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## **Editorial**

### COMPLEXITY, SCIENTIFICITY AND KNOWLEDGE TODAY

#### Premise

It must be emphasized that what makes the concept of complexity original is the fact that for the first time, a vision of the world exists that is the result of truly symbiotic interaction between science, history, art, philosophy, etc. Now history mediates with science, art, psychology, philosophy, sociology. In particular, science is historicized through Fourier and Prigogine. While, through Croce and Bloom, the role of knowledge through imagination was developed in art. In psychology, through the emphasis of the role of the irrational which, with Gestalt, is part of a Whole. As far as philosophy, through Vico and Hegel, the right historical context was established, and with Morin, sociology became qualitative. As a result, it seems that the pathways thus followed, now converge "naturally" towards a common "meeting point". Ideally methodology, which can be placed in a theoretical horizon that is bound by a field produced by the new concept of science, has emerged from all of these interactions. To understand it well, then, we must ask: What does science mean today?

To respond adequately, we must begin by saying what is not scientific. First of all, it is not a scientific principle that, even in the thirties of the twentieth century, when Moritz Schlick said that "the meaning of a proposition is the method of its verification" because the upheaval caused by the relativity of science has now shown that there are no theories verified once and for all. This applies not only to processes that relate to the macroscopic world, such as the Newtonian theory, but also to those addressed to the microscopic world, where, according to the uncertainty principle, nothing is verifiable with the desired accuracy.

The same consideration must be applied to of Poppers “falsification”, born in 1934. In fact, in 1927, the principle of complementarity of Bohr had been shown to be inconsistent, as while in his experiment the corpuscular theory of light was falsified, in another experiment it was shown to occur, thus fueling a dualism that by now has imposed itself as "structural". In other words, the resulting wave-particle dichotomous image made two "complementary" paradigms whose consistency has become undecidable and annulled. Thus, forever pretending to draw a line of demarcation between science and metaphysics. As a result, the whole debate that had animated the neo-positivists and that had aroused the alternative proposal of Popper has evaporated like a soap bubble. The timeless connotation of scientific theories has proved to be unsuccessful and is a dead end.

The way out consists of a moving response that was provided jointly by the new historicist science and a renewed philosophy, which is, of course, also historicist in a sense. First of all, this way tells us that today science is qualified at a theoretical level, starting with a dual combination of both history and complexity. So science, understood in epistemological terms, is now historical and complex and does not mix with reductionism and even more exclusively with eternity. Scientific methodology also means a historic route that, according to an unpredictable bifurcation cascade, meanders and creates the unexpected and therefore makes human life worth living because it constantly produces new indicators and starts new routes. Thus, it is ensured that there is a future, because the future is not what is pre- vis; it is not what has been seen "before" and therefore it emerges as an absolute novelty, without repeating a deleted past that is instead "kept " in the very moment in which it is passed.

Today science means, then, reversing the famous aphorism, that "everything under the sun, is always new " in nature, as in history, nothing is repeated; nothing "is"; everything becomes. In this sense, Ilya Prigogine is absolutely right when he considered Hegel's "source " of new science essential. Hegel, who first realized that "everything is history and nothing but history," expresses something we have seen repeated by Benedetto Croce. Given all this, we must reshape, not only the image of the world that humans have created, but also the sense of their relationship with it. But the significance of the scientific term does not end here.

As we have seen so far, the emphasis has been on the discussion of the theoretical significance of the term “scientific.” This is because it cannot not remain confined in this area because it still persists even its traditional context, which is linked to the technical and practical level. In fact, the

turning point which occurred in the meaning and the role attributed to science does not erase the established character, but simply reshapes it. In other words, from a practical point of view, science continues to mean what it meant to Galileo and Newton, except, of course, the claim that scientific nature also includes a full understanding of everything with which we encounter. In this sense, scientific theories are constructions of the intellect which facilitate the manipulation that man has always tried to exert on natural objects. So they do not reflect the objects, but build a framework within which the so-called objects take on a role and a presence directly arising from this frame in its entirety and in its appearance, as outlined by the theoretical turn.

#### I. From the realism to constructivism; from the photographer to the artist

The belief that scientific theories should accurately reflect an objective external reality is hard to relinquish not only because we have absorbed and supported it for more than three hundred years, but also because it seems strange to question that there are "real" entities beyond us. To be able to speak convincingly and persuasively of a "constructed" reality, then, is the first prejudice to be thrown out. First, we must prove that the concept of objective reality is not as obvious as it appears. In theoretical terms, we must denounce the ingenuity of the "realism" of old and new. This is done by using the argument that seems the most striking and the most convincing at the same time.

From Aristotle and Ptolemy and beyond, the quintessence of objective reality in its entirety has been identified with a heaven of the fixed stars, which, as you obviously know, was deemed immutable, incorruptible and not made up by earth, water, air and fire, but of a fifth essence, of a particular item : "eteros " literally, "different" than the other four "sublunary" elements. As we all know, from Ptolemy to Newton we have attempted to accurately reflect the structure of this immobile and therefore incorruptible universe. Everything went well enough until 1905-- until, that is, Albert Einstein, without having the slightest intention (and perhaps not even being fully aware) messed everything from the ground up, as a whole, down to the most minute details. His arguments seem to have simple and limited effects. Specifically, they produced unpredictable consequences. Although these arguments are well known, it's convenient to summarize: we can neither send nor receive signals at speeds greater than that of light, which travels at high speed, yet it is still "limited." This implies that the time it takes for a signal to reach us is the time required to cover the distance that separates us

