, Harvard University Press, Cambridge (MA) 1969.
[16] B. Skyrms, *The stag hunt and the evolution of sociality*, cit., p. 50.
[17] Ivi, pp. 51-52.
[18] D. Catteeuw, B. Manderick, *The limits of reinforcement learning in Lewis signaling Games*, in «Conference: Proceedings of the 13th Adaptive and Learning Agents workshop», 2013, p. 2.

particular act[19]. A convention then is made if a strict Nash equilibrium occurs, that is, when there is a semantic match between the parts. Theoretically speaking, we can apply signaling games' frameworks to every domain of knowledge or complex systems, implementing more rules, agents, conditionals and backwards logical relations, such as counterfactuals[20]. For instance, social norms can be described evolutionarily from game theory. The aim of an evolutionary approach to game theory is to find which kind of population's dynamics leads to equilibrium in specific tasks. When cooperative strategies become conventional in a group, the rules that regulate these practices are called *social norms*.

Concluding the paragraph, we would like to present a short, yet relevant, argument that will enrich the discussion on cooperation. Success in games requires the ability to mentally represent all possible scenarios and relative implications, adopting mental constructions of future events. Regarding meta-representations, Thomas Suddendorf and Michael Corballis suggest the term of *mental time travel* as a generative property which could represent a virtuous precursor and precondition to human language[21]. In particular, the recursive faculty of human language may be embedded with mental time travel in narrative representations: we refer to abstract complex scenarios, where social roles are assigned; or even predictions of future based on how individuals may react to incumbent situations. Mental time travels might be seen as former causation in human cognitive evolution, where language occupies the role of a normative quality. As a factor of discontinuity between humans and great apes, mental time travels involve some specific and unique cognitive features, such as episodic memory, perception, and rational reasoning. Such hypothesis seems to corroborate what we have tried to outline until now: there is a mutual shaping between cognition and the environment that evolved along human phylogeny and occupies the role of precondition for the emergence of language. This is supported by the fact that the hypothesis of mental time travels could be understood as a combinatorial property, that regulates how elements work and gain meaning through time. Semantic space is acquired when events are associated with specific moments, memories, future forecasts, and conditional simulations.

3. Language and *distances*: environmental grammatical dependences and the phyletic development.

The way humans organize speech is not casual, but rather follows the direction of attention: human phylogeny suggests that food-foraging and tool-making were the very causal principles of cognitive revolution, where language had the

[19] In our opinion, the term *shared semantics* better describes what occurs between agents that cooperate in a common environment. They benefit the same pragmatic space, which is the precondition for *mutual* semantics to occur.

[20] These insights are some of the keystones of the Lewisian philosophy. Lewis has a large and fascinating philosophical production which covers the majority of philosophical subjects. His theoretical investigations are systematic and present fine argumentations useful to implement in and frame an evolutionary theory of communication. We cite: D. Lewis, *Counterfactuals*, Blackwell Publisher, Oxford 1973a; D. Lewis, *Causation*, in «Journal of Philosophy», 70, 1973b, pp. 556-567; D. Lewis, *Causal Decision Theory*, in «Australasian Journal of Philosophy», 59, 1981a, pp. 5-30.

[21] T. Suddendorf, M.C. Corballis, *Mental time travel and the evolution of human mind*, in «Genetic, Social and General Psychology Monographs», 123, 1997, pp. 133-167.

chance to emerge. Nevertheless, the activity to pay attention to something specific, rather than anything, cannot be taken for granted, for it has to deal with the genesis of the theory of mind, or even, in ontogeny, to the transition from pointing (deictic gestures) to proper speech.

Specifically, humans distinguish themselves with their closest cousins, the great apes, in tasks involving gaze-detection and gaze-following. In a phyletic scenario, the cognitive split between us and apes could represent an adaptive feature and be responsible, or forerun, the linguistic mastering. How? The biologists Kobayashi and Kohshima gathered several proofs about the uniqueness of the human eye's morphology in a comparative optical study among primates' eye, where the results suggest that the singular shape of the human eye is the result of adaptations that led to the extension of vision, above all horizontal direction[22]. Further, while we observe that among primates a certain percentage of pigmentation in the sclera is present, humans have no trace of it. The attainable explanation regards the predation risk: during human evolution, the necessity for gaze camouflage decreased, while the control of fire, tool-crafting, and gaze-signal systems emerged. The evident movement of the iris in the sclera could prove a crucial enhancement in human communication, beside language, just through the lack of different pigmentation in the scleral area. Gaze-signals, following the iris' movements, allow all the individuals of a given group to focus on the same thing, to direct and share the attention towards a common goal:

> Co-operative and mutualistic behaviors might need refined communication systems, such as language to inform one's intention to other members of the group. The human eye, the large scleral area surrounding the iris and a great ability of eyeball movement, would have provided a chance for a drastic change from «the gaze-camouflaging eyes» into «gaze-signaling eyes» through a small change in scleral coloration. The SSI and WHR of human eyes are even greater that those of gorillas, the largest primate, which suggests adaptation for gaze-signal enhancement[23].

It is likely that this particular trait evolved in function of a more permissive habitat and opportune ecological pressures. Perhaps, the form of intelligence involved in camouflaging upgraded is a safer environment, protected by strategic thinking and the ability to craft weapons, leading to a cascade of cognitive enhancements such as cooperative behaviors and coordinative performances.

In this regard, communication represents a direct consequence in the phylogeny of cooperation and, as Michael Tomasello outlines, it belongs to a broader adaptive and evolutionary scenario. Pointing, and then pantomiming, appeared as relevant skills of coordination in a finer way, enhancing the process of collaboration[24]. Further, the unusual feature of informing others as a way of free support «may have arisen by processes of indirect reciprocity in which

[22] H. Kobayashi, S. Kohshima, *Unique morphology of the human eye and its adaptive meaning: comparative studies on external morphology of the primate eye*, in «Journal of Human Evolution», 40, 2001, p. 433.
[23] *Ibidem;* SSI stands for «index of scleral size», while WHR refers to the «width/height ratio» of the eye.
[24] M. Tomasello, *Origins of human communication*, cit., p. 324.

people sought to gain reputations as good collaborators»[25]. *Indirect reciprocity* could have been the evolutionary precondition of a proto-communicative structure, namely, expecting mutual help, cooperative, and informative expression, in a common-ground space, where individuals' ability to read recursively mind states of others could have had its proper field of development. Tomasello believes that language is entirely built upon a shared psychological infrastructure which emerges in a conventional system based on deictic and iconic gestures. Panto-miming represents a crucial leap in human cognition, since it involves symbolic representation and, in absence of pointing, concerns displaced referents.

Linguistically, hierarchies in syntax are built upon a causal order: gram-matic dominance could be rather represented as a describing process *towards* the object of the survey. In Tomasello's theory of language, gestures correspond to specific grammatical entities: pointing evolved in demonstrative pronouns, and pantomiming are representations of nouns and verbs. Regarding demonstratives, the psychologist states:

> As an example, an especially interesting class of words, universal in lan-guages, is that so-called demonstratives, which are often accompanied even today by pointing. In English, these are words such as *this* and *that* or *here* and *there*. The special nature of these words may be seen (as Witt-genstein 1953 first noted) by thinking about how children might learn them. For words such as nouns and verbs we may, given the appropriate joint attentional frame, point to something and name it for a child and she will learn the name. But how might we use pointing to teach children the words *this* and *that* or *here* and *there*? The problem is that if we point to something in attempt to teach these special words the pointing is both part of the ostensive act intended to teach (to direct attention to the ap-propriate referent) as well as the meaning itself – a peculiar situation that, miraculously, does not seem to confuse children at all. They must in some way understand the redundancy involved[26].

Thus, spatial and distance awareness were two former cognitive features which are fine represented with demonstrative pronouns, for they describe the direction and the position of the object of the speech. Although deictic gestures are still present after the shift from gesture-based communication system to a vocal-based one, they do not give more informative insights. Instead, iconic ges-tures directly refer to the nature of the object of interest, as well as to the action itself: pointing to something in movement might refer to the movement itself, to the direction, to the color, or to its shape. Iconic gestures evolved in verbs and nouns for they give us the characteristics of the actions and indicate the object associated with the actions themselves. Such occurrence is possible also since pantomiming does not require a present referent.

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[25] Ivi, p. 325.

