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Complex thinking and transdiscipline

Pensamiento complejo y transdisciplina

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Abstract

This study is based on the outlined path that goes from Rationalism conceptualizations and postulates of Classic science as regards the conception of man and life to the paradigms that opened their way to think about current challenges, which, from complexity, debate with human sciences. A world of disciplines studied with certainty and methodical purpose requires another world that goes through, questions and reformulates its postulates from the emergence of crisis and rifts. These are the rifts that trigger off research in complexity, which will provide this work with grounds. The need to define truth scope has encouraged a field of study and diverse philosophical models, which, from Rationalism, have provided truth procedure with a shape. It is from this development that complex thinking advances with its conceptualizations and reflection paradigms, being the objective to delimit the concepts that question deterministic postulates and to delve into the meaning of scientific revolution in the 19th century. Sciences entry in the development process breaks away from conceptualizations of isolated procedures, aiming at transversal communication among the heterogeneous. If the challenge is knowledge advance, its progress, nest in uncertain complexity.

Keywords

Rationalism, idealism, scientific knowledge, subject.

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Resumen

El siguiente trabajo se encuentra centrado en el recorrido trazado desde las conceptualizaciones del racionalismo y los postulados de la ciencia clásica respecto de la concepción del hombre y de la vida, hacia los paradigmas que se abrieron camino para pensar en los desafíos actuales, que desde la complejidad debaten a las ciencias humanas. Un mundo de disciplinas estudiadas con certeza y propósito metódico requiere de otro mundo que se presente atravesando, cuestionando y reformulando sus postulados desde la emergencia de crisis y grietas. Son estas grietas las potenciadoras de investigaciones en complejidad y darán fundamento a este estudio. La necesidad de delimitar zonas de verdad ha animado el estudio disciplinario y de los diversos modelos filosóficos que, desde el racionalismo, dieron su forma al procedimiento de cada verdad. Es desde ese devenir que el pensamiento de la complejidad avanza con sus conceptualizaciones y paradigmas de reflexión, siendo el objetivo, tanto delimitar los conceptos que cuestionaron los postulados deterministas como ahondar en el significado de la revolución científica del siglo XIX. La entrada de las ciencias en un proceso de devenir rompe con las conceptualizaciones de procesos aislados, apuntando a la comunicación transversal entre lo heterogéneo. Si el desafío es el avance del conocimiento, su progreso anida en la incierta complejidad.

Palabras clave

Racionalismo, idealismo, conocimiento científico, sujeto.

Introduction

In its historical evolution, the concept of discipline has been detached from the need of the human spirit to arrive at the establishment of essential truths for every individual and every society. We will begin by analyzing the conditions and historical advances with respect to classical research in science methodology, highlighting three questions for reflection: the historical evolution of scientific thought with some postulates that were decisive for such progress, studies on the language that has allowed to expand its conceptual frame towards the pertinent scope to the complexity and the paradigms that have facilitated the development of the complex thought and defy the thought of today.

To begin with, it will be called the scientific method, according to Pérez Tamayo (1998), to the set of theoretical principles, rules of conduct and mental operations used by scientists to produce knowledge. The thought of Plato and Aristotle has initially marked two courses in the research processes that traced the future. Plato started from the concept that the facts are imperfect reflections of the ideas and a new knowledge had to increase their understanding by means of the intellect. His procedure was carried out through dialogues in which ideas took on an a priori dimension. His world was divided into two, one sensitive constructed of opinions and another intelligible recipient of scientific and philosophical knowledge. This diagram allowed him to draw a vertical line, which would generate an epistemological and an ontological plane, along with

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a horizontal line that would demarcate the plane of the doxa or opinion in the lower territory, seat of images and shadows, and knowledge and the episteme in the upper territory, the seat of two spaces: the mathematician-geometer and that of pure ideas. His philosophical scope were those pure ideas reached from the opinion and its images towards the mathematical models conducive to the perfection of them. His method was the dialectic, as opposed to successive intuitions, if what you want to find out is an anticipation of knowledge, which will then be denied or discussed until the purification of the thesis.

