An Epistemology of Natural Logic to Understand Knowledge

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In the XIV Century, in particular after the European diffusion of "Scolastica patavina", the pedagogical component adopted by Logic permitted this subject to be valued as a primary set of natural principles, in the wide sense, which was then assigned to this term. Natural Logic was born with Humanism and continued for centuries, although with many differences.

The art of reasoning shared by individuals certainly existed and manifested itself in different ways to resolve everyday troubles, and contrast scientific logic, i.e. inferential deductive theory, which was born with Aristotele's syllogistic. Many distinguished logicians alluded to it, particularly **Leibniz** (e.g. his letter of 1696 to **Gabriel Wagner**, called Realis of Vienna, and his definition of common logic, [*Meditationes de cognizione, veritate et ideis*, 1684] concerning everything,which is perceived clearly and distinctively and is deemed useful although insufficient.

The present work doesn't claim to list the meanings and domains of applications acquired by natural logic over time.

It also became *Medicina mentis, Lumen naturale* (**Descartes**) so close to the *ésprit du cœur* of **Pasca**l, *Ars Loquendi, Art de la Pensée* coming then to **C.**

Wolff (1728 *Logica rationalis*), who distinguishes between natural and artificial logic, the former being *« le regole che Dio ha prescritto all'intelletto e la disposizione naturale che noi abbiamo a seguirle »*

« ciò che dirige lo spirito umano e da seguir per conoscer la verità, insieme delle leggi che governano ma anche costituiscono lo spirito umano ».

Because this is present in everyone, we can say that it is something **connate** but also **acquired** because it provides a coat to his knowledge and it can be *pure* or *applied*.

With **Frege** there is a turning point : Logic was apparently timeless, impersonal, completely independent from common thinking, constituted of objects (Gedanke) and concepts (Begriffe). It was necessary to distinguish it from the concept of representation (Vorstelung), which is "naturally" different for every person, and because of this feature it has to be removed (*heraus!*) (*Über den Begriff der Zahl*, 1891-1892).

In my opinion this is a very important contribution by Frege, who since *Begriffschrift* (1879), made really important clarifications and observations about what later will be stated and confirmed first by Hilbert and then systematically in the 1930s, i.e. metalogic, understood as the exam of logic system properties (like their consistency, exhaustivity, etc.).

Frege's aim was to define logic, which he considered as the laws of the human being: to attain his aim he had to free logic from everything could prevent him to realized his project. Many of the productions realized after Frege's work had to be placed in a metalogical context : even natural logic itself, which is being discussed in this work, could revalue the *natural* attribute, which on the contrary, caused a lot of problems in the past.

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Today it is possible to subdivide logic into 3 mainstreams :

1. Fundamentals (logicism) – Frege is the first and most preeminent representative of logicism . His aim was to found arithmetic, therefore mathematics, with only the resources borrowed from pure thought.

a- such radical view, carried on by Hilbert [1862-1943], was followed for a lot of time, although attempts have been made to make it more flexible:

b- **Gentzen** [1909-1945] later asserted that logic interference rules were similar to real constructions.

c- **Beth** [1908-1964] has expanded the inferential process through his semantic tables.

2. **Computational**- First Turing [1912-1954] and then Hilary Putnam and John McCarthy considered the human soul as a computer program: cognitive processes are totally independent from material supports. Building intelligent machines is the best way to create artificial intelligence, which allows us to understand natural intelligence. Thinking of the brain as a machine shouldn't highlight differences between respective activities: but it isn't so.

3- **Mental Logic**- Taking into consideration different points of view, people assert that there is a formal logic (classical or scientific) and a different logic (or model) (for biological, cognitive or social reasons). In this case it is just a matter of form and nothing else. Postulating macrostructures, which organize discourse as well as common thoughts, maybe introducing complex and definitive models, implies remaining linked to an idea of logic, which refers to matters regarding contents, duties and decisions , that is, themes belonging to predicate logic. This, despite the fact that they firmly refuse the idea that men-

tal logic is defined by formal rules (for example: **Kintsch, van Dick, McCulloch., Pitt, J. Laird, Evans**).

