Operativity and Representativity of the Sign in Leibniz

by

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In opposition to, or in the line of, Philosophy cannot grow except inside a tradition. This is precisely the issue with the contemporary research on diagrammatic thinking. We all agree that it is essential to go back to Peirce or Husserl not only to recognize important roots, to honour significant predecessors, but to recover their insights, to make use of their hypothesis, to recuperate the conceptual instruments they have been able to put forward.

What I propose here is to go back even more in time, to go back to Leibniz. Not to claim for Leibniz as a predecessor of cognitive semantics or of present-day diagrammatic research, but to recall what Leibniz thought out in this respect, to bring into play the conceptual devices he put up, to bear in mind the distinctions he was able to constitute.

1. My first claim is that the historical importance of Leibniz philosophy of language is mostly due to his cognitive conception of language, that is, his recognition of the constitutive symbolic nature of human thought. As he says in the celebrated *Dialogus de connexione inter res et verba* (1677):

"I will never be able to know, to discover, to prove without using words or without the presence in my mind of other signs"(GP 7.191)

This cognitive conception of language was mainly formulated in the scope of the debate against Descartes and of their different mathematical experiences. Descartes tends to star from Geometry, in which figural representation is a merely auxiliary, imaginative support for reasoning. Leibniz stars from algebra where operations are fully symbolically performed, where symbols constitute the reasoning process itself, completely replacing the supposed direct experience of mathematical objects.

In fact, the Cartesian principle of evidence entails a merely instrumental and communicative conception of language. For Descartes language has above all a communicative function. The most language may be asked to

do is to operate as a mnemonic support for the recall of the long chain of reasons. Leibniz refuses the intuitionism of Descartes. For Leibniz, rigour cannot be dependent neither on subjectively based certainties, nor on the confidence in the intuitive infallibility of natural light. As Leibniz says in a *Letter to Gallois (1677),*

[The Cartesian methodological rules]"give surely beautiful decrees but not the guideline for developing those decrees"(GP7.21)

According to Leibniz, rigour should be achieved by the use of a symbolic system which would render visible the more abstract ideas and would constitute a material support for thought and reasoning, a "*filum Ariadnes*" (GP7.22)[1], a "*filum palpabile*" (GP7.57, 59, 125), a *filum cogitandi* (C; 420), a *filum meditandi* (GP7: 14), a *filum mechanico* (C: 351), that is, a symbolic criteria, a manipulatory device. Something which Mathematics has already developed and which, as Leibniz used to say needs nothing but paper and ink. Let us look for what Leibniz writes in the well known *Preface à la Science Générale* (1677)

"Now the reason why the art of demonstrating has been until now found only in mathematics (...) is this: Mathematics carries its own test with it. For when I am presented with a false theorem, I do not need to examine or even to know the demonstration, since I shall discover its falsity a posteriori by means of an easy experiment that is, by a calculation, costing no more than paper and ink.

The tests or experiments made in mathematics to guard against mistakes in reasoning (...) are not made on a thing itself, but on the characters which we have substituted in place of the thing.

Take for example a numerical calculation: if 1677 times 365 are 612,105, we should hardly ever have reached this result if it were necessary to make 365 piles of 1677 pebbles each and then finally to count them all in order to know whether the aforementioned number is found.

This test is performed only on paper, and consequently on the characters which represent the thing, and not on the thing itself". (C 154)

Symbolism is for Leibniz the proper, the necessary and essential means of human reason. Leibniz even goes a step further by claiming that only

[1] «La veritable méthode nous doit fournir un *Filum Ariadnes*, c'est à dire, un certain moyen sensible et grossier, qui conduise l'esprit, comme sont les lignes tracées en geometrie et les formes des operations qu'on prescrit aux apprentifs en Arithmetique», (GP7.22)

symbolic signs allow us to operate with ideal significations which can only be established by the sign and that only sign enable us to think. The example of the polygon of thousand faces presented by Leibniz in his celebrated *Meditationes de Cognitione, Veritate et Ideis* (1684*)* is eloquent:

"When I think of a polygon of thousand faces, I do not always consider what is a face, an equality or the number thousand but I use this words (whose meaning is present on my spirit only in a very confuse and imperfect way) in order that they (the words) take the place of the ideas which I have of them (...) I call this knowledge as blind or symbolic. We make use of it in algebra and arithmetic and in almost all domains" (GP 4. 423).

Again, Leibniz mathematical experience lies on the basis of this important theory of blind thought (*cogitatio caeca*). In infinitesimal calculus, sign does not evoke but fully substitutes notions which human mind cannot otherwise completely reach. So, I believe, we are here face to two main correlated leibnizian theses which deserve to be recalled by our current research on diagrammatic thinking: a) the non merely communicative but cognitive conception of language; b) the theory of blind though.