On the other hand, Aristotle, following the approach of Ferrater Mora (1985), defined a world in which the existence of continuous change in appearances is made with a preservation of nature, a world of an invariant substrate that would adopt different forms. His method was logic for the study of ways of knowing, contributing to the theory of knowledge from four sides: the theory of syllogism, by which the same principles of reasoning apply to all sciences, defining syllogism as two premises and a conclusion united by implication; the theory of definitions, such as concepts or universals that require sufficient attributes for something to be in relation to its essence; the inductive-deductive method, in which he establish specific premises for both induction and deduction; and the theory of causality by which he establishes four types of causes, from the obvious to the less apparent. For the synthesis proposed by Pérez Tamayo (1998), in the Middle Ages the scholastic thought investigated the difference between the two procedures that go from causes to effects and vice versa, arriving to consider logic as an instrument and a method of definition equal to syllogism.

Corna Fernández (2018) argues that modern science, by breaking with the dichotomy between revealed truth and medieval discourse, left pending the delimitation of what is real and how it works. This stage of science begins with research that had specific precursors. Among them, Galileo (1564-1642) used experiments to explore ideas about the mathematization of physical science and astronomy. Then Harvey (1578-1657) used experiments to explore nature in biology, Newton (1642-1727) took as his method the analysis and synthesis, in a different use than today's, and Hooke (1635-1702) was the first microscopist. Leibniz (1646-1716) developed two principles of use in science, that of contradiction and that of sufficient reason, by which nothing can happen or exist without there being a sufficient reason for it, and Bacon (1561-1626) traced a new method trying to correct the deficits of the Aristotelian theory, providing a procedure to make gradual and progressive inductions, and a method of

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exclusion to gather empirical information, drawing the final causes of the field of investigation. But it will be Descartes (1596-1650) the founder of *modern philosophy*, proposing that scientific knowledge starts at the top and from there it goes down the path of deduction until it reaches real nature, being able to be done a priori, in the absence of the reality and being his "I think, therefore I am" the conception of clear and precise forms, immediate and obvious to the mind. In the consideration of Hernández González and Salgado González (2011), two are the contributions that deployed Cartesian thinking for modern philosophy in the future: on the one hand, a methodology with which it recovers mathematical science as a model of knowledge based on the "methodical doubt", on the other hand, metaphysics for the analysis of the method that will redefine the concepts of substance, attribute and truth.

For Descartes, the task of philosophy will be to analyze and *discover the truth*. How to discover the truth? For Hartnack (1986), finding undoubted propositions, logically impossible to deny. The knowledge of the object through the cogito and the deepening in the knowledge of the subject, will give a final point to Descartes to the exaltation of the senses, inaugurating the idea of an imagination in the direction of the rational affirmation of the subjectivity, with an act of faith placed in that construction of reason. It was the help of the principle of mathematization, which allowed to settle the four rules of its methodology as paths to the truth: the *evidence* of the truth, as clear as distinct, the *analysis* of the reduction of the complex to the simple for the understanding, the deduction as a way to get to the complex and the *verification* or discovery of the rules of knowledge. Thus, the first route towards a *philosophy of the subject* was drawn, where the person exists as a thinking being, the world is known by the cogito and there will be no separation between existence and thought. Thought and extension will be substances deployed from their base subjectivism, being easier to know the soul thought than the body/extension. If the substance exists in such a way that it has no need of anything else to exist, God will be considered as an infinitely thinking substance, the cogito as finitely thinking and the world as extensive substance. Who will God be? Hernández González and Salgado González (2011) will say that the guarantee that understanding needs a natural agreement between thought and things. Three substances, but two ways of being of the substance: thought and matter, finding in their struggle against empiricism a proposition beyond all doubt: "I think, then I exist". The Cartesian strategy has been to move to the subjective treatment of the idea, defined as a representation of the world, ideas that will be fac-

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tual, adventitious or innate, always of objective and formal aspect once configured and detached from the thing.

