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Conscious gesturality as asymmetrical proprioception is at the origin of human language and Creativity

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ABSTRACT: *Lateralization and the preference for one hand in daily tasks throughout evolution have made the exchange of neural information along the left-right axis of the body essential. This information would not have been necessary in symmetry. The difference in sensory-motor perception (proprioception) between one hand and the other (e.g., the weight of an object) triggers an initial sensation of conscious interoception. This glimmer of self-awareness led to the enjoyment of understanding and experimenting with new movements (e.g., dance). Humans develop the competence of a gestural syntax by identifying the meaning of individual gestures, and extracting them from the flow of action. Thus, there was a transition from a single gestural chain between the beginning of the act and the goal becoming aware of a fragmentation of gestures or interchangeable syntagms. The meaning of partial gestures is recognized by difference, that is, paradigmatically: a gesture or syntagm is semantic if it can replace another in a new chain and change the sense of the entire action flow.Throughout this sensory-motor process, language overlaps, with the lateralization and specialization of areas dedicated to the movements of the phonatory apparatus, probably due to exaptation. Language then prevailed but never became independent of its sensory-motor roots. We will also discuss how asymmetry and inner dialog have favored the invention of increasingly creative solutions. Additionally, we explored neuroscientific concepts related to cross-modality, embodied cognition, and mirror neurons*

KEYWORDS: *Digitization, digital economy, new media, media technology; information; communication economy; digital revolution.*
Keywords: *Cerebral Asymmetry, Origin of Languages, Himan Behaviors, Cognitive Neurosciences, Cultural Semiotics*

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I. INTRODUCTION

In characterizing humans in comparison to other primates, the opposable thumb is often referenced. The firm and secure grip of the hand on an object may have facilitated the use of complex tools, which are unanimously accepted. In this work, we are interested in investigating the role of lateralization and the preference for using one hand as an evolutionary advantage (Morgan 2007).

We hypothesize that this genetic disposition may have developed as a particular form of awareness, linked to the understanding, through difference, of sensory qualities perceived differently in each hand. Specifically, the weight of an object and the detection of subtle tactile qualities, perceived differently, may have created the self-awareness of being able to use the two limbs independently rather than having one support the other for a single purpose.

Morgans (ibid.) clarified how bodily asymmetry necessitates a neural mechanism that interprets positional differentiations along the left-right axis, which would not be required in the case of symmetry. The author demonstrated that among the possible gradient schemes to consider for this left-right information transfer are "symmetric gradients from which information is extracted through spatial (ibid.).

It would therefore be reasonable to think that a certain form of differentiated proprioception may have played a prominent role in the early emergence of self-consciousness. This phenomenon aligns with the established theories on embodied cognition (Gallese and Cuccio 2019), which consider the dynamic interaction between the brain-body, mind, and specific environment in which an individual learns and operates in the world.

From an evolutionary perspective, lateralization, a phenomenon observed in numerous animal species, may have fed back into human brain structures, promoting their specialization. Some authors have worked within the framework of the Exaptation Theory, which suggests that preexisting brain functions—in this case, those involved in movement control may have adapted for new cognitive or behavioral functions.

Gallese and Cuccio (2018) proposed that the theory could explain the connection between gestures and language in patients with Parkinson's disease, who, in addition to gradually losing their ability to move, have evident difficulties in recognizing motion verbs (see also Ramachandran 2011).

To understand these phenomena, cognitive psychology has employed the idea of the "primary metaphor," which associates bodily experiences and sensations with language: "Mental imagery research has shown that much of the same neural circuitry is used in imagining action and perception as in actually acting and perceiving (…) Research on systems of mirror and canonical neurons points to joint action-perception" (Lakoff 2012 p. 779). Wang (2011) argues that individual experiences of embodied cognition significantly facilitate second language learning. The same author invokes cross-sensory metaphors in embodied learning.

