

# **Natural Logic and Language**



Milton N. CAMPOS  
Université de Montréal (Canada)

## **Perspectives in Natural Logic: The Operations of Argumentation, Ethics, and Rhetoric**

**Abstract:** In this paper, we propose to provide greater heuristic value to Grize's natural logic by integrating it with the communication theory of schematization. To achieve that, we propose enhancing operation  $\sigma$  (sigma). Natural logic integrates the logic of objects and that of subjects, and it is this last that would benefit from making the  $\sigma$  (sigma) operation of taking charge a blend of natural logic, argumentation theory and rhetoric. We introduce the problem by presenting the historical context of natural logic development. We follow by explaining schematization and by describing the logic of objects and the logic of subjects in some detail. Then we introduce what we call the interactive turn of natural logic, by suggesting that logos, ethos and pathos should be considered as inner subject sub-operations of the natural logic the  $\sigma$  (sigma) operation. We conclude by formulating some paths for future research.

**Keywords:** natural logic, argumentation, rhetoric, logos, pathos, ethos, communication.

### **1. Introduction**

Through the centuries, different academic traditions based in contrasting philosophies developed varied approaches to the study and analysis of discourse. The first Western universities, structured in the Medieval Age with the direct concourse of different Church congregations, used to organize knowledge between the *Quadrivium* (arithmetic, geometry, astronomy and music) and the *Trivium* (dialectics, grammar and rhetoric) (Blanché and Dubuc 1996). Since then, discursive activities attracted the attention of scholars who focused on the origin of

languages, argumentation and rhetorical processes as well as logic, most knowledge deriving from the works of Greek philosophers, namely Plato (in dialogues in which Socrates was a central character) and Aristotle (such as in his famous work *Organon*). It is safe to affirm that Aristotle viewed logic as a natural reasoning process, shared by all human beings. The notion of “natural”, present in the minds of philosophers along the centuries, was re-thought in contemporary times in terms of biology and the working brain. Jean Piaget was one of the first modern thinkers to raise the idea of “natural logic” as a constructivist model of the mind (Piaget 1950), field of study that led to the development of contemporary cognitive sciences. However, the disciplines dealing with “discourse” did not often merge easily with biological thinking, and were not able to solve many questions related to the difficulties of integrating *form* and *content*, of taking into account the *structure* of thinking, the *meaning* of words, and also *the ways we co-interpret* them as enunciative totalities in academic and daily conversations as well. These difficulties are related to opposing epistemological standings with regards to the role of cognition, affectivity and ethics in the study of discourse and the production of knowledge. In the 50’s and 60’s, for example, discourse analysis techniques aiming to take “quality” into account were developed with the intent of dealing with those difficulties. On the one hand, scholars whose works derive from Kantian and Hegelian contributions to philosophy proposed solutions according to which the relationships between form and content change along time as a result of cognitive development. In this case, cognitive abilities would become prevalent upon affectivity. Indeed, many cognitive traits were genetic, although many others were constructed and shaped by the environment (Piaget 1950), and had a significant influence in the way human relationships affect social groups (Habermas 1981) and daily conversations (Grize 1986). On the other hand, scholars whose works derived from English empiricism, proposed solutions according to which content was somewhat prevalent upon form – in the sense that structures were shaped by context (Toulmin 1958, Austin 1962, Searle 1972) – and cognitive abilities submitted to experience. More radically, such approaches set the stage to the paradigm shift representing the thesis according to which not only cognitive abilities are submitted to experience, but affectivity, most specifically emotions, would indefectibly shape cognitive abilities and logical reasoning (post-structuralist thinkers and neuroscientists sharing Damasio’s hypothesis). In a way, all agree that, at some extent, reasoning is “natural”. However, according to our analysis, post-structuralism

started to discuss the adjective “natural” as if it would necessarily represent dogmatic moralistic standings on human behavior. Postcolonial and feminist studies deriving from this view consider what is “natural” as a social construction aiming to reinforce science as an ideological discourse that would consider choices of genre (different the sex of the individual) or respect of authorities as “unnatural”.

In this paper, we adopt a scientific standing that, according to our judgment, neither completely adopt the relativist poststructuralist position (although in a number of situations, relativism must be exercised as a critical methodology of assessing affirmations) nor the dogmatist cognitivist position, unable to deal with the complexity of human interactions. We adopt rather a critical-constructivist epistemological approach. From this perspective, we intend to discuss the meaning of “natural” used by Jean-Blaise Grize when he proposed the theory and the logical discipline of “natural logic”, accepting that there are indeed natural things, but aware that notions and understandings are built and might communicate ideologies. The objective of this article is not a mere discussion on how he understands what is “natural”, but how his proposal suggests a collapse of the *form-content*, *quantitative-qualitative* dichotomies. Moreover, we discuss how his theory can be further developed in order to go beyond this collapse by describing it in some detail. In addition, because it is a *logic*, Grize organized it around *objects* and *operations*. However, because it is “natural”, he introduced *subjects* that participate in the construction of meanings pragmatically exercised thanks to the application of “natural” operations on thinking objects. Revolutionary as it is, with its objective and subjective poles that enable *object building* by *active subjects*, natural logic should be further developed because it does not take into account *subject building*. Our thesis is that the subjective pole is ill developed. Our aim here is not to complete natural logic on the pretense that it is incomplete, but rather suggest solutions for opening it in order to enable it to become a more suitable method for studying discourse and, as a result, all kinds of psychosocial communicative exchanges.