2. My second claim is that it is necessary to be aware of the specificity of Leibniz semiology, namely the prospective, heuristic potentialities which Leibniz attributes to symbolic systems. In a *Letter to the German mathematician Walter von Tschirnhaus* dated from May 1678, Leibniz writes:

"No one should fear that the contemplation of characters will lead us away from the things themselves; on the contrary, it leads us into the interior of things. For we often have confused notions today because the characters we use are badly arranged; but then, with the aid of characters, we will easily have the most distinct notions, for we will have at hand a mechanical thread of meditation, as it were, with whose aid we can very easily resolve any idea whatever into those of which it is composed. In fact, if the character expressing any concept is considered attentively, the simpler concepts into which it is resolvable will at once come to mind. Since the analysis of concepts thus corresponds exactly to the analysis of a character, we need merely to see the characters in order to have adequate notions brought to our mind freely and without effort. We can hope for no greater aid than this in the perfection of the mind" (GM 4. 461).

We find here some of the main thesis of the Leibniz semiology:

1. Characters do not disturb the knowledge of reality.
2. On the contrary, characters constitute a powerful means for the development of knowledge.
3. Characters not only reflect but also promote human knowledge allowing to go from confuse to clear, distinct notions.
4. This happens because of the written, graphic (iconic) nature of characters.
5. Characters are mostly valuable because they can be contemplated, because they can be spatially arranged, because they can be handled, manipulated, used as mechanical threads.
6. Characters could then become a mechanical thread of meditation.
7. But for that to be possible, it is necessary that characters may express concepts.
8. With such expressive characters, then the analysis of characters will correspond exactly to the analysis of concepts.
9. If this happens, then to seeing the characters would be the easy way of getting adequate knowledge.
10. The result should be of the greatest importance for the perfection of human mind.

Leibniz is always very clear concerning the recognition of the qualities and potentialities coming from the spatial nature of characters. And he extends that recognition, not only to the characters of the new artificial philosophical language to be constructed, but also to natural languages, namely to writing. The most illuminative passages in this respect appear in the *Nouveaux Essais.* While he recognizes the critical arguments presented by Lock's Philalethe against the difficulties, insufficiencies and disturbing effects put forward by natural languages[2], Leibniz position consists invariably in stressing the virtues of language and most of all the merits of writing for a more rigorous and regulated utilization of the various dimensions of signification. As he writes:

«Mais pour revenir à vos quatre defauts de la denomination, je vous dirai, Monsieur, qu' on peut remedier à tous, surtout depuis que l'écriture est inventée» (Nouveaux Essais, III, IX, § 9).

[2] In fact, the XVII century discusses deeply the role which language performs in the process of knowledge: Does language help to promote knowledge? Or, on the contrary, is language a disturbing factor for the acquisition of knowledge? Two great positions can be signalized. A critical position, which emphasizes language's insufficiencies and ambiguities: Bacon, Locke, Descartes, Arnauld, Melabranche and, in general, all those who look for the construction of new artificial languages, and a positive position which, although recognizing some limits and imperfection of human languages, nevertheless stresses its constitutive character. From my point of view, just two names in modern times: Thomas Hobbes and Leibniz.

Leibniz project is thus double. He aims: 1) to overcome the difficulties of natural languages by the exploration of their capacities in terms of definition and writing, 2) to construct a new language, more exactly, a writing system or *Characteristica Universalis* of which Mathematics would be just an example. As Leibniz says in a *Letter to Gallois (December, 1678)*

"But to make it easier and, so to speak, more tangible, I intend to make use of the Characteristic, of which I have spoken with you on occasion, and of which Algebra and Mathematics are merely examples. This Characteristic consists of a certain writing or language (since he who has the one can have the other) which perfectly corresponds to the relations of our thoughts. This characteristic would be completely different from any that has been envisaged until now, since the most important thing has been overlooked, which is that the characters of this writing have to serve for discovery and for judgement, like in algebra and in arithmetic" (A II 1.669)

Again, it is clear that Leibniz praises the properties of writing. Only its two-dimensional spatiality makes possible a more clear and differentiated expression of relations.

We are here face to the enormous and very much ambitious project of a *Characteristica Universalis*. All along his life, Leibniz will be fully committed with this program which he claimed to be very much innovative[3]. In fact, Leibniz does not avoid criticism towards his predecessors in terms of the construction of new philosophical language, the line that goes from Lull to Kircher and that which goes from the English pasigraphers to Dalgarno and Wilkins.[4] However, according to Leibniz, none of his predecessors have managed to guarantee the heuristic virtualities that symbolism may offer. And that by two main reasons: the insufficient analysis of thoughts which, in Leibniz opinion, underlies the set of *predicamenta* or *suma genera* in the basis of which their systems were constructed[5] and the arbitrary nature of the characters they have established[6].