Considering this macro subdivision we suggest adding a natural or discourse logic that, according to this work, has the advantage of escaping from these universes, both in theory and formally, since it allows a constructive reciprocal relation between various knowledge branches belonging to different universes, i.e. classical logic, mathematics, genetic epistemology, linguistics, mereology, genetic psychology, rhetoric, sociology, etc.

The aim of natural logic is no longer to analyse how the devices of classical logic are formed: it considers several possibilities by which it is possible to understand cognitive faculties themselves, through the exam of the main expressive mean, i.e. everyday language.

It compares everyday language with logic, comparing two totally different universes .

It is fundamental for the former to be subjective, whereas for the latter is important the contrary.

Taking into consideration these observations, two pragmatic cases emerge:

A] There is a union of both languages, which might lead to misunderstandings and contradictions: therefore it is important to be as clear as possible.

B] There is a new way of studying, opposite and alternative to the classic one (called by Isabelle Stengers *Spirit mutilation*), having a well-defined base, but at the same time developing itself in new and different ways, producing original results.

The classic modality prevented contradictions and forced every discipline to affirm that its own point of view was the only one valid and that its aim was to say everything about the real world. On the contrary, alternative models

An Epistemology of Natural Logic to Understand Knowledge

now affirm that all the discourses of a specific discipline are by default incomplete and they represent only a point of view; thus they allow other perspectives, however relative, that could lead to knowledge.

L. N will be based on operations useful in order to think : we will certainly have deduction, but also analogy, the use of specific figures, etc. so we can say that this logic, which couldn't be «the physics of an ordinary object » as Gonseth said, will have to distance itself from formal logic, to create its own models, because it can't afford to produce a rigid system, as the Boolean dream intended to do.

Lets consider, for example, the notion of class, which is different from the one used by mathematicians. In this last case, a class defined as distributive, presents itself as a set of homogeneous elements. A really meaningful example that explains this concept is, I believe, Jean-Blaise Grize's:

"La classe distributiva (β) dei bacilli è l'insieme dei "micro-organismi x a forma di bastoncelli di cui la cellula non comprende il nucleo", ovvero xεβ=def. X è un "micro-organismo a forma di bastoncello di cui la cellula non comprende il nucleo" e β contiene null'altro. Un tale genere di classe non tiene minimamente conto dell'impatto che il termine "bacillo" ha su un padre, nel momento in cui il medico gli comunica: temo che vostra figlia sia stata contagiata da un bacillo. E' evidente che "bastoncelli" e "nucleo" siano termini che in quanto tali ben poco gli importino, mentre ciò che lo preoccupa è un insieme di ingredienti associati al termine "bacillo": Koch, tubercolosi, sanatorio, morte".

Following a logical perspective we are dealing with a class, in which cultural pre-constructions are present, related to this term.

From a certain point of view, they almost represent some "parts"of it, from which the definition of mereologic class stems (Lésniewski), almost a sort of nominalistic view of mathematics, which no longer quantifies groups but individuals.

These kind of classes give birth to natural logic.

It is therefore necessary to expand the notion of logic and extend it to knowledge problems especially adding an heuristics component and accepting the fact that it is established on rules as strict as the other ones, even if clearly falsifiable.

1- This allows the consideration of other forms of inference like the progressive one (cause -> consequence, therefore) or regressive ones (consequence -> cause, because), considered nonexistent by classical logic and excluded from any demonstration. It allows to structure reasoning, which expresses itself through discourse, with a chain of strong and weak themes in order to observe how their logical-discursive operations are analysable, being able to provide new suggestions to increase knowledge.