[26] Ivi, p. 232. Michael Tomasello presents across his scientific work several philosophical insights. Amongst the other, we recall few texts which Tomasello uses a lot to theoretically describe the philosophical issues regarding language, cooperation, and the emergence of social behaviors: G. H. Mead, *Mind, self, and society*, University of Chicago Press, Chicago 1934; J. Searle, *The construction of social reality*, Free Press, New York 1995; W. Sellars, *Empiricism and the philosophy of mind*, Routledge, London 1963; L. Wittgenstein, *Philosophical investigations*, Basil Blackwell, Oxford 1955.

In early ontogeny, humans learn a language progressively by using linguistic constructions, which are acquired within their proper *cultural environment.* Under a process of sociogenesis, the underlying constructions of language turned into conventions[27]. Furthermore: «in this view, complex linguistic constructions are just another type of symbolic artifacts that human beings inherit from their forebears – although these artifacts are in some ways special as their systematic nature evokes from children attempts at categorization and schematization»[28]. Children cognitive development is shaped by the activity of hearing sentences and abstract linguistic constructions from the speech. During ontogeny, children learn to use linguistic tools, which become more complex and abstract as they grow: given standard situations, empirical studies show that children relate themselves with the same scenarios using different syntactic forms, structured around a central core and, becoming cognitive sharper, constructions will enrich with more contextual details[29]. As they grow up, children master holophrases, verb island constructions, abstract constructions, and narratives. Around thirteen months of age, children are able to use basic gestures and vocalizations to communicate with adults, and start to adopt holophrases, which are nothing but simple linguistic conventions. Tomasello outlines five categories where children use the first linguistic structures, which usually represents causal, imperative, and declarative scenarios: the presence-absence-recurrence of something, such as people or events (*gone*, *more*, *again*); the exchange-possession of objects (*give*, *share*, *mine*); the movement-location of objects (*up*, *down*, *here*, *outside*); the states and changes of states and objects (*hug*, *roll*, *want*). Thus, holophrases are the first linguistic tools used by children, and consist of a linguistic unit which function as an entire speech act (*play* as *I want to play*)[30].

Between eighteen and twenty-two months of age, it is visible the shift from pivot-like constructions to verb-island constructions. Pivot constructions occur when children use a specific word to describe several scenarios or interact with adults: the linguistic expressions are thus built up around this specific word, and as the capacities become finer, a verb occupies the pivot position. Such hypothesis, namely verb island constructions, bears that children, at twenty months circa, linguistically perceive reality through states of action, for they construct sentences mostly on verbs. Such syntactic structures present an abstract component regarding participants involved in the action, instead the correspondence between the verb used and the action to describe is concrete and responds to syntactic rules of dominance.

Abstract constructions and narratives presuppose a cognitive enhancement. The capacity to create abstract schemes presupposes the insight that schemes themselves have their own reasons of existence, even without considering the specific words of the sentence: the upgrade from a verb island construction to abstract construction in not the semantic aspect of the message, but rather the cognitive structures which mirror abstract linguistic frameworks, in a circular-recursive shaping of mind and language. Narratives occur when children

[27] M. Tomasello, *The cultural origins of human cognition*, cit., p. 135.
[28] *Ibidem*.
[29] M. Tomasello, *First verbs A case study in early grammatical development*, Cambridge University Press, Cambridge 1992b; M. Brooks, *Early syntactic development*, in M. Barret (ed.), *The development of language*, Psychology Press, London 1999.
[30] M. Tomasello, *The cultural origins of human cognition*, cit., p. 137.

comprehend complex and abstract scenarios where participants are in relations which others or events and they are able to rationally understand it, even if the causal chain of events happens by chance. As a matter of fact, children can track consequent scenarios adopting phrasal connectors, such as *since, therefore, however* and so forth, and mentally backward retrace causations.