## 2. Context of the development of natural logic

Natural logic is a logical language developed by Jean-Blaise Grize with the goal of integrating form and content (Grize 1982, 1991, 1996, 1997). Grize and his collaborators (Gattico and Grize 2007, Miéville 2010) who, as a group, became known as the argumentation and logic

“School of Neuchâtel” (van Eeemeren et al. 1996) further developed natural logic. Since his early university studies, Grize was interested in the relationships between form and content, which were discussed in his doctoral dissertation which tackled the problem of time in mathematics. His expertise in this difficult domain and his interest in trying to understand the paradox between mathematical abstract systems and time and temporal development (which are physical notions) grabbed the attention of Jean Piaget. Indeed, he pursued a project of developing a logical model able “to be operated” that is developed along time (Piaget 1976b). Piaget’s goal was that of making emerge from consciousness a natural model of the mind. In his view, logic – as it was for Aristotle – was a representation of the mind’s natural mechanisms. Piaget gave young Jean-Blaise Grize the task of revising the second edition of his “Treatise on logics” in which he proposed Logic as a domain able to operate across time, based on logical operations representing human cognitive transformations, empirically verified in his studies on children (1976, 1977c). It was the first biological model of human cognitive abilities, a model of the working brain capable of representing the possibility of knowledge acquisition. Mathematically founded on the binary logic of the British philosopher, logician and mathematician Georges Boole (“Algebraic Logic”), the model was meant to represent how the temporal progression of mental structures opened up, for children, the possibility to achieve more and more complex thinking abilities. Once developed, Piaget’s model (1950) would not only allow the understanding of children’s phases of cognitive construction, but also demonstrate that a scientific model as rigorous as those of physics and mathematics could be applied to the biological, human and social sciences.

Grize revised carefully Piaget’s logical calculations aiming to represent children’s cognitive abilities according to their age (developmental phases), but realized that the passage of one phase in particular, to another, was not quite “right” from a logical viewpoint. This specific transition aimed at representing the transformation through which children undergo when they start applying language to the previously acquired structured of the “logic of actions”, that is, when they begin communicating through language. According to Grize, Piaget’s solution presented serious logical difficulties and could not stand close examination, even if it was consistent with empirical observation. As a consequence, the second edition, published in 1972, bore a different stamp, that of “Essay on operatory logic”. Piaget recognized the difficulty in the foreword. He wrote that either the difficulty of formalizing content

will never have a logical solution (and, in this case, form and content would never be integrated), or a logical solution will be found in the future. As an amendment, he later proposed the notion of “meaning implication” (Piaget 1987) to explain the conflict between form and content. This notion reversed the form of Aristotle’s syllogism (“If A then B, and if B then C, then, necessarily, A then C”). The “meaning implication” structure obeyed the following reasoning: “If a part of C is in B, and a part of B is in A, then A implies C in terms of meaning” (Piaget 1977b, 1976c, 1987). The formulation was elegant, typical of Jean Piaget’s ingeniousness. However, he never integrated this notion into his model of child development and did little to help constructivist social and human scientists who were introduced to it: extracting forms from meanings was not exactly useful for explaining complex social, economic and political realities, and ignoring the content of discourse, as data, in a century that witnessed the birth of the sciences of language, left them uncomfortable.

It was Jean-Blaise Grize’s discomfort that led the Swiss logician to start reflecting on the “natural” logical inferences that people make in their daily lives, and how to solve the difficult relationships between form and content from a logical viewpoint. His intuition led him to think about communication processes, but did so only taking adults into consideration. As a result of these reflections, he proposed the foundations of a communication theory (schematization) and natural logic as a formal representation of human exchanges and sense making, with the help of a team of researchers working with him at the *Université de Neuchâtel*, where he laid the foundations of the *Centre de recherches sémiologiques*.

### **3. The communication theory of schematization**

Grize (1996, 1997) defines communication as a schematization process in which people construct and reconstruct ideas expressed through natural language (which obeys “natural logic”). The words “construction” and “reconstruction”, in our opinion, should be understood as actions to “shape” and “reshape” the meanings in order to make sense of the interlocutors involved in communication processes. Meanings providing the possibility of making sense are expressed through language that, according to Grize (1996), should be understood as both the product and the result of people’s intentions (that is, motivations and goals), representations (individual and social) and pre-cultural constructs (which are the results of the transformation of meanings throughout the cultural history of a given language, developed in a given society and territory).