The culmination of the evolution of Plato and the Scholastics of the Middle Ages is dualism and mechanicism with the postulation of two parallel worlds, independent and incapable of interacting with each other: the body and the mind. Plato and Descartes had their opposition in John Locke (1632-1704), considered the founder of empiricism, a doctrine that derives all knowledge from experience (except logic and mathematics), stating that there are no a priori intuitive general principles, since our ideas come from sensations and perceptions. Pérez Tamayo (1998) has specified that Berkeley (1685-1753) states that the universe of sensations is real and perceptible, although not related to external reality. If "to be is to be perceived," what has real existence is the world of sensations. His philosophy criticizes Newton for his transformation of mathematical terms into real entities, staying in an idealist position. Hume (1711-1776) will come to take another step towards empiricism, taking the thinking of Locke and Berkeley to its ultimate consequences. With the absence of a priori ideas or concepts, he dissected Locke's ideas in impressions, derived from sensations gathered by the senses and ideas conjured by the mind. Thus, the elements that contribute to a complex idea come ultimately from sensory impressions or ostensive definitions. This reasoning is an empiricist creed, which gets rid of the metaphysics of substance, the theological notion of soul and the epistemological notion of subject and object. The thought of Hume contributes, for the structure of the scientific method, its opposition to the consideration that the same effects have the same causes. There being no regularity of nature, it invalidates the use of induction and takes to enunciation to arrive at valid generalizations.

In their review on the construction of philosophical concepts, Deleuze and Guattari (2001) consider that the "I" of Descartes, being a concept that is made of doubting, thinking and being, will have a multiplicity in itself, which transits from the "I doubt", to the "I think" and the "I am a person who thinks", this being the event of his thought: a first zone made of doubting and thinking, and another zone made of thinking and being. In the middle, the components of the declination of these verbs will be "variations" that don't have a radical importance to think how much is the reason that there is in the Cartesian concepts, because - like all other philosophical concepts - they must be valued according to the problems they are trying to answer and the plans they draw in their formulations. The authors (2001) consider that a concept will no longer be a truth but

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will have the degree of truth that is relevant to the conditions of its creation and its usefulness in the temporality of an era, declining with the emergence of better concepts in relationship with new variations and resonances hitherto unknown. Therefore, each concept brings an event that unites it to its past and overflows it, and at the same time, every concept will have a perimeter irregularity, and will form a whole as it articulates its components and will be fragmentary as long as any composition will show its non-composite areas.

Hernández González and Salgado González (2011) will conclude that Cartesian ideas, as clear as distinct, were a solid basis for advancement in the disciplines, providing both the benefits of specialized and organized coherence and the disadvantages of super-specialization with its concomitant fragmentation of knowledge and power. Movement that managed to install a blind spot made of a disjunction between the sciences of nature and the sciences of man. The spirit and processes of cultural, social and historical change were left out of their implication in natural processes and theoretical conceptualizations. Dead end with an unprecedented progress of scientific knowledge, together the progress of ignorance. Morin (1982) opens a path in this quagmire, by defining that all sciences, including physical and biological, should be considered as social, since the anthroposocial shows its rooting in the biophysical dimension, while each science has an important submerged part of non-scientific character, that as a "blind zone" tries to settle in the belief that scientificity is to reflect the real, avoiding processes of changes within the theories themselves and in the scope of the refutations. So, it was that from the hand of Cartesian thinking the paradigm of mechanization was introduced, by which nature is an automatic functioning machine and subject to dual laws of regularity, which with the principles of inertia, rectilinearity and conservation of movement, have made the framework for this thought. In the words of Morin (1982), it is noteworthy not to have perceived that the cut between science and philosophy made from the seventeenth century, with the dissociation formulated by Descartes between the thinking self and material thing, has created a greater problem for future investigations.