Narrations are difficult tasks: they describe complex events framed in a multi-level structure and nested in a tapestry of relations. In this regard, pragmatics is the first condition of existence for a successful narrative process, as the need of common ground, either linguistic or non-linguistic, prepare the field of the discourse. Time is a major constant in vocal description of events, followed by the ability to track all the actions of the actors, through time, and outline the relations among them. The ability to track actors in action requires the verbs to modify their description of the action, namely, to *tense* in favour of the time in which the event occurs. Thus, grammar is the principal cognitive tool that permits an accurate description of events, where they occur, how they are presented, which are the agents of actions, the temporal extension and timing, in the most accurate and economic way. Moreover, grammar permits to track referents across events and actions, focusing on a particular behaviour, switching agents and outline specific relations among participants:

> This kind of extended discourse leads to the most complex, utterance-level, syntactic constructions in a language, that is, those containing more than one event. […], extended sequences of discourse indicating multiple events – loosely organized and expressed across different intonation units – «congeal» over historical time in the discourse community into more or less tightly organized grammatical constructions expressed within a single intonation contour[31].

Narratives represent a social bonding mechanism, since they enlarge common grounds of stories that eventually become of public domain. Thus, Tomasello suggests that what occurred was a form of cultural and historical evolution of language as a practice, rather than an alteration on biological traits of humans: in Tomasello's theory of language, the historical-cultural evolutionary hypothesis is supported by the fact that speech emerges as a set of conventions, following Lewis's theory of signaling games, as «prepacked» devices, usually called linguistic constructions. Linguistic constructions usually involve schemes that describe actions and agents. In such sense, grammar represents the faculty that associated subjects Xs which act on some Ys, or generate Ys, or are affected by Ys. In resonance with the theory of social construction through cultural development, language is one of the phenomena that emerge because members interact with each other in describing their environment and the forces that shape and affect it.

Such perspective of description of the world permits to make phrases where, although semantics crashes, syntax make us understand at least the trend of the sentence: if we say «the baf has lizzed a drinen kihn» we cannot get the meaning of the sentence fully, unless we formally correlate the nouns 'baf' and 'kihn', the verb 'to liz' and the adjective 'drinen' with respective words in English.

[31] M. Tomasello, *Origins of human communication*, cit., pp. 286-287.

Nevertheless, language, in this case, in the form of English grammar, permits us to describe a non-existing word such as *liz* and decline it like a common regular English verb. The same could occur even if we establish that the past form of *liz*, instead, is 'laz', so the phrase would sound «the baf has laz a drinen kihn» and still having a clear trend in syntax. Despite the fact that these words are not present in the English vocabular set, we, as humans, are able to create conventional languages upon our current one, where syntax and some grammatical tools (such as auxiliary verbs) remain unvaried. Moreover, Tomasello does not justify language as something innate, for language is a cognitive tool in a relation with the environment and itself. Artificial languages, in his view, justify the existence of language in a social and pragmatic perspective, namely, as a tool which adapts itself in all possible worlds. In addition to that, such hypothesis would explain why languages do change, but do not evolve. Philology shows perfectly that our English is not the language used by Shakespeare to write *Hamlet*, since forms and words changed historically. This process is usually called glossogeny of language.

Still, the syntactic structure describe with *X verb Y* is shared among languages, because language basically depends on actions and events that do or do not occur:

> Language creation and change is what has been called a phenomenon of the «third kind». Like such other societal-level phenomenon as inflation and resource depletion, it is something that results from intentional human actions, even though no single individual or even group of individuals intended for it to happen. Language creation and change result from the fact that human communication is open and dynamic, with interlocutors constantly adjusting to one another in order to communicate effectively and accomplish other social goals – relying to different degrees in different circumstances on different degrees and kinds of common ground[32].

Human communities reinvent language, receiving it from the past. As a dynamic system, superficial changes (words' semantic space, for instance) may occur, enriching the vocabulary in consonance with the historical period. However, the syntactic core does not change and, apparently, never did. With the shift from a form of communication based proto-linguistic gestures to a vocal one, Tomasello claims that the order in which concepts are put together for the semantic outcome remains constant. The phyletic trait that evolves is the physical form in which communication in the genus *Homo* is established. Hence, vocality has the primacy of efficacy to transmit a message. Using again narratives as sample, a task that young children acquire fast and without any effort is the capacity to nestle in the narration not only occurring events, but also mental states and intentions of participants. Using words such as *gonna* or *could*, the narration assumes shades that enrich and complicate the trend of the story. In a collaborative task, the theory of mind ensures that each participant is aware about the shared goal but does not take into consideration crucial factors like uncertainty, unpredictability, manipulation, and success' probability. Instead, psychological states aware the participants about the odds that everything will

[32] Ivi, pp. 299-300.

lead to a positive outcome and give the possibility to enrich mental simulations concerning potential bad scenarios.