According to the author, schematization is applicable to all processes of meaning production and communicative actions based on language (which are mostly related to the daily lives of people immersed in cultural contexts) as opposed to models, which are only applicable to closed systems (such as those of formal logic or mathematics). Schematizations are, thus, processes related to human exchanges in which we make sense and interpret each other's discourse.

Grize (1982) introduces *postulates* that should be considered when we talk about communication: dialogism, interlocution situation, representations, cultural pre-construction and the construction of objects. According to him, theoretical discursive formulations opposed to the validity or appropriateness of all five postulates taken together would break the principle of communication. (1) Dialogism, an idea borrowed from Mikhail Bakhtin, goes beyond the dialogue between interlocutors exchanging ideas because it includes the context in which the communicative interactions take place. (2) Interlocution – i.e. the context of communication – involves two dimensions that relate complementarily to one another. The first concerns taking responsibility for what is said while communicating, and the second covers the context in which conversation activities develop, and the references that are made to what is said by those who take part in them. Situations of interlocution are the opposite of what happens in formal systems because meaning is co-produced and co-built: circumstances are never the same and emerge from situated communication activities. (3) The postulate of representations has its roots in the idea of mental representations taken in its common sense. It is, however, connected with Piaget's definition of mental images, that is, what "is in the head" of those who communicate. He conceives representations always in context: that of a subject A and a subject B who communicate about a given theme T. In addition, representations have some characteristics such as: (i) knowledge is processed, (ii) language is used in action with argumentation goals, (iii) discursive action has underlying values. (4) Cultural preconstruction stands for discursive adaptation processes based on complementary mechanisms of assimilation and accommodation. Although, taking it abstractly, the possibility of meaning production is infinite, it is also the result of interaction processes that actualize historical constructions of language use in which people share a given space and time. (5) The last postulate concerns the construction of objects of thought within communicational activities. Constructions of objects based on meanings, relating to objects, signs and referents are, according to Grize, repositories of discourse.



Schematizing processes imply actions of interlocutors who build “images” of “themes” according to their own communicative purposes. Images evoke histories rooted in cultural preconstructions. When schematizing, the interlocutors exchange ideas (themes) with each other by shaping understandings progressively. Grize stresses that the interlocutors’ discursive interactions need “reconstruction help” under the form of pragmatic actions tailored to support meaningful exchanges (such as gestures, voice intonation etc.). Moreover, Grize identifies four skills that are needed in schematization processes: (a) language skills, (b) cultural competence, (c) rhetorical skills, and (d) logical skills. The first (a) requires knowledge with respect to the vocabulary and syntax of a given language. As for cultural competence (b), Grize remarks that it goes beyond actual language skills. It requires knowledge and deep understanding of codes that are contextual and closely related to a culture. Rhetorical skills (c) bridge the gap between cultural competence and the linguistic, cultural and logical skills. They are often represented by metaphors and other figures of speech or even images, such as those of satirical cartoons. Finally, logical skills (d) are those that underlie speech through affirmations, negations, hypotheses etc., and allow that one interlocutor could infer, from communication moves, supposed meanings attributed to representations in order to confront them with their own.

Grize (1982) also notes that, in addition to required skills, argumentative contexts must obey specific *conditions*, such as those of (I) reception, (II) acceptance and (III) membership, to obtain the minimum prerequisites for the establishment of successful communication. (I) Reception requires the intervention of the four skills presented above in order to interpret as faithfully as possible the intentions of the interlocutors. Regarding (II) acceptance, it must be noted that reconstruction is not enough. Other conditions are necessary, often logical, because it is obviously difficult to accept an argument whose premises are doubtful or false. However, Grize observed that logical arguments are not enough. One must take into consideration that contexts favoring acceptance require relationships that Piaget (1977) calls cooperative and Habermas (1981) communicative: interlocutors must be or believe to be equal partners in the communication process (which leads to discussions about ethical principles of autonomy and heteronomy). With respect to (III) membership, it points to the need that a given argument be accepted for reasons that go beyond than just access them. When we adhere to an idea, it is because we have been persuaded and affectively attached to the content of the speech.

When introducing our suggestions for further developing natural logic later in this paper, we will return to the discussion about communication and argumentation processes, namely to its postulates, skills and conditions. Last, but not least, Grize understands arguments and argumentation processes quite differently. For him, arguments are far more than just confronting ideas normatively, with the goal of establishing the truth or falseness of logical statements. Argumentation processes are those in which we communicate different ideas and viewpoints in ordinary life, such as telling someone a story heard on the streets or trying to agree on going or not to the movies. In such daily situations, subtle meanings often drive communication and there are hardly pure truth or false values. Argumentation in this sense uses “natural logic”. It is not the same as arguing mathematically or in structured situations such as in the courts (although in this case, in spite of its normative framing, arguments used to solve a case might be quite illogical, that is, natural language based).