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3 Something which is more significant since, as well known, Leibniz was in general very much interested and attentive to all the achievements of his predecessors.

4 Leibniz knows well all their works. He praised above all Wilkins's project, *An Essay towards a Real Character and a Philosophical Language, with an Alphabetical Dictionary*, published in 1668, with the support of Royal Society. As Leibniz writes: «J'ai consideré avec attention le grand ouvrage du Caractere reel et Langage Philosophique de Mons. Wilkins; je trouve qu'il y a mis une infinité de belles choses, et nous n'avons jamais eu une Table des predicateurs plus accomplie» (*Letter to Burnet, 24th August 1697*, GP 3: 216).

5 See, for instance, GP 3.216.

6 See for instance, C. 177 ff.

That is to say, on the contrary of what is could appear, Leibniz is not a full formalist. He does not fall into the illusion that the automatic functioning of a set of operational rules can permit the development of science. On the contrary, Leibniz claims that the new symbolic system should be semantically opened to the reality that it must permit to say. According to Leibniz, beyond responding to a logical objective of faithfully and rigorously express thought and its articulations, characters should open the road to the progress of knowledge. And that heuristic capacity can only be achieved if the system of characters to be constructed could be directly open to the reality they are supposed to say. Above and beyond operativity and functional capacity of the signs within the formal system, characters should also be "natural" that is representative of the world which is to be known. Leibniz heuristics involves a semantic exigency.

3. My third claim intends precisely to call attention to the representativity of sign which Leibniz wanted to conquer for the characters of the philosophical language to be constructed.

With this requirement of the representativity of the sign, Leibniz looks for the isomorphism between characteristic signs and the reality they signify. But how could it be done? How is it possible for a sign to represent reality? And which reality should be represented? Its sensory, particular traits as they appear to our perception? Its essence? The composition of its elements? The inner relation of its parts? Given the extreme difficulty of such a task, it is easy to understand the heterogeneity of this leibnizian theory of the representativity of the sign. I will try to briefly summarise the several models which I believe Leibniz has pursued[7].

The first model is the extreme proposal of a figurative representativity as the pictorial representation of the sensible, imagetic traits of the signified reality. As Leibniz says in the *Nouveaux Essais*:

«Et on pourrait introduire un caractère universel fort populaire et meilleur que le leur, si on employait de petites figures à la place des mots, qui représentassent les choses visibles par leurs traits, et les invisibles par des visibles qui les accompagnent, y joignant de certaines marques additionnelles, convenables pour faire entendre les flexions et les particules» (GP 5. 379).

[7] For a developed presentation of the various models of representativity in Leibniz and which we present here in a condensed, abridged way, see our Pombo (1987: 174-190)

A procedure which Leibniz believes to be applicable to visible and also to invisible realities.

«Those (realities) which cannot be figured [pingi], like the intelligible, should however be represented by some hieroglyphic method at sometime uniform and philosophical. This can be done if we do not pursue particular similarities, as the painters, the mystic and the Chinese do, but if we follow the idea of the very thing» (GM 5: 216).

In second and weaker model, representativity is conceived, not as the figuration of the particular traits of the signified reality as they appear to our perception, but as its essence, that is, as the direct representation of the essential basis of those particularities. A good example is the project which Leibniz calls a *Characteristica Realis (GP7.12-13)* in which the character would represent the unifying principle or "key" (*clavis*) of the multiple properties which compose the signified idea.

«The name of each thing will be the key of all we should say, think and reason about that thing (…). The name we will give the gold will be the key of all we can humanly know about gold, that is, by reason, and according to such an order that, by the examination of that name, we can discover which experiences should be rationally realized with that name» (GP 7.13)

There is, finally a third model, which I propose to call expressive representativity, aims to discover, neither the figuration of sensory particularities of the signified reality (figurative representativity), nor the essential basis of those particularities (essentialist representativity) but rather the analogical and structural reproduction of the network of relations constituting the idea and its articulations.