4. No word where the norm lacks: the pivot.

In different works, Martin Heidegger highlights the cruciality of language in defining the existence of bodies[33]. We could heretically synthesise his thought with the following sentence: *no things where the word lacks*[34]. Nothing exists if the reference word is missing. Analogously, the philosophical view proposed above suggests that language as a complex system emerges, or even occurs, for it *attends* a specific and peculiar environment; rather and further, language *is* the environment that individuals attend: individuals are *soaked* in language, even before their birth[35]. Evolutionarily, affirming that human language is a form of environment means that language is firstly a *practice* which exists for humans to perform it and, circularly, for it was available and after discovered by humans.

This seems a logical paradox. How is it possible for humans to perform something *ex novo* if it must exist beforehand and, nonetheless, being the environment humans are put in? Such question represents the philosophical core of the paper, since it outlines the nature of language as a *threshold* to cut through and, contemporarily, the practice to perform, in order to play an ecological part among the individuals of a given community, which is ultimately the social environment itself.

The paleontological research of Ian Tattersall on the topic suggests that language had to be discovered by *Homo sapiens*, since the species presented all the morphological features to perform language before language was firstly used[36]. The Chomskyan tradition and latest biolinguistic interpretations of the subject endorse similar aspects[37]. Despite the elegance of the theory as well as the higher probability that there must be a certain degree of biological availability for the emergence of human throughout human phylogeny, we would rather support the hypothesis that language is highly affected by the environment and emerged in a dialectics of mutual shaping. Tattersall's view is interesting, if we consider the discovery made by *sapiens* a rather enhanced form of self-awareness. Moreover, borrowing the Lacanian concept[38] – without considering its psychoanalytic structure and consequences –, language is a specific environment, a cognitive tool that we share with individuals, that we perform, and nonetheless we are yet

[33] The literature on the topic is enormous. Since the aim is to use an Heideggerian formulation without considering an analysis on Heidegger's thought, we just refer to M. Heidegger, *Being and Time*, Basil Blackwell, Oxford 1962; M. Heidegger, M. Heidegger, *What is Metaphysics*, in D. F. Krell (ed.), *Martin Heidegger: Basic Writings*, Routledge, London 1993, pp. 93-110.

[34] The formulation is simplistic and perhaps does not render justice to the Heideggerian deep philosophy. We functionally adopt the concept as a theoretical tool, using its syntactic, rather than conceptual, framework.

[35] We borrow this concept from J. Lacan, *Petit discours à l'O.R.T.F. (1966)*, in *Autres Ecrits,* Edition de Seuil, Paris 2001.

[36] I. Tattersall, *An evolutionary framework for the acquisition of symbolic cognition by* Homo sapiens, in «Comparative cognition and behavior reviews», 3, 2008, pp. 99-114; I. Tattersall, *Human evolution and cognition*, in «Theories in Biosciences» 2010, pp. 193-201; I. Tattersall, *Masters of the Planet: The Search of Our Human Origins*, Palgrave Macmillan, London 2015.

[37] In particular, we refer to N. Chomsky, R. Berwick, *Why only us. Language and evolution*, The MIT Press, Cambridge (MA) 2016.

[38] See footnote 34.

performed *by* it. Language is a practice presenting individuals as objects and performers, synchronously.

Hence, considering the peculiar circularity of affection, we should not seek for an origin; rather, we should look for a feature, a *pivot*, on which language and environment reciprocally lay on. In paragraph 2 we outlined the importance of conventional language in cooperative scenarios like hunting parties. The philosopher considered, Brian Skyrms, proposes a simple, yet convincing, explanation about the success of joint activities: there must be a shared semantics among individuals, previous to any form of communication. Nash equilibria are gained when the stasis of the scenario requires a certain degree of cooperation in order to gain a favourable payoff. The hunt demands, then, a shared set of practices, a *norm*, which guarantees that the behaviour performed by one individual corresponds to the one expected by the other, and *vice versa.* Games need participants to act rationally in activity with an unequivocal goal and, further, to monitor their behaviour is response to others'. Thus, connecting the dots, practices ground on a shared norm, and not on a common language, meaning, the linguistic tool does not emerge *ex abrupto* for it has a «launch» within the practice to follow: human language is nothing but a *habit* of the norm.