#### **4. A brief account of natural logic**

We explored, in the previous section, the communication canvas in which natural logic is painted. Grize intended to keep natural logic just as a descriptive instrument enabling researchers to look at mental operations at work when people communicate. We will, briefly, describe the structure of natural logic by explaining its main poles (subject and object) and operations. Differently from other logical languages that are epistemologically distanced from the thinking subject and operate on abstract objects or objects “out there”, natural logic integrates interactively objects and subjects involved in schematization processes through natural language. In other words, it looks at the subject and how he/she shapes discourse through natural logic operations which, in great extent, parallels those of syntax. Natural logic focuses on two basic “logics”: that of the subjects, and that of the objects (which is shape by the subjects). However – and that is the point of this paper – it is our understanding that its theoretical building should be refined because the *logic of objects* is far more developed than the *logic of subjects*. This issue is neither easy nor straightforward and the suggestion that we will introduce might be controversial. To start with, we will briefly explain the *logic of objects*.

##### *4.1 The logic of objects*

Because objects are represented through language, logical operations related to them are based on the way sentences are built, which

normally requires a subject and a predicate, connected by verbs able to express actions. The first (the subject) is thus, related to the *theme* and the second (the predicate) to the *rheme*. Because they are connected by action words (verbs), the subject of a given sentence usually keeps a stable state (ex: *the house is beautiful*) that is challenged by predicates representing choices (ex: the house *is beautiful* or *is not beautiful*). In analytic statements, a challenging predicate might turn to be fallacious for obvious reasons, while in all syntetic ones it would signal a choice made by the interlocutor who assumes the authorship of what is being said. The operation based on the *theme* is called  $\alpha$  (alpha). It is an instrument that allows the subject to extract objects from primitive notions (cultural pre-constructions built along time in a given language and culture) which, in turn, may or may not lead to other objects and classes-objects. The notation of extracting an object X by operation  $\alpha$  (alpha) is represented as follows:  $\alpha(X) = \{X1, X2, \text{etc.}\}$ . It is through operation  $\alpha$  (alpha) that we can explore the properties of objects and classes-objects with other operations acting on the theme. The operation  $\gamma$  (gamma) helps the identification of meaning beams emanating from objects in such a way that they all become bundled up in a totality (like a planetary system surrounding a star). Operation  $\gamma$  can help us to determine whether or not is introduced, in given statements, ( $\gamma1$ ) a portion of the object in question, ( $\gamma2$ ) an internal process of the object based on beam action schemata, ( $\gamma3$ ) a state of the object or ( $\gamma4$ ) a dimension, a plurality or an extension of the object. The operation  $\alpha$  (alpha) may also result in operations  $\rho$  (rho) on object fields that may help determining if there was an introduction ( $\rho1$ ) of one component of the object, ( $\rho2$ ) a process requiring an external agent, ( $\rho3$ ) a metaphor, ( $\rho4$ ) or a delimitation of the object extension. Operation  $\alpha$  (alpha) can also be accompanied by the self-referencing operation  $\theta$  (theta) which not only introduces objects ( $\theta0$ ) in the form of synonyms, but also ( $\theta1$ ) by adding terms of the next genre, ( $\theta2$ ) by presenting them from different viewpoints making use of metonymy, ( $\theta3$ ) expressing judgments or ( $\theta4$ ) a judgment which empties them of their content. In addition, class objects can also be extracted from the inside of a given speech instead of direct extractions from  $\alpha$  (alpha), based on primitive notions. There are two operations of this type. The operation  $\iota$  (iota) acts upon a predicate and extracts an object from it. The operation  $\omega$  (omega) introduces a new object as a result of its application to a statement or series of statements.

The implicative dimension of thought (*inferencing*) can not be reduced to the mere reference to objects and / or class objects. It also manifests itself in the detranscendentalized process of predication. This

process has, as we noted above, a bivalent foundation. The operation  $\eta$  (eta) is the one that results in a predicative contradictory coupling from its application to primitive notions – that is, objects and classes-objects. As we also have said, it acts on the *rheme*, not the theme. The notation for extracting predicates by  $\eta$  (eta) is represented as follows:  $\eta(X) = \pm$  [predicative action] = [+ predicative action, – predicative action] = [●, ●]. The operation used to search what determines the predicative contradictory couplings extracted by  $\eta$  (eta) is the operation  $\delta$  (delta): while acting on class objects, it modulates the predicate. “It was Frege who distinguished different judgment contents that I call determinations because the rheme partially determines the object and statements” (Grize 1996, 69)<sup>1</sup>. The notation of operation  $\delta$  (delta) is connected to that of the operation  $\eta$  (eta) because they are interrelated. It is represented as follows:  $\delta(X) = \pm$  [that the predicative action] = [that the + predicative action, that the – predicative action] = [●, ●]. Or [that the + predicative action, x] = [● x]. Or [x, that the – predicative action] = [x, ●]. Grize defines the determination as polyoperation  $\delta$  (delta) because of its more or less inseparable numerous functions. The first ( $\delta 1$ ) is the obligation of the subject to choose one of the values of the predicative contradictory coupling. The second function ( $\delta 2$ ) regards the fact that the process of decision-making leads to a quantification of objects and classes-objects as well as the beams surrounding them. The third ( $\delta 3$ ) is related to the possibility that terms or modulations be introduced when choices are made. This whole process can lead to more accurate determinations with respect to spatial-temporal-causal localizations, without which no discourse could be developed. In this regard, Grize introduces the operation  $\lambda$  (lambda), which marks the *logic of subjects* when they locate objects ( $\lambda 1$ ) spatially or ( $\lambda 2$ ) temporally, or ( $\lambda 3$ ) when it emerges thanks to causal elements in the speech, and thus identifies its conditions.

