From Visual Perception to Learning and Science Objectivity

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This article develops some themes contained in the book "Through the microscope. Neuroscience and bases of clinical reasoning" with inverted comas enclosed (in Italian), published by Springer, Milan, 2011.

As a neurologist and neuropathologist who has spent a lot of time at the microscope, I am realizing that I started to think seriously about perception, learning and consciousness in microscopic experience when I grasped the maxim from Linnaeus "*nomina si nescis, perit et cognitio rerum*" [1] that referred to the old nominalism of William of Ockham and to the old debate about the universals of the XIII century. I understood that to know is to name. As a medical student I realized also that the observations at the microscope gave me a code for the interpretation of a reality that did not exist as such and I understood the difference between seeing and perceiving. Neurologically, I could follow the visual pathway and understood visual perception on the basis of Gestalt psychology that considers it a cognitive product consisting of two processes, the first being the distinction of the figure from the ground for its physical properties and following the seven laws that regulate form constitution considering that it is seemingly more than the sum of its constituents. Already in this process there is a cognitive principle that corrects the so-called "illusory figures" according to a constructivistic hypothesis. The second process is definitely a cognitive one that leads to the recognition of the objects in the visual field on the basis of the cognitive patterns already in place. If these are wrong, maybe because of the inability of learning from experience, recognition will also be wrong. This reminded me of the definition of delusion in psychiatry that can be found in every textbook: "a mistaken interpretation of reality that cannot be corrected either by science or experience." Everything can interfere on the mentioned patterns, including the psychic unconscious mechanisms that Kretschmer [2] called hyponoic and hypobulic mechanisms that are developed during lived experiences.

Observation at the microscope implies two fundamental assumptions: the first one is the impossibility to observe the external world without manipulating and modifying it physically and chemically by fixation, embedding, cutting and staining of the matter. The second one is the need to magnify it if you want to know its structure. At every magnification, not only does the

figure change its aspect, the context also changes and one must know it. The form and size of the external world are relevant to the structure that evaluates them, but it is induced by them in a material logic. It cannot be said whether the external world exists only if it is looked at, because as a scientist one must stick to the objectivity of nature, but it can be perceived through other means than resorting to the visual pathway, for example through electromagnetic waves, or it can simply be imagined.

At different magnifications, I see different things in the microscope field; for example, I can see cells, but are they labeled by a tag as "cells"? Or am I denominating a certain reality with the term "cells"? Calling them "cells" I do identify and interpret them on the basis of my specific lived experience that intervenes between myself and the reality under the microscope. At every magnification, different objects are observed: going from low to higher magnifications they appear as cells, mitochondria, membranes, vacuoles and then, in order to go deeper, I'll use electron microscopy and then PCR for the molecular structure and I'll see colored bands on a paper indicating molecules that run in an electromagnetic field, and so on. At every step I have to name what I see; therefore, I have to introduce the external world in myself through language. It is exactly what I learned from Linnaeus's maxim: to know is to name, as one will never be in direct contact with the "thing" itself, that Kant called the *vooúμενον*. Phenomenology was developed by Husserl just for this reason and in order to privilege the experience of consciousness [3].

At this point, it is mandatory to enter in the world of semiotics, linguistics, philology and philosophy of language, namely in the world in which the study of the phenomena of signification and communication is based on "something that is instead of something else" indicated by Umberto Eco as "Department" [4]. The philosophical or linguistic nature of semiotics has long been debated and specific semiotics and grammars have been generated. The semiotics of language and communication is of the greatest interest for a neurologist, because cognitive semiotics includes the external world, the language, the knowledge and biology of the semiotic-cognitive functions and it involves scholars of great renown [5-8].

First of all, to know means to modify and be modified; we can't

reach the “soul” of things, as already said, but only their features and on the basis of a reciprocal adaptation. The procedure implies to read the signs, to learn, and to catch the significance with a complementarity between the reading apparatus and the signs of the object where the latter induce the former and the process terminates with the formation of an internal signaling system. To know, i.e. to explore signs and significance is subjective and it can be objectified through standardization. Codes are formed. This process implies a historicization of the subject, as the structure changes after receiving the sign, in line with the concept of πάντα ῥεῖ ὡς ποταμός (everything flows like a river) of Heraclitus. The memory of the sign creates an analogical internal system that has nothing to do with the external one, but once the sign is brought out a recognition of the object takes place, as if it was reassembled. In this phase of the knowing process the hypothetical function intervenes with its store of perceptions, instincts and feelings. The language would derive from the inter-subjectivity and would be a linguistic communication. To categorize means to find a name using the analogical function, and the logical operations would always be categorical identifications. The scientific language would be similar to the common language with the inter-subjective standardization and with the introduction of measurements. In the above described process, the interpretation, as for example of a text, would have a great importance.

What has been said could be interpreted in terms of the opposition between empiricism and rationalism, Plato and Aristotle. However, it could be interesting to quote Wittgenstein [9] according to whom “to be in the world and to think the world” would be the same thing, as for Heidegger between language and being [10]. Language would be a representation of the world. In the Sapir-Whorf’s hypothesis [11] a correlation would exist between the linguistic categories and the way the world is understood: in other words, there would be a linguistic determinism.

In microscopic observation other elements are fundamental for the achievement of the intended purpose, i.e. the study of the objects in the microscopic field: the concept of space, attention, the personal lived experience and the emotional state of the observer. There exists the possibility that emotional interferences affect the first visual perception process; they are the so-called “unconscious inferences” of Von Helmholtz, that can influence, together with the hyponoic and hypobulic mechanisms, the formation of the mental images or patterns belonging to the already mentioned internal analogical signaling system or its application in the recognition of the external world. Interferences

may arise from our imagination, as in the *reveries*, that do not pass through sensations and with which the consciousness goes beyond materiality toward freedom [12]. Mental images are used for the recognition of the external signs and can be creative. The emotional state of the observer and his lived experience may greatly influence the recognition of the external world and be misleading, in addition to the non-existence of a clear-cut demarcation between the real and microscopic worlds. It is at this point that ideologies or false beliefs can be inserted. Another feature of the microscopic observation is the unavoidable anthropomorphism that is spontaneously applied to the objects of the microscopic field and the possibility that emotional states are induced in the observer by the microscopic fields themselves.

At the end of this exposition, one wonders what the so-called scientific objectivity is invoked at every turn: nothing other than the application of mental patterns in dialectics with the scientific inter-subjectivity to objects rigorously criticized and logically detected.

It would also be of great interest to know the significance of microscopic fields for lay persons who would have all the opportunities to reveal their hyponoic and hypobulic mechanisms, as in a Rorschach test.

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