Thus, language is the outcome of the shared practice where individuals cooperate following the same norm; once manifested different forms of communication, the needs for an economic form of information trade is conventionalized into language. Language exists for it exists the group and the group's requirement to share intentions for pragmatic reasons.

No word where the norm lacks. The norm is the pivot of sociality, and the very condition for language to exists. If it is true that humans are ontologically soaked into language, they are initially soaked into a variable horizon of normative events and practices. Without a norm, individuals do not comprehend each other and cannot, consequently, establish a communicative trade[39]. The norm exists prior to language. The peculiar public nature of language has a relevant presence in the late thought of Ludwig Wittgenstein. In the *Philosophical Investigations* he presents several paragraphs where he shows how considering language as a private phenomenon leads to a blind alley:

> 243. A human being can encourage himself, give himself orders, obey, blame and punish himself; he can ask himself a question and answer it. We could even imagine human beings who spoke only in monologue; who accompanied their activities by talking to themselves. An explorer who watched them and listened to their talk might succeed in translating their language into ours. (This would enable him to predict these people's actions correctly, for he also hears them making resolutions and decisions.)
>
> But could we also imagine a language in which a person could write down or give vocal expression to his inner experiences – his feelings, moods, and the rest – for his private use? – Well, can't we do so in our ordinary language? – But that is not what I mean. The individual words of this

[39] This insight belongs, once again, to the philosophical investigations of David Lewis on the origin of conventionalized practices. The author justifies the emergence of language proposing a now-classic signaling game in his volume *Convention.*

> language are to refer to what can only be known to the person speaking; to his immediate private sensations. So another person cannot understand the language[40].

Wittgenstein's critique is moved towards the Cartesian tradition which ultimately and univocally endorsed a separation between the layers of cognition, understood as a private space, and the external world. Wittgenstein's will is to outline a theoretical mistake: language is not a private tool able to describe public situations, but rather a public feature that we, as humans, share in order to describe the private ways in which we experience the world:

> 256. Now, what about the language which describes my inner experiences and which only I myself can understand? *How* do I use words to stand for my sensations? – As we ordinarily do? Then are my words for sensations tied up with my natural expressions of sensation? In that case my language is not a «private» one. Someone else might understand it as well as 1. – But suppose I didn't have any natural expression for the sensation, but only had the sensation? And now I simply *associate* names with sensations and use these names in descriptions[41].

In our opinion, the exposition given by Wittgenstein sheds light on the right hermeneutical mechanism involved in understanding which relation stands between language, human experience, and the environment. What scholars usually name «private language argument» in fact presents the need to invalidate the hard dualism in favor of a more open and mutual dialectic of influence between the parties[42]. If language is public, Wittgenstein asserts, then what we trade are not linguistic enunciates – for they are the way in which we express concepts – but rather the set of perceptual experiences, the practices, that we frequently attend. Nonetheless, enunciates are available to be traded for they are linguistic, and semantics occurs since language is ultimately intersubjective: meanings, then, are mediated by the linguistic environmental web which has as nodes all the individuals involved in the communicative exchange. Yet language, as we pointed above, is the preferential cognitive tool which permits such operation: language contains the public information, for language is ontologically public, and not only contains the message, but it is the message itself, namely, the linguistic form of information is in the very information, the message to exchange is represented by the communicative form. If it is true that language mediates information, the *medium*, comprehended environmentally, is the message[43].

Further, if language occurs synchronically as an act and as the ecological equilibrium where the act occurs, it is rather comprehensible as an *experience.* Phenomenologically, we experience language starting from the (linguistic) event

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[40] L. Wittgenstein, *Philosophical Investigations*, Basil Blackwell, Oxford 1986, pp. 88-89.

[41] Ivi, p. 91.

[42] G. P. Baker, *The private language argument*, in «Language & Communication», 1998, pp. 325-356; S., Candlish, *Wittgensteins Privatesprachenargumentation*, in E. von Savigny (ed.), *Wittgensteins Philosophische Untersuchungen*, Akademie Verlag, Berlin 1997, pp. 143-165; S. Kripke, *Wittgenstein on Rules and Private Language*, Blackwell, Oxford 1982.