II. METHODOLOGY

The reflections that follow are the product of the author's speculations based on fundamental principles of cultural semiotics and cognitive neuroscience. The founder of the former discipline, Yuri Lotman, as early as the late 1970s, recognized the need for a cybernetic theory to make the study of human communication and semiosis scientific. He already addressed the problem of artificial intelligence, aiming to identify the possible mechanisms of a "thinking system." For Lotman, the human mind was the model that could explain both individual thought and collective consciousness. Collaborating with neuroscientists of his time, he studied the phenomenon of cerebral asymmetry, particularly focusing on split-brain phenomena. We have inherited his legacy, which can be summarized as follows: The two cerebral hemispheres and their specialized secondary structures are asymmetric. They continuously exchange information, but each processes these "messages" with its own code, which is not translatable into the code of the other structure. Therefore, each hemisphere must have within itself an intersection area shared with the other, where specific functional areas translate the inputs of the counterpart so that the data can be converted into assimilable information by the internal system, allowing it to function complementarily with the other hemisphere. Despite these structures being designed for the most accommodating adaptations possible, their translation is always imperfect and metaphorical. This, as Lotman observes, results in an information surplus, but also different possibilities for creative choice. There would be no art, cultural customs, religious differences, sports, or tribal dances without this asymmetric system of "translating the untranslatable." Natural language and sensorimotor languages were, for Lotman, languages in perpetual translation within culture. Lotman passed away in 1993 and did not live to see the discovery of mirror neurons, which translate the observation of others' actions into a form as if it were one's own. As a semiotician and neuroscientist, the author of this article has taken on the task of updating and verifying Lotman's insights and constructively comparing them with the latest neuroscientific knowledge. Reflecting intensely on asymmetry and dialogue, key themes in Lotman, we have arrived at the most original theory reported here, that of the sensorimotor basis of human language.study used the triangulation approach of both qualitative and quantitative methods. A survey was used to collect quantitative data from media users. Structured interviews were conducted with newspaper editors to collect qualitative data which provided detailed information on the current situation of newspapers in the face of digital platforms. Interviews allowed the researcher to gather in-depth data that questionnaires could not produce.The research population was the entire Namibian newspaper industry. The sample for this study was made up of editors from each of the two newspapers, The Namibian and New Era which were selected purposively using non-probability sampling techniques. Stratified random sampling was used to distribute 60 questionnaires to Windhoek residents of which 53 were answered and returned. Both qualitative and quantitative data analysis methods were used, content analysis was used to analyse the interviews and statistical tests in SPSS were used to analyse the survey data.

III. DISCUSSION

Asymmetry

Neuroscientific knowledge has evolved significantly since the second half of the last century, with the study of the effects of surgical brain dissection involving the cutting of the corpus callosum (split brain). Recent studies have confirmed that in patients with split brains, the functions of the left and right cerebral hemispheres are asymmetric (Hartwigsen 2021, Laureys et al. 2016, Ramachandran 2011). The left hemisphere is predominant for language and problem- solving, while the right hemisphere specializes in visuomotor and spatial tasks (Zu et al. 2023).

It remains to be clarified how, in the intimate experience of the patient, consciousness seems to remain unified: the observation that there are deeper and older connections than those passing through the corpus callosum is not sufficient for scholars to explain the phenomenon (Zu, ibid. ; Pinto et al. 2017; De Haan et al. 2023). Even though it is not yet possible to confirm whether and how split-brain surgery leads to a division of consciousness, it is at least certain that this separation concerns perception, with parallel and nonintegrated information flows (Pinto, ibidem)The It is evident that for the evolved abilities we recognize in humans, it was necessary to acquire particular cognitive qualities. This includes not only becoming aware of individual gestures

and isolating them from the contextual flow of action, but also using primitive gestures in new and novel gestural chains or replacing them with other gestures more effectively in the new environmental context. We know that the general meaning of a gestural chain (whether conscious or not) is given by the purpose with which it is performed: the mirror neurons discovered in macaques reacted only when observing actors who were reaching a precise goal or performing goal-oriented gestures without ambiguity (Di Pellegrino et al. 1992, Rizzolatti 2016).