In relation to the scientific method, it was Kant (1724-1804) who raised in his fundamental thesis that none of our knowledge transcends experience, being a priori and not inductively inferred. Chaves Montero and Gadea Aielo (2018) have argued that critical philosophy was the mediator between the rationalist dogma and the empiricism of the senses. Kant considered that rationalist philosophers like Leibniz and Descartes

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tried to solve problems by means of pure reason, without reaching reality through the senses. The external world only causes the matter of sensations and our mental apparatus proceeds to order it in space and time. Subjective space and time insofar as they are part of our perceptual apparatus and, a priori, part of all experience. Pérez Tamayo (1998) synthesizes that the Kantian categories form mental patterns within which intuitions or sensations acquire meaning as objects and the interaction between intuitions and a priori categories gave rise to their doctrine of schemes to achieve the principles of pure understanding.

Nowadays, the dogma still manifests itself unassailable by experience and science undertakes a sustained struggle for truth, with ideological overtones that at times point to a necessary conceptual revisionism. The advance of knowledge in various disciplines has also shown the conflict of ideologies, metaphysical assumptions and power systems that act on a field of compossibility that has high incidence at the time of thinking scientifically, choosing territories and banishing others, favoring advances and impeding valid and novel deployments. That is why in this work its advocated to advance from the disciplinary crises with the morinean thought (1982), which insists on the need for a science of science, a *meta-science* open to *meta-horizons*, since Foucault (2002, 2012) –in relation to the weight of ideologies– all rationalization constructs a closed logic and as such, a system of obedience, of exclusion to the different and of surveillance.

Methodology

What concepts questioned the basic postulates of the determination of rationality and modern science? Relativity, quantum mechanics, genetics and molecular biology moved the representation of the Cartesian universe away from the scene and aggravated its postulates. What significance has the nineteenth century scientific revolution? Considering Otero Carbajal (1993), it has been fundamentally the crisis in the explanatory matrix of the "world system" that from the middle of the eighteenth century relied on rationalism and -embracing the work of Kant- left the law of causality as fundamental law of the nature and condition of all possibility of knowledge. What in Newton (1642-1727) were postulates, in Kant they were already absolute foundations, determining with representation the consolidation of Darwin's evolutionary theory (1859). In this way, the mechanism of natural selection was sustained as the basis of adaptability

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to the environment and its equations on the survival of the inherited variations. In the same way, it happened in physics, where the corpuscular theory, together with the wave theory of light and the development of electromagnetic phenomena, opened new representations of nature. The nineteenth century has also brought with it two important currents for the future of the philosophy of science: empiricism and positivism. Stuart Mill (1806-1873) was the great English empiricist and proposed that mathematical principles are also empirical and not relations of ideas –as Hume postulated– nor products of the mind –as Kant pointed out– these arise from the observation of the world around us. The central operation of his system is the induction that rests on the principle of the uniformity of nature, by which what happened once will happen again in similar situations. Anyway, Hume was not refuted by Mill, because while one centered his arguments against logical causality, the other took refuge in experience without exceptions. It was considered that positivism, initiated in the nineteenth century, found its philosophical sources in Bacon (1561-1626), English empiricists and philosophers of the Enlightenment, being noteworthy the contribution of Comte (1788-1857), which had two main objectives in his research: demonstrate the need and ownership of a science of society and show the different sciences as branches of a single trunk. His famous course begins with the enunciation of his law of the three stages (theological, metaphysical, positive), through which the primary cause, the essence and the law should be sought, showing at each stage a well-defined phase of the history of the sciences, a stage in the mental development of the individual and the structure of society. Following Pérez Tamayo (1998), the great goal of *positivist philosophy* was to advance in the study of society, taking sociology out of the domains of religion and metaphysics, to bring it to the field of physics and biology. Comte considered, in relation to the scientific method, that as the facts become more complex, the methods necessary to study them also increase in complexity, being convinced - unlike Descartes - that each discipline develops a logical and operational strategy appropriate to and from there emerges its methodology. For its effects, he used the methods of observation, experimentation and comparison. For him, the first procedure is the observation of the facts, but not in the sense of Hume (groups of sensations) or Locke or Mill (registered phenomena as they occur out there), but more in the sense of Kant (data perceived within a context not of categorical imperatives or fundamental ideas, but dependent on some hypothesis or scientific law).