#### 4.2 *The logic of subjects*

$\Sigma$  (sigma) could be seen as the manifestation of mental processes in communicative (two-way, three-way etc.) discourse and is, by definition, an operation that implies relationships. It represents the subject of communication, the one who, through his/her representations, build images of the world, logically organize objects in discourse. The French name of the operation, *prise en charge*, could be translated as the “taking charge” or “responsibilization” operation. We will keep the first because

---

<sup>1</sup> Translated from French to English by the author.

of its linguistic resemblance to the French original term. The notation of the taking charge operation  $\sigma$  (sigma) is  $\sigma(X)$ . This notation implies that when a subject takes charge of the communication process through language, *it does on objects* because, as Miéville suggests (2010), he/she takes charge of discourse, which implies that by representing objects in a discursive way in the mind, when the speech is enacted, operation  $\sigma$  enables the subject to take charge, or take responsibility for what is being said (and object of discourse). The structure of natural logic, as logic, *keeps the subject as an object of the analyzer* (the logician who looks at discourse and analyzes it through the lenses of the tool). In line with this reasoning, Grize identifies certain  $\sigma$  (sigma) functional markers. The first function ( $\sigma_1$ ) is that of introducing the communication topic or theme (the “I” or “we” – the first person – or the “it” – the third person). The second function ( $\sigma_2$ ) refers to the thinking activity that underlies the action of the subject of communication with regards to what he/she means about what is *written*<sup>2</sup>. The third function ( $\sigma_3$ ) reflects the temporal determination of speech acts through the use of temporal markers while predicating (different from the presentation of temporal elements, as in the operation  $\lambda$ ). In the context of linguistic discourse, these markers are those found in verbal conjugation. The fourth function ( $\sigma_4$ ) consists of the introduction of the modality *de dicto*. This function can be clarified by distinguishing two possible discursive relationships between predicates and their objects. When determination acts upon the predicate, we talk about the  $\delta$  (delta) operation because, in this case, the modality, *de re*, is related to the *rheme*. However, in the second case, the determination of the object ( $\sigma_4$ ) is an assertive *de dicto* action of the subject who speaks, related to the *theme*.

The whole of the logic of subjects is limited, thus, to operation  $\sigma$  (sigma) and its four functions. Jus another operation, acting as the Russian doll *manioshka*, is enacted by an “amplified”  $\sigma$  (sigma). It is  $\tau$  (tau), understood as “the structure of statements that gives it meaning” (Grize 1996, 101), which represents complex enunciates constructed by the subjects.

## 5. An interactive turn: amplifying the operation of taking charge (sigma)

### 5.1 General problems regarding the operation of taking charge

There are some problems that we would like to discuss, concerning what we understand to be limitations of natural logic with

---

<sup>2</sup> Natural logic was conceived as an analytical tool to be applied to written texts.

regard to the way in which the communication theory of schematization and natural logic relate to one another. Although they were conceived and taken together by Grize and his followers, their relationships are somewhat unclear. The question to be answered here could be formulated in the following way: provided that natural logic supposes a logic of objects and a logic of subjects, does the latter obey schematization just for the sake of discourse analysis or does it contain a much broader epistemological understanding of the relationships between the mind and the world outside that we all believe to be the same (to appropriate Habermas' standing with regard to objectivity)?

One set of problems concerns natural logic taken "logically", that is, a logic that has an inner structure developed to satisfy analysts. In this case, the action of analyzing texts (the one developed by the School of Neuchâtel) applies the  $\sigma$  (sigma) operation of taking charge to subjects of the narrative, who become objects of the discourse. The logic of subjects is somewhat restricted to taking charge of what happens with the objects of discourse. We say "somewhat restricted" because natural logic allows the analyzer to interpret the relationships among subjects and objects, in the text, according to his/her own goals, representations, and cultural pre-constructs. That means that the schematization conditions are fulfilled: there is an A (the reader/analyst) and a B (the text written by an author). There is, thus, a sort of co-construction, but only from the part of A (in addition to co-constructions that could be found within the text, built by actors whose discursive actions are analyzed from the outside).