Even if rigorously speaking all representativity is in Leibniz expressive (since expression is for Leibniz the supreme instance of any kind of relation), it is now Geometry which provides the privilege model for the relation of expression. In fact, Geometry is characterized by the immediate establishment of an isomorphism between the idea represented, as an ideal structure, and its schematic figuration. But this isomorphism does not imply similarity, as the imitation of the original.[8] That which expresses does not have to be similar to the thing expressed provided that some kind of analogy can be discerned between them. The reaction of expression can even accept dissimilarity. As Leibniz says in *Essais de Théodicée:*

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8 In fact, this isomorphism implies a search, not for similarities, but rather, as Leibniz puts it, for *"un rapport constant et reglé entre ce qui se peut dire de l'une et de l'autre"(GP 2.112)*

"The same circle can be represented by an ellipse, a parabola, an hyperbola, another circle and even a strait line or a point. Nothing seems so different, neither so dissimilar, than those pictures; however, there is an exact relation of each point to each point" (GP 6. 327)

Now, it is within this expressive model that Leibniz points to a purely diagrammatic form of representativity. The most interesting indication is present in the fragment *Essais d'Analyse Grammaticale* (1683/4) where Leibniz considers to be licit to connect the components of characters by different lines since, in this way, he says, it would be possible "to see" all those components in a simultaneous way. It is worth wile to give the word to Leibniz:

«It would be licit to connect by different lines the parts of the character since, in this way, it would be possible to see the in paper in a simultaneous form while the sound speech vanishes and, thus, the first sound cannot refer the posterior unless the second contains something which corresponds to what it was in the first » (C. 285)

It should be noted that the recognition of the value of writing in contrast to speech which Leibniz presents here, it is not limited to the stressing of writing's advantages in terms of fixing and registering or as a support for the failures of attention or of reasoning. What Leibniz here emphasizes is the two-dimensionality of writing, the possibility of simultaneous grasp of the multiple relations which characters (and the ideas they signify) establish among them. That is, diagrammatic symbolism, to which the passages cited above tend, has the merit of permitting the simultaneous apprehension of the relations among the entities represented.

In another passage, Leibniz introduces a slight distinction within expressive representativity. As he writes in the celebrated *Dialogus de connexione inter res et verba*, of August 1677:

"Even if characters are arbitrary, their use and connection have nonetheless something which is not arbitrary, that is to say, a certain proportion between characters and things, and, at the same time, between the diverse characters which express the relations of things among themselves" (GP 7.192)

Leibniz is looking here for the possibility of displacing the ideal of representativity from the character (without however completely abandoning it) on to the plane of syntactic relations. The meaning of a

character comes now to depend either on its integration in a formal structure – its *usus et connexio* – or on the correspondence (*proportio*) between this structure and the structure of the real which it aims to represent. Now, it is the very form of relations between characters that is seen analogical with things in the form of their relations.

Ultimately, there is – I will further argue – another last possibility which Leibniz explores in the fragment *Characteristica Universalis* of 10th August 1679:

«The more exact are the characters, that is, the more they represent the relation of things, the bigger is their utility and if characters are able to exhibit all the relations of the things, as do the arithmetic characters that I use, then there will be nothing in the things which cannot be deduced from the characters» (GM 5. 141, our emphasis).

Representativity is again, not between structures (syntactic and natural) but between elements, between the individual (containing relations as its predicates) and the character as a sign which, through its own flexion, would "exibit" the multiple relations of the thing. It is now again each character, and not the relations between characters, that is to express the relations which individual entities contain as their predicates.

Then, within the expressive model of representativity, Leibniz pursues three approaches. In the first, the structure is purely formal; in the second, the structure becomes a source of meaning because, in itself, it imitates the real conceived as a structure; in the third the structure is absorbed by the sign and it is through the sign that it becomes expressive. If, in the first tendency (clearly diagrammatic) the semantical level tends to be entirely reduced to the syntactic, and in the second tendency (strictly structural) priority is given to analogy between the formal structures of language and the structures of the real, the third and last tendency (from the figurative and the essentialist models) recovers the requirement of the semanticity of the sign itself, that is, of a space that should be symbolically differentiated and, as such, indicative of the signified reality, open to the world which is to be known.

As I have tried to argue, it is precisely this indicative power of the sign, this openness of the symbolic system to the signified reality that Leibniz wants to safeguard at all costs. That is why he has pursued so many models, has attempted so many different ways of, besides operativity, gaining such a representativity.

This is a thesis which Leibniz recuperates and pulls through a long tradition coming from Plato´s *Cratylus,* the speculations on Adamic language all along the Middle Ages, Renaissance and modern times.

A thesis which will be advanced by Peirce's conception of the iconic nature of diagrams and of the revelatory, heuristic power resulting from the relational analogy which lives in their heart.

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We know that Leibniz never achieved any new language system nor have succeeded to establish a system of characters with the openness he wanted them to be endowed. He just left projects, drafts, sketches, numerous fragments, *specimina*, *échantillons*. However, his unfinished work must be regarded, not so much as a root of recent research in the area, but as a source for clarification of the difficulties as well as of virtualities involved, as a font for the formulation of powerful hypothesis and of delicate distinctions.

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