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Mach (1838-1916) was considered the most refined positivist, influenced by Comte, Berkeley and Darwin. His world was constituted by feelings and relations between them, in the style of Comte, but as a Darwinian positivist he accepted that there were thoughts and deeds to which ideas could be more or less adapted. He used the notion of "mental experiments" as theoretical questions and answers that allow discarding hypotheses to explain a relation between facts or the existence of a phenomenon. Very close to him, Pierce (1839-1914) would not have liked to be considered positivist, since his beginnings were like Kantian and his life ends in pragmatism. His interest was logic and his contribution was that every proposition requires abduction of a hypothesis, deduction of its consequences and evidence for the explanation of the facts. In these steps his scientific methodology was based. If, according to the positivists, the hypotheses should be put to the test, Pierce gave importance to socio-economic factors in the structure of knowledge, which Mach would never have accepted. He insisted that the only way to discover the principles on which the construction of anything is based is always considering what is going to be done with it. His pragmatism is related to relativism (from the hand of Kuhn) and Darwinism prevails in his last writings. Following the positivist tradition of Mach, Poincaré (1854-1912) contributed to the methodology of science by conceiving an order of the universe independent of man and his knowledge. Objects for him are groups of sensations "united by a permanent league", so that science does not aim to teach nature, but its relationships. We should not ignore the consideration of Bolaños Vivas (2015) that it was Husserl (1859-1938) who discovered the connection and transit between intentional acts that not only empower the cognitive function, but the function of representation of reality. It is important to add his name in this section, because he led with transcendental phenomenology one of the most influential movements of the twentieth century, trying to renew philosophy to bring it closer to a strict science and collective scope. Perez Tamayo (1998) will continue his formulation in which after the Second World War, the entry into the scene of *logical positivism* or scientific empiricism was the antecedent of the Vienna Circle (1907), moment in which the physicist Frank, the mathematician Hahn and the economist Neurath, gathered around the philosophy of science, inclined towards the thought of Poincaré and Mach's positivist anti metaphysics. With the contributions of Carnap, the Ernst Mach Society was founded in 1928 to disseminate and progress the vision of modern empiricism. Through its manifesto "The scientific vision of the world: the Vienna Circle", the movement is defined, and

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its origins are identified in Hume and Mach, in methodologists such as Poincaré and Einstein, in logicians such as Leibniz and Russell and in sociologists like Marx. Wittgenstein (1889-1951) emerges in Vienna proposing that the external world exists as a group of facts, constituted by different configurations, whose components are represented by elementary propositions, logically different from each other and without connection between them.

Carnap (1891-1970), for his part, introduces the concept of pseudo-problem, as problems that belong to metaphysics, ethics and aesthetics, and can only be considered as propositions without meaning. He postulated the union of all sciences according to a unit of quantitative protocols that express defined points in space and time. In such a scenario, scientific progress will make an advance in the levels of accuracy, fundamentally of reduction, that allow to make predictions in relation to degrees of verifiability. Reichenbach (1891-1953) assigning the postulate of the "blind spot" a probability value, was antecedent to the development of molecular biology and genetic engineering, opening the interest for the life sciences since 1950.

Advancing with the vision of Pérez Tamayo (1998), the field of science arrived to our times was dominated by Popper and Lakatos, and by Kuhn and Feyerabend, coinciding the latter in the incommensurability of paradigms or scientific theories. Thus, while Popper represents science as a battle between theory and experiment, considering as