Taken "epistemologically", natural logic should be seen more as a methodological discourse analysis tool, which enables the study of communication processes from a psychosocial-logical viewpoint. In this case, it would not *just* be used as a logical tool to enable text analysis, but as a *theory of mind* embedded in the *communication theory of schematization*. It would allow, thus, multiple layers of analysis in which the subjects would not be taken as objects of the discourse, but subjects in their own rights. The  $\sigma$  (sigma) operation of taking charge of subjects should not, thus, be understood as acting on a X representing an object of the discourse, but on a Y (or M, or P or whatever letter chosen for notation purposes) representing an *actual subject* acting within the discourse as well as outside it, integrating schematization processes intrinsically.

Grize's texts are unclear in what concerns whether or not primitive notions, which certainly apply to objects, would also apply to subjects. If so, by hypothesis, one could infer that the primitive notion of a subject would lie in his/her history, his/her memory actualized through

experience. Also, instead of representing a subject by (X), but by (Y), as suggested above, we empower subjects and reverse the mainly objective standing of all logics. We understand that Grize's decision to unveil the way we think in ordinary situations by including a logic of subjects within logic and by creating operation  $\sigma$  (sigma), he brought to the fore the subjects of communication processes who co-construct ideas and universes' configurations of meaningfulness. A conversation between two people, for instance, should be notated  $\sigma(Y1) \rightarrow \sigma(Y2)$ , following, necessarily, by a reaction  $\sigma(Y1) \leftarrow \sigma(Y2)$ , and so on.

In this hypothetical case, inner and outer schematization conditions would be fulfilled in multiple layers that would integrate the "logical" way of operating with natural logic. For instance, such an approach would allow looking at co-construction within a discourse in the following way: there is an A (the reader/analyst) and a B (the text written by an author) that has multiple actors within it. In addition to the co-construction by A found in the reading of a text with multiple actors, there will also be their schematized co-constructions processes, taken as such in their own right. The result is that an A (reader/analyst) would be confronted with co-constructions between B and C, C and D, B and D, and so forth, within the text. Even if the interpretation of all interactions would rely on A (as an "analyst"), there would be a refined description of how co-construction happened among the actors within the text, how an object changed across time when reinterpreted by the subjects within the text. If we take this example and think of social media in which "actors within a text" are actual persons within an interactive communication platform, this is something very different. We are here analyzing true exchanges among people who take charge of their communications integrally. At the end of the paper we will return to this question to address contemporary forms of interactive communication, and the ways the sigma operation could be enhanced to enable deeper analysis.

### 5.2 *The theory of mind / schematization hypothesis*

The hypothesis of natural logic as a *theory of mind* embedded in the *communication theory of schematization* should be further studied although it already derives, to a large extent, from empirical knowledge verified by Piaget and his followers, but also from socio-constructivist psychologists such as Leo Vygotsky, Jerome Bruner, and Michael Cole. Such an approach blends natural logic "code" with the postulates of communication discussed above (section 3): (1) Dialogism, (2)

Interlocution, (3) Representations, (4) Cultural preconstruction, and the (5) Construction of objects. In terms of natural logic, that means:

- a) Analyzing discourse from a dialogical viewpoint that takes into consideration situations of interlocution;
- b) Trying to understand, from cues present in discourse with regards to cultural pre-constructions, supposed reasons able to unveil, if at all possible, how objects are represented;
- c) Re-co-constructing objects through interpreting possible co-constructions among the subjects of the discourse in order to grasp its totality.

However, most of the above-mentioned actions – deemed to be essentially psychosocial and communicative – are beyond what natural logic is able to provide to the analysts in terms of description. Normally, the dimensions related to the postulates of communication fall under the label of the  $\sigma$  (sigma) operation. “Subject (X) took charge”, and that is it. Natural logic procedures follow by enabling mainly the analysis of discourse objects. Such an approach might well satisfy a logician, but falls short of what human and social scientists expect. We defend in this paper that natural logic must not be taken *only* as a logical tool, but as a method for discourse analysis of communication situations. The only way to do this is understanding natural logic as a *theory of mind* embedded in the *communication theory of schematization* as we suggested above.

There is still more: the  $\sigma$  (sigma) operation must be further developed. It must not only indicate that a subject as a discourse object took charge, but also describe the argumentation moves taken by the subject while communicating, and also *suppose* from the rhetorical mechanisms used, which possible intentions might be at stake in the communication process. We will provide some suggestions on how to do this in the last part of this section. Before, we would like to argue in favor of the idea that this epistemological standing was present in Grize’s reflections although he did not actually further operationalize the  $\sigma$  (sigma) operation.