[43] The conceptual link between the impossibility of privacy in language and its relationship with a shared semantics is inspired also by the consideration of M. McLuhan, *Understanding Media: The Extension of Man*, Routledge, London 1964.

we attend and, crucially, the way is which we perceive the event depends on the personal disposition of participation. John Dewey magnificently explains such mechanism in the psychological field, coining the term of «organic circuit»[44]. The relation between stimulus and response must be searched in the *juncture* of the parts:

> It is a question of finding out what stimulus or sensation, what movement and response mean; a question of seeing that they mean distinction of flexible function only, not of fixed experience; that one and the same occurrence plays either or both parts, according to the shift of interest; and that because of this functional distinction and relationship, the supposed problem of the adjustment of one to the other, whether by superior force in the stimulus or an agency *ad hoc* in the center of the soul, is a purely self-created problem[45].

By means of this mechanism, there is organicity among the systems: the complexity of the linguistic phenomenon acquires clarity within the shaping mechanism of mutuality between stimulus and response. Again, the organic feature occurs since language itself is included in a set of normative practices where individuals are soaked. The systematic relation among the philosophical terms mirrors what happens at a systemic level in the scientific field. If language grounds on a norm, which nature has it? How this language springs up in a circular relation of shaping?

Beside the hunt theory which, as we saw above, endorses the hypothesis that hunt parties are the social events responsible for the emergence of language, another scientific path suggests different environments, different subjects, and different norms. Moving within a Lakatosian framework, we are still looking for a relevant hybridization of theories, able to finer describe the relation between the elements mentioned. A fascinating hypothesis comes from the anthropological field and support the idea that, ultimately, language does not regard solely a horizon of masculinity, but rather it could come from the circular relation between maternal cares and babies in phylogeny. Regardless the data, the former insight to keep in mind is the mechanism described by Dewey, which finds a scientific corroboration in the principal properties of the Extended Evolutionary Synthesis such as niche construction, phenotypic plasticity, constructive development, and reciprocal causation[46]. The plasticity of mind, its relationship with a plastic environment, and the prolonged development of juvenile traits, represent few of different insights proposed by a Florida State University professor, the anthropologist Dean Falk, who gives mothers the role of centrality for the

[44] J. Dewey, *The Reflex Arc Concept in Psychology*, in «The Psychological Review», 3(4), 1896, pp. 357-370.
[45] Ivi, p. 364.
[46] K. Laland, T. Uller, M. Feldman, K. Sterelny, G. Muller, A. Moczek, E. Jablonka, J. Odling-Smee, *The extended evolutionary synthesis: its structure, assumptions and predictions*, in «Proceedings of the Royal Society: Biological Sciences», 282, 2015, 20151019; J. Odling-Smee, K. Laland, M. Feldman, *Niche construction: the neglected process in evolution*. *Monographs in Population Biology*, Princeton University Press, Princeton 2003.

occurrence of human language[47]. Since neoteny is a major factor of human development throughout phylogeny, she claims that the evolutionary tractions responsible for the emergence of human language must be searched in the *relation* between mothers and children, and temporarily before any form of protolanguage.

Specifically, she locates in *motherese*, the universal musical way in which mothers talk to infants, the first forms of successful linguistic construction, where successful strongly depends on the activity of care, which we comprehend as the set of normative practices responsible for the public and environmentally occurrence of linguistic communication. She also claims that:

> One reason we've misunderstood the role of motherese in the development of language may have to do with assumptions about gender. Since at least Charles Darwin's time, men have been viewed as prime evolutionary movers because of their hypothetical focus on hunting, tool production, and warfare. More recently, women have also become celebrated as evolutionary movers because of their roles in gathering food and helping daughters raise offspring[48].