2- These operative strategies cannot be deductive only, they are also of other nature, like analogy, metaphor, etc. because these are strategies that, as Bachelard said [1884-1962], allow to «complicare l'esperienza, cosa che è la vera funzione della ricerca oggettiva».[1]

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[1] G. Bachelard, *Le nouvel esprit scientifique*, P.U.F., Paris, 1934 (notre citation est tirée de la huitième édition, P.U.F., Paris, 1963, p. 138).

An Epistemology of Natural Logic to Understand Knowledge

3- Communicating is a really complex act, because it is created by a succession of explicit and implicit processes: psycology, or rather *Gestaltpsychologie,* has demonstrated that vision is a product, obtained from the combination of what has been perceived through retinal receptors and other signals, directly related to stimuli. The perception act can be considered as produced from implicit inferences and we believe the same thing happens in communication. This means that natural logic has to consider the problem of implicit inference.

I would like to stress that it is necessary to talk about implicit inference because otherwise, we would be in the same position as Michael Anthony Eardley Dummett, who spoke about the importance of expanding inference supremacy, always on a explicit level, and referred to the enunciate form.

As regards my aim, or « da dove proviene la logica naturale, perché si è avuta la necessità di parlarne, ma soprattutto la si è sempre interpretata allo stesso modo o meno?», I distance myself from cognitive thories, which assert that first we have to know competences already formed and then determine how they should have been acquired during ontogenesis. On the contrary, I believe that it is impossible to understand a formed competence if we don't examine its construction in time, or in other words, its development.
Natural logic should be able to consider a subject's activities, progressively constructing and elaborating a knowledge object. This is the reason why I want to consider it as a knowledge of knowledge.

REFERENCES

BETH E.W. AND PIAGET J. (1961) *Epistémologie mathématique et psychologie*, E.E.G., XIV, P.U.F., Paris, 1961.

CELLUCCI C. (1998), *Le ragioni della logica*, Roma-Bari, Laterza, 1998

FREGE G. (1879), *Begriffsschrift, eine der aritmetischen nachgebildete Formalsprache des reinen Denkens*, Nerbert, Halle (trad. it., *Ideografia, un linguaggio in formule del pensiero puro a imitazione di quello aritmetico* in C. Mangione (a cura di), *Logica e aritmetica*, Boringhieri, Torino, 1965, pp. 103-206).

FREGE G. (1891) , *Über den Begriff der Zahl*, in: H. Hermes, F. Kambartel, F, Kaulbach (a cura di), *Nachgelassene Schrifte und wisseschaftlicher Briefwechsel*, F. Meiner Verlag, Hamburg, 1969, trad. it, *Scritti postumi*, Bibliopolis, Napoli, 1986, pp. 164-220).

FREGE G. (1893) , G*rundgesetze der Arithmetik. Begriffsschriftlich abgeleitet, I, II*, H. Pohle, Jena (trad. it. (parziale), *I principi dell'aritmetica*, in C. Mangione (a cura di), *logica e aritmetica*, Boringhieri, Torino, 1965, pp. 475-594).

FREGE GATTICO E. AND GRIZE J.B (2007), *La costruzione del discorso quotidiano. Storia della logica naturale*, B. Mondatori, Milano.

GRIZE J.B (1967), *Historique. Logique des classes et des propositions. Logique des prédicats. Logiques modales.* In J. Piaget, *Logique et connaissance scientifique*, Gallimard, Paris.

GRIZE J.B (1996), *Logique naturelle et communications*, P.U.F., Paris, 1996.

WANG H. (1974), *From Mathematics to Phylosophy*, Routledge & Kegan Paul, London, (trad. it., *Dalla matematica alla filosofia*, Bringhieri, Torino, 1984).

MANGIONE C. (1971), *La svolta della logica nell'Ottocento*, in L. Geymonat (a cura di), *Storia del pensiero filosofico e scientifico*, Garzanti, Milano, vol. V.

MANGIONE C. (1983) (a cura di), *Gottlob Frege. Alle origini della nuova logica*, Boringhieri, Torino.

MANGIONE C. AND BOZZI S. (1993), *Storia della logica*, Garzanti, Milano.