Today, in AI deep learning, a challenging task is to isolate primitive gestures from a flow of action for video analysis and indexing. In addition to the vast number of examples that need to be collected, meticulous human work is required to identify the key points of gestures and assign appropriate labels to them. To accomplish this, it is necessary to find an isolated meaning for a minimal syntagma of the elements

A solution to this problem was proposed by Wang et al. (2001). Particularly interesting in this collective work is the method used in the second phase of gesture recognition, which is based on optical gesture recognition and spatial/temporal parameters. The basic concept is that just as it is possible to extract individual words from natural language discourse, it is possible to extract individual gestures from actions.

Considering that, as the authors state, the computer (agent) cannot recognize any meaning in the gesture; it is the human operator who decides the segmentation of gestures and their semantics. However, conscious operators can identify and isolate only a very limited number of gestures and will be precise only for those or whom they have direct experience. (ibid., pp. 6-7).

Updated technologies use convolutional neural networks (CNNs) and recurrent networks (LSTMs) for these visual data, which have achieved great analytical precision in deep recognition, including skeletal and manual recognition of 3D and dynamic poses (Núñez et al. 2018).

However, the following fundamental problem remains: what happens in the deep recognition of human gestures that are not describable or translatable into the words of natural human language? Are we not facing the risk of total dominance of language over other modes of communication?

It must be recognized that humankind is profoundly different from machine learning. There is embodied cognition that recognizes others' gestures through sight, not because the observer is linguistically instructed about a given gesture, but because certain bimodal neurons in the observer would also activate during the execution of the same gesture.

We have said that monkeys also have this mirror system, but in other primates, cross-modal neurons activate only in the recognition of actions for a specific purpose; in humans, they activate for any movement that an individual sees performed by another person, as long as the same gesture or gestural chain is part of their own mnemonic repertoire of embodied cognition (Ammanniti e Gallese, 2014, Gallese

Yuri J. Lotman, in the field of cultural semiotics, speaks of the conscious creation of different artistic languages, stating that nonartistic expressions must be “destroyed and remade anew” to then be inserted into a certain “rhythmic form” to become art. This applies to ballet, which “transforms movement into an image of movement,” as well as to verbal art, including poetry, which transforms the content of language into an “image of the word” (Lotman J. 1993, p. 70).

Certain pragmatists relegate poetry to a mere rhetorical exercise, observes Lotman, who cites the Russian Romantic critic Schedrin, according to whom “writing poetry is like stopping at every step to do a push-up.” With the same criticism, Lotman notes, one can instead understand the profound essence of artistic creation because, if, as conscious beings, we want to comprehend the nature of our movement (one could say our enteroception), “interspersing habitual gestures with experimental ones is indispensable” (ibid., p. 71).

This means, as mentioned, that only humans are capable of cognitively isolating individual gestures, abstracting them from the gestural chains of the contexts in which they have embodied knowledge and then recomposing them into new sequences even without any actual purpose. One could say "for pure play," but is not how the first tribal dance could arise in a group of hominids who enjoy making parodies of a hunting scene or some other social performance?

According to our proposed phenomenological hypotheses, all the elements are involved in the emergence of a gestural syntax, the awareness of which seems attributable to cognitive differentiation, paradigmatic in the context of lateralization and cerebral specialization. This syntax of gestures may have been accompanied by verbal language from the beginning (Roth 2002). However, concerning semantics, no meaning can be attributed to a gesture or a gestural chain if it is not possible to abstract it from the continuum of action. Considering that, as the authors state, the computer (agent) cannot recognize any meaning in the gesture; it is the human operator who decides the segmentation of gestures and their semantics. However, conscious operators can identify and isolate only a very limited number of gestures and will be precise only for those or whom they have direct experience. (ibid., pp. 6-7).