from the place from which it started. It is possible for an instantaneous transmission of signals. But we know, through Einstein's established claim, that all the stars that make up the "firmament" are an immense distance from us. Their signals require thousands and thousands of light years to reach us. This means that what we see "now" are only light signals left thousands and thousands of light years ago from objects that we have no way to verify if they "still exist", to see if they're still real and existing at the time when we perceive their signals, precisely because they were sent so long ago. So what we observe is not the present but the distant past of certain objects, which are extremely far away from our history. In short, "incredibly" due to our nature, we perceive signals from objects that may no longer exist. The problem is that the distances are such that we cannot even try to test them. So, the question: "Do the stars we see still exist?" has no serious and plausible answer. We will have to respond, using a popular expression of Du Bois-Reymond: "ignoramus et ignorabimus." So what is real? The only serious answer is: the concept of reality varies with the distance of the events around us, and varies also depending upon the objects of which each of us chooses to check "reality"; the objective consistency. Envisage all that is considered reality and reality really is, at best, a "social construction" as claimed by Berger and Luckmann. Its aspects acquire greater or lesser importance depending on the interests of the one who allows to "emerge" from a continuous whole, the isolated parts, that which to them for various reasons is "interesting." This brings us back to the heavily supported thesis of Ernst Mach.

Given the idea of Reality which corresponds to the traditional scientific idea of an eternal substance, objective and unchanging, the same for any observer, the scientist's task was to develop a theory that perfected the adequate structure of reality itself. So everything was considered scientific which implemented the complete *adaequatio intellectus et rei*. Today it has completely failed its own static concept of reality, so the outlined theories are recognized, as we have seen, such as "free creations of the human intellect." What is real is what exists in "real time" and depends on its distance from the observer. Returning to the question: "Do the stars we see still exist?" we finally realize that this is no longer paradoxical. If we are forced to wait thousands and thousands of light years to receive a signal after it has started, how do we know if by the time it arrives, the source still exists? This question has no answer. Similarly, it is equally impossible to answer the question: What is the most powerful telescope in the world "observing" at this very moment?

For this and many other reasons, it was concluded that all reality is constructed by the observer, each of us outlining our own reality and for this, as you recall, the concept of objective reality should be bracketed. The scientist, not being a photographer who passively reproducing parts of reality, becomes more like an artist who creates the landscape. Until some time ago, it was said that "the map is not the territory "; now this expression is noted with greater awareness. So Bergson was perfectly right when he described the immeasurable difference between wandering the streets of Paris or only seeing it in postcards.

## II. The science of complexity

The universe around us, as we knew it, is no longer. It would be better to call it a "multi-verse" in which regular and repetitive events, until some time ago, seemed the only alternative, instead of being events characterized by instability and fluctuations whose course is, in principle, unpredictable. These events led to the incredible variety that exists and continually evolves. Given this, we need to develop "new concepts and tools to describe a nature in which evolution and pluralism have become the key words." The two sciences that have had a major role in turning the quantitative and reductionist approach to the historical and complex were the thermodynamics of non-equilibrium physics and the theory of dynamical systems based on the concept of instability for which a small change in initial conditions of an event can cause, distance, catastrophic effects. In the sense that, taking a now famous example, sometimes the flutter of a butterfly's wings in the Amazon can cause a tornado in the United States. So the new science of evolution discovers complexity, diversity and instability in the same place where science was once classical immutability, unified and stable. It turns out that simplicity is our own invention. It turns out that complex behaviors and diversified discoveries that surround us and that the emergence of the new is what characterizes every real event. Thus, the twentieth century has become the century of excellence for complex and, in fact, since the 60's, we are witnessing a revolution both in mathematics and in the physical sciences, which requires a new attitude in the description of nature." It requires us to recognize, at all levels, the complexity of the Real. In what sense, then, can the theory of complexity be defined as a scientific theory? Is it seriously plausible? It is scientific in the sense that it has created new criterion for science, but also in that it has a base, a content both in thermodynamics, the science of heat, and in the new sciences that have understood that the real world is inherently unpredictable because of its continuous transformation. In short, the science of complexity in its first

appearance and in the additional results which are articulated in a manner more evident every day, in the direction of developing a vision of the Real, strict but indeterministic, has become concrete and, for this reason, cannot be generalized. All the innovative science of the last century expressly moves in this direction and actually converses with the real world thus deconstructing the "paper world " of classical science.

### III. The epistemology of complexity

Recognizing that reality is complex and is enriched by an endless series of events that intertwine with each other, modifying each other in a radical way, means treating the complexity of the real as an object to be examined from an epistemological perspective. It means to flesh out the uncertainties, contradictions and inextricable tangles that form its diversity. But, considering everything that is recorded, the plurality of each event that interactively organizes itself, with the task of those who put themselves in the perspective of complexity, cannot ever be complete. To be complete requires the use of complex thought to deal with interdependence: the multidimensionality and the paradox. In other words, the complexity is not only the problem of the object of knowledge, it is also the problem of the method of knowledge necessary to this object" But this method cannot contain itself in the forty pages used by Descartes. It cannot be definitional and analytical. The method of complexity needs a historical reconstruction of the origins of the universe and ending with the productions, at the highest level, of man-made ideas. This method, after an appropriate historical-theoretical analysis as Edgar Morin unfolds in a few thousand pages, is primarily, that in view of the complexity, epistemology has become open; it is no longer prescriptive; it is no longer "episteme." This is not imperative but purposeful, and it does not intend to convince but to ensure free membership for the interlocutor. One must persuasively declare through rational argumentation and should not be defeated by the power of constraint of rigorous proofs.

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