What is fascinating about Falk's hypothesis is that it ultimately relies on paleontological data and anatomic issues: the fossil record tells us that the association between the standing posture and childbirth had to arrange in order to lower the high risk of mortality of mothers in giving birth with a narrowing birth canals, resulted from the upright walking to too-developed infants. Hence, selective pressures started to be in favor of the birth of less developed infants. Nonetheless, «because of their physical immaturity, these newborns lacked the ability to cling unsupported to their mothers, a skill that monkey and ape infants very quickly develop»[49]. Such deficit led mothers to lay down the infants during foraging or gathering tasks: the physical separation, eventually, had to be filled up by an exosomatic replacement, by a non-physical tool, able to link mothers and children in a non-tactile context[50]. Language might have emerged as this specific feature, ultimately from maternal cares.

5. Conclusion.

No language where the relation lacks. The philosophical category of relation is the one considered in the first paragraph to justify the need to put different systems and disciplines in dialogue. It is evident that the multisystemic approach is nothing but an equilibrate ecology of domains, which share several spaces and nonetheless needs an independent dialectics among them. Considering similar

[47] D. Falk, *Prelinguistic Evolution in Early Hominins: Whence Motherese?*, in «Behavioral and Brain Sciences», 27, 2004, pp. 491-503; D. Falk, *Finding our tongues: mothers, infants, and the origins of language*, Basic Books, New York 2009.

[48] D. Falk, *Finding our tongues: mothers, infants, and the origins of language*, cit., p. x.

[49] *Ibidem.*

[50] Dean Falk does not adopt the term *exosomatic*. However, we believe that the adjective represents the best formulation to explain the filling feature and the physical gap as well. The gradient of separation was necessary for language, as a practice, to fill in. The theoretical suggestion comes from the reading of C. Sini, *Il potere invisibile*, in «Noéma», 4(2), 2013, pp. 1-25.

phenomena in linguistics and comparative psychology does not reduce the precision of the analysis nor confound the possibility to dig deep in each subject; rather, it is the *conditio sine qua non* for the study to be prolific and interesting. The pragmatic infrastructure brilliantly proposed by Wittgenstein regarding the public nature of language would remain a theoretical thesis without a robust corroboration in the field of hard sciences. The endorsement of a dialogue between the sciences and philosophy is, in fact, one of the former needs of this paper. Collecting data would be useless, if considered in a short-term view. The hypothesis we suggest, instead, is a dialectics within a hybrid environment structured, as Charles Sanders Peirce would say, *in the long run*: if it is true that analyses must be made in fractions, knowledge cannot be parceled out.

For these reasons, we collected different perspectives concerning language. The motivation might be synthesized with a general but appropriate case of study. In the paleontological perspective, language is a cognitive feature not so easy to study, as it does not present any access from the fossil record. Nonetheless, it is possible to forecast how language shaped throughout evolution, in relation to different available empirical study based on archaeological evidence, such as stone industry and symbolic manifestations. Such process of study involves the so-called proxy systems, namely, adopting a subject and its data as a filter to approach another. However, we were not solely interested in such dynamics; rather, we wanted to study language as proxy of the proxies, as the specific cognitive domain which presents an external as well as internal framework that influences all the sibling domains. The aim, then, is to be aware that language is the exomorphic prothesis that let humans structure the world, starting from early ontogeny, in distances and familiar orders; saying it differently: «speaking in "material" language it means that the world, i.e., the total of observable events, shows structural uniformities, manifesting themselves by isomorphic traces of order in the different levels and realms»[51].

In this theoretical horizon, we believe that the ontogenetic investigations of Michael Tomasello are decisive for the cause. In our opinion, Tomasello adopted different philosophical positions and implemented them in scientific and comparative studies to better understand the reciprocal correlation between empirical and theoretical approaches. His uses of the evolutionary game theory and the private language argument are a perfect example of this dialectics, since he poses such subjects in ethological and anthropological grounds *strincto sensu.* The relevancy to study the social agency, both philosophically and biologically, requires diachronic and synchronic layers of study which nonetheless weave together: conducting comparative studies between young children and young chimpanzees is fruitful if the corroboration in philosophical theories is evident and not so hard to see. Why so? Since the practices where the systems are involved take as virtuous sample human language in a shared environment of the analysis. Further, language itself is that specific human cognitive feature that is representable through distances, or rather through the separation between the subject and the object/event. Language is the environment where humans are

[51] L. Von Bertalanffy, *General System Theory. Foundations, Development, Application*, George Braziller, New York 1968, p. 49.

soaked in and by which humans interact with each other. It is, then, the condition of existence of an ecological and rational agency.