According to Grize, natural logic is not prescriptive in nature, as mathematical logic. The normative character of the latter lies in the fact that it is built as a process leading to a proof, that is to say, a “demonstration” announcing a “decision” about the object it deals with. Rooted in logical-discursive operations, natural logic offers no evidence,



---

demonstrates nothing and, therefore, does not lead to any decision. It is purely descriptive. However, Grize notes that:

“Today, we now know quite well how thinking processes work while using a logical-mathematical language, but few studies are concerned with the way they function daily. We know more about models than schematizations and yet all formalization and axiomatization rest ultimately on what was previously done, on knowledge and reasons that unveil other ways of doing. So the question is to understand – or at least to describe – how thinking works when it does not mathematize.”<sup>3</sup>  
(Grize 1996, 82)

When Grize explicitly introduces the subject in logic and implicitly appeal to the logical-discursive operations underlying thinking processes, it connects the subject and object of communication. This *in media res* procedure unfolds from the *situated contexts* of interactions, but also reflects *universals* under the form of language structures, which mirror neurological functions. Communication, therefore, crosses form and content, the individual and society. When the subject thinks and apprehends objects, he dives into a world of sense making. This process that cognitive scientists are still unable to fully explain is rooted in genetics and development, in history and evolution.

### 5.3 Enhancing the sigma operation

Representing thinking processes through natural language and natural logic operations is quite a revolutionary endeavor, unheard since logic came up to Socrates' awareness. They are at the core of the interactive and fluid games between the logics of subjects and objects that shape schematizations in communication situations. Moreover, the skills discussed above (section 3), needed for schematization (language skills, cultural competence, rhetorical skills, and logical skills) and their conditions (reception, acceptance, and membership) are a reminder that, in the wake of the work of Chaim Perelman and Lucie Olbrechts-Tyteca, argumentation (in Grize's sense) should be integrated into natural logic.

That said, we could come up with our suggestion of enhancing natural logic by attributing new possibilities to the  $\sigma$  (sigma) operation. It could be understood as an attempt to add to the “first layer” of traditional descriptive natural logic a “second layer”. This procedure would turn it into a discourse analysis method able to go beyond pure description. We

---

<sup>3</sup> Translated from French to English by the author.

would call it a *critical-constructivist semiotics* (Campos 2015). Communication situations can, certainly, be described, but today, communication studies (and also the human and social sciences) need to have a deeper understanding of what goes on in the minds of people when they get together through communicative means, in presence or at a distance. Technology has complicated this goal because previous methods of discourse analysis became very limited in the study of multiple subjects (such as social media) and languages (verbal and written discourse, still and moving images and sound etc.). Our suggestion might enable natural logic to do just that (Campos 2010).

The  $\sigma$  (sigma) operation, as we explained in the fourth section, has functional markers. To keep our proposal within the lines of what was already proposed by Grize and his colleagues, we suggest the following reflections:

- a) The ( $\sigma_1$ ) function concerns *what* (theme) is introduced in the communication process. It deals with objects but, taking Toulmin's categories (1958), the *claim*, the *data*, the *warrant*, the *backing*, the *rebuttal* and the *qualifier*, such objects are organized as an *argumentative structure*. Our suggestion would go on the direction of understanding this function not only in terms of *what*, but also of *how* the argument is built in terms of premises and conclusion. This function could lead to the creation of a *sub-operation able to identify argumentation moves*. We named it the *logos sub-operation of sigma*.
- b) The ( $\sigma_2$ ) function refers to the *thoughts* underlying the actions of communication partners. It deals with the communication intentions (goals, pre-cultural constructs and ways of representing). Our suggestion would be that, when identifying the objects of *thoughts*, we look at the *intentions* that drive them when expressing judgments. This function highlights the bridge  $\sigma$  (sigma) and  $\eta$  (eta). This bivalent predication operation describes what is or what is not, allowing the analyzer to have a look into the content of thoughts *and* possible intentions underlying judgments. This function could lead to the creation of a *sub-operation that would express decision-making processes of subjects through conscious choices*. Although Grize defined natural logic as a non-normative tool and  $\eta$  (eta) as a predication operation, this new sub-operation would allow *suppositions* about mental operations, and the identification of *indices*

concerning the subjects' moral values and ethical choices in communication processes. We named it the *ethos sub-operation of sigma*.

- c) The ( $\sigma$ 3) function reflects the temporal determination expressed in verbal conjugation; and the ( $\sigma$ 4) function consists of the introduction of an assertive *de dicto* action of the subject who speaks, related to the *theme*. They both deal with the communication context in terms of the ways discourse is built and expressed. Although the previous functions are intrinsically related to these two in terms of how *rhetorical moves* are shaped, we understand that it stands by itself as a category that somewhat expresses *attitudes* tailoring arguments and ethical judgments. Our suggestion would be that it be named the *pathos sub-operation of sigma*.

The proposed solution might be considered simplistic. However, we believe that it is in line with Grize's position when he thought about schematizations as communication processes of sense making, and developed natural logic as a tool to analyze the use of language in ordinary life. Moreover, integrating the Aristotelian three interconnected dimensions of *logos*, *ethos* and *pathos* seems just "logical" in terms of the logic of subjects. The logic applied by human beings in ordinary life is usually tailored as arguments, but in communication processes personal histories embed passions and judgments that the "first layer" of natural logic is unable to make emerge in the form of suppositions of the communication partners' intentions. That is what critical-constructivist semiotics can achieve, not only by taking the above mentioned dimensions into account, but also extending the notion of "language" beyond what we call "linguistic language" (Campos 2015).

## 6. Conclusion

It is important to make two final remarks with regards to Jean-Blaise Grize's contributions to communication theory. The first concerns his prudence. Grize proposed natural logic limiting his endeavour to a careful descriptive analysis of logical-discursive operations that might represent thinking processes.

The second concerns the possibilities of his theory for further developments. When merging natural logic and schematization, we are left with the need to discuss values, to allow them to be used for the identification of needs and intentions that evoke duties – or laws that define moral obligation, respect. In other words, taking natural logic to

this path paves the way to use it as a tool that would provide reflecting about morality and ethics, and about communication moves (rhetorical) that express people's passions.

For us, integrating natural logic, argumentation and rhetoric in one only theory is the way to go. Not only it will heuristically enhance the School of Neuchâtel extraordinary contributions, but also allow it to, yes, keep the written word alive, but also embrace the contemporary ways to communicate with images, sounds, tact, and interactivity. We hope that the ideas developed here could lead to meaningful research able to further better the uses and the appropriateness of natural logic.

## References

- AUSTIN, J. L. 1962. *How to Do Things with Words*. New York: Oxford University Press.
- BLANCHÉ, R., and DUBUC, J. 1996. *La logique et son histoire*. Paris: Armand Colin.
- CAMPOS, M. N. 2015. *Traversée. Essai sur la communication*. Bern: Peter Lang.
- CAMPOS, M. N. 2010. "La schématisation dans des contextes en réseau", *Travaux du centre de recherches sémiologiques*, 68, 215-258. Neuchâtel: Canton de Neuchâtel.
- GATTICO, E. and GRIZE, J.-B. 2007. *La Costruzione del Discorso Quotidiano*. Milano: Bruno Mondadori.
- GRIZE, J.-B. 1997. *Logique et langage*. Paris: Ophrys.
- GRIZE, J.-B. 1996. *Logique naturelle & communications*. Paris: PUF.
- GRIZE, J.-B. 1991. "Logique naturelle et construction des propriétés des objets". *L'Année psychologique* 91: 103-120.
- GRIZE, J.-B. 1982. *De la logique à l'argumentation*. Genève: Droz.
- HABERMAS, J. 1987. *Théorie de l'agir communicationnel*. Paris: Fayard (translation from German to French by Jean Marc Ferry). Original work published in 1981.
- MIÉVILLE, D. 2010. "Logique naturelle: aspects méthodologiques et perspectives". *Travaux du centre de recherches sémiologiques*, 68, 11-89. Neuchâtel: Canton de Neuchâtel.
- PIAGET, J. 1987. "Introduction". In *Vers une logique des significations*, edited by J. Piaget and R. Garcia. Genève: Murionde.
- PIAGET, J. 1977a. *Études sociologiques*. Paris: Droz. Original work published in 1965.
- PIAGET, J. 1977b. "Essai sur la nécessité". *Archives de psychologie* 45(175): 235-261.

- 
- PIAGET, J. 1977c. *La Naissance de l'intelligence chez l'enfant*. Neuchâtel-Paris: Delachaux & Niestlé. Original work published in 1945.
- PIAGET, J. 1976a. *La formation du symbole chez l'enfant. Imitation, jeu et rêve, image et représentation*. Neuchâtel-Paris: Delachaux & Niestlé. Original work published in 1945.
- PIAGET, J. 1976b. *Ensaio de Lógica Operatória*. São Paulo: Globo/EDUSP. (established by Jean-Blaise Grize, translated from French to Portuguese by Maria Angela Vinagre de Almeida). Original work published in 1949.
- PIAGET, J. 1976c. "Le possible, l'impossible et le nécessaire", *Archives de psychologie* 44(172): 281-299.
- PIAGET, J. 1950. *Introduction à l'épistémologie génétique*. Paris: PUF.
- SEARLE, J. R. 1972. "What is a Speech Act?". In *Language and Social Context: Selected Readings*: 137-154, edited by P.P.Giglioli. London: Penguin Books.
- TOULMIN, S. E. 1999. *The Uses of Argument*. Cambridge: Cambridge University Press (15<sup>th</sup> edition). Original work published in 1958.
- VAN EEMEREN, F. H., GROOTENDORST, R. and HENKEMANS, F. S. 1996. *Fundamentals of Argumentation Theory: A Handbook of Historical Backgrounds and Contemporary Developments*. Mahwah (NJ): Lawrence Erlbaum Associates.