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Inner Dialog

Inner dialog is necessary for advanced cognition. This form of reflective cognition can be seen as a process of internal argumentation during which an individual can adopt contrasting positions and argue them. This process is crucial for understanding how individual decision-making processes develop (Greco 2017), and for the construction of shared rules in group communication.

Neuroimaging studies highlight the involvement of different brain areas in the production and processing of inner speech; among these, the regions involved in phonology and semantics, as well as those implicated in auditory and motor processing (Geva 2018), stand out, as do the frontal lobes and Wernicke's area. It has been observed that inner dialog fosters creativity through divergent thinking, regarding which "the production of variation is assumed to increase the chance that sufficiently varied and novel material is generated during a creative process such that an original yet useful idea" (de Rooij, 2023, p. 108).

Split-brain patients have demonstrated distinct capabilities in each hemisphere. For example, a patient's right hemisphere could independently gather, comprehend, remember, and express information, sometimes performing actions contrary to the desires of the left hemisphere (Joseph, 1988). Split-brain patients experience significant impairments in creative thinking and inner dialog due to the loss of interhemispheric communication

De Haan et al. (2023) convincingly note that the experience of singularity, the inner self, does not coincide with the different states of consciousness, not even in people with a normal mind. The integration of information, the authors assert, occurs through the interaction of local asymmetric systems, and conscious awareness is disunited. In particular, "The conscious experience of perceptual, language, memory, attentional and even motor processes may largely proceed unintegrated in parallel" (ibid., p. 3).

Other authors have instead emphasized that states of consciousness depend on the situation and condition of the thinking individual and vary continuously because, while one state emerges into awareness, another works in parallel and in latency. It has been suggested that the emergence of certain classes of consciousness might also be favored by a form of weak magnetic field, on the order of picoTesla (Persinger and St. Pierre, 2016).

The more the states of consciousness being compared are determined by specialized and asymmetric structures, the more the solution to the present problem will be creative, metaphorical, and/or lateral. This hypothesis suggests the role of the IPL as a cross-modal hub and, in general, as a dense connection of the corpus

callosum. However, it cannot be excluded that dialog can also be intrahemispheric in specialized processes. Rather than a 1-2 switch, we envision a continuous fluctuation from one state to another, maintaining the internal impression of a continuity of subjective consciousness. However, if the internal processing codes of the various regions in dialog are asymmetric, we must consider that each hemisystem contains the tools to decipher the input, with a translation that allows the significant values to be integrated into the language coherent to the hemisystem, and vice versa. This results in a significant and continuous overall surplus of information, which is perhaps the cause of some of our mental rumination, but also perhaps of our Eureka moments (Lotman 1992).

3.2 Semiotic View

We would now like to revisit the arguments we have begun to explore from a semiotic perspective, initially from structuralist semiotics and then from cultural semiotics. The uniquely human faculty of imagining oneself elsewhere and at a time that is not present, could be more clearly understood through a "theory of narrativity," which the French Semiotic School of A. Greimas (1969; 1977) worked on for a long time during the structuralist wave.

Suddendorf and Corballis (2007) explained through cognitive theory how mental -time travel not only influences planning and forecasting abilities but also impacts our capacity to form a sense of self over time, significantly contributing to our unique human identity and culture. Greimas's semiotic theory, which the Lithuanian scholar considered intrinsic to universal human thought, introduces the concept of the "narrative program," which consists of the actions and transformations that a Subject undertakes toward the junction with their Object.

The Subject is an agentive instance endowed with intentionality, and the Object is a good that can be material or immaterial. A distinction is made between a main narrative programme (PN), oriented toward a specific goal (junction), and one or more secondary or accessory narrative programmes, which serve to overcome obstacles and achieve the various milestones that separate theSubject from their Object. For example, in fairy tales, the semiotic object is often the Princess, and the main PN is "to conquer the princess." In contrast, the accessory PNs are the trial to obtain magical means and the battle with the monster that has captured the girl.

Awareness that a complex narrative program oriented toward a goal can be planned through a series of secondary programs in mental journeys probably belongs solely to humans. In their natural environment, anthropomorphic apes act directly on the object, and the tools they use, such as stones to crack nuts or sticks to catch termites, should be considered more as prosthetics or enhancers of the animal's physical ability than as strategies independent of the object's accessibility. Most importantly, they lack awareness of the meaning of the accessory action in itself, extrapolated from the motor procedure activated to obtain food.

Significantly, they engage more or less in assigned tasks based on the qualities of the food obtainable through a certain procedure (Huang and Grabenhorst 2021). We could say that nonhuman animals can acquire excellent skills in constructing chains of syntagms, while humans elevate themselves from this condition through their unique semantic abilities due to their capacity to think in paradigms.

Only humans can mentally isolate a gesture and give it its own meaning because they can replace it with another movement taken from a different chain they have experienced. They can evoke a gesture in the middle of a procedure that takes the place of the usual procedure. Complex syntagms can also be isolated and replaced in strategic programs that have been implemented differently. Finally, they can substitute an indefinite number of new objects for the same action.

In summary, Saussurean linguistics and the structural semantics derived from them by Greimas teach us that, beyond learning through the development of natural species qualities and through imitative procedures—which in certain animals might already consider "cultural"—humans learn by transferring examples from one semantic domain to another. Here, the ability to plan complex actions such as hunting or warfare arises with more evolved systems of group communication.

We believe with Yuri Lotman (1993) that no human language could have originated and evolved by referring only to itself, that is, by constructing meaning using only its own tools. The Russian semiotician explains that there must be at least two languages (sign systems) that are continuously translated into each other in mental activity (Lotman 1992; Gramigna 2013).

Lotman, who studied the dynamics of culture, discovered a new semiotic model compared to the "typological" model of languages, specifically in the functional asymmetry of the brain hemispheres and their continuous exchange of information through the corpus callosum (see considerations on split brain in Lotman 1977, p. 3; 1991, p. 7). This same model underpins the most fruitful theoretical conception in the semiotic study of culture, the semiosphere, as demonstrated by the subtitle that the author chose for the Italian edition of his fundamental essay (1985): "Asymmetry and Dialog in Thinking Structures."

The semiotician asserts the invariability of a "cybernetic law," according to which "the stability of the whole increases with the increase of the system's internal variety" (1977, p. 7). The elements of a system

become more specific, and in the exchange of information with other specific parts, they gradually increase their degree of autonomy on the one hand and the effective amount of information of the holistic whole on the other.

According to this, in the culture- system (in the human semiosphere), it would not be possible to think of natural language as an independent and autonomous mechanism of communication and historical memory. From both ontogenetic and phylogenetic perspectives, natural language develops through dialog and mutual support (at least) with sensorimotor and spatial language. The latter provides spoken language with a syntactic and articulatory basis, as well as the first semantic contents (spatial directions, indexical signs, and fundamental verbs related to bodily experiences such as "grasp," "push," "press," "ingest," and "support," etc.).

In the formation of the brain from infancy, the original hyperconnection of the neural mass undergoes a gradual pruning process that parallels the accumulation of the child's sensory and motor experiences, increasingly specifying structural differences even before the child begins to speak. With growth and adulthood, bilateral functional specialization becomes significantly accentuated (Cai et al. 2019).

This gesture has an intersubjective role even in prenatal interactions between twins, as was observed by Ammanniti and Gallese (2014). Referring to Bachtin's studies, Lotman asserted that intersubjectivity, or intersubjective dialog, exists before explicit communication. For this reason, he corrected Jakobson's well-known communicative model, observing how each individual modifies the input message because they process and understand it only partially through their singular thinking before returning it, which is always transformed, in a new communication cycle (Andrews 2015, 2022).

Here, the communication structure of I-I, the inner dialog, and the intersubjective dialog can be reduced to a single dynamic and asymmetric cognitive model, which can extend to the dialog between arts and languages within a culture, and even to the dialog between cultures. When Lotman stated that the individual mind and the collective mind are isomorphic, he meant this. This is the model of the semiosphere: asymmetry and dialog in thinking structures.

In our discussion, discussed the unresolved problem of the integration of consciousness. G. Tononi's Integrated Information Theory states that a system is conscious if it achieves both the maximum amount of specialized partial information and the maximum amount of integrated general information (Tononi and Flanagan,

Lotman, who was not familiar with Tononi's ideas (he died in 1992), started from the aforementioned cybernetic law to develop it within the framework of thought and culture. However, IIT does not explain how this paradox can exist between two opposing functions, specialization and integration (Massimini and Tononi 2013). Lotman, on the other hand, explains the phenomenon with the concept of the "semiotic boundary." The boundary that separates two elements of a dialogic system is permeable, similar to cell membranes, and each part of the system has, in this zone of intersection, the tools to recognize and transform input messages so they can be integrated into the internal functional code. However, this transformation and "illegitimate" integration into a foreign system lead to extensive modifications and, in any case, to a surplus of information that can remain latent or be promptly used. The more the dialogic system compares different, self-referential elements, the more difficult and forced the exchange of functional information will be. However, as we have shown, in interhemispheric exchanges, these processes lead to creativity and problem- solving. Lotman further confirmed that metaphorical translations, the most distant translations from standard procedural rationality, allow the specific hemisphere to specialize further and progressively acquire entirely new systemic elements while maintaining dialogic integration with the other hemisphere. Lotman states: , "The more evident the specificity of a given language is (and the greater the difficulties in translating texts from one language to another), the more particular its modeling capacity will be and consequently the more useful it will be to the system as a whole" (1993, p. 9).

The power of metaphor in the translation between languages of art has also convinced the Indian neuroscientist V.B. Ramachandran, who reconsiders the various sensory and motor information that converges in the parietal lobule and is "translated" thanks to the cross-modality of mirror neurons (Ramachandran, 2007; 2011).

IV. FIND AND CONCLUSION

We have tried to construct a conceptual model of cognition that can be implemented in the understanding of human thought as well as in AI deep learning. The model consists of asymmetric hemispheres (neural networks), each of which processes functions in which it is highly specialized using its own code (language). On the one hand, the hemispheres work in parallel, processing the information exchanged by the internal modules; on the other hand, the hemispheres communicate in various ways, especially through cross-modal hubs. In the human brain, the most important of these is the inferior parietal lobule, where multimodal neurons play a prominent role.

Communication difficulties, far from constituting an obstacle to global cognitive functions, favor the creation of redundant information incubated in each hemisphere and the metaphorical adaptation that each

hemisphere performs by transforming input messages. This process continuously modifies functional processes and generates novel internal messages, which can be utilized in creativity and problem solving and subsequently exported as outputs. "Asymmetry and dialog in thinking structures": We explored this line of inquiry, introduced in the late 1970s by the semiotician Yuri Lotman, who was inspired by the principle of cybernetics according to which the stability of the whole increases with increasing internal variety within the system.

The model we have adopted explains, among other things, the paradox observed in Integrated Information Theory, that of the "difficult coexistence of integration and specialization" (Massimini and Tononi 2013): Only in the tension between these two functions and their "forced" metaphorical resolution is the surplus and variance of information generated, along with creativity and individual critical thinking. We also believe that the presented model can provide convincing proposals in the fields of neuroscience,deep learning robotics, and studies on cultural differences.Lower level headings remain unnumbered; they are formatted as run-in headings. Considering our general proposals, a deep learning model is hypothesized to be structured as follows: 1) a first convolutional neural network processes inputs based on spatial topological, contextual paradigmatic, holistic parameters 2) the second CNN learns syntagmatic, procedural, computational, statistical parameters, etc. Each system (hemisphere) must then contain a subsystem capable of translating the parameters of the opposite asymmetric system, and this translation should not be perfect but metaphorical: in this way, deep learning could learn to create unforeseen and truly new solutions for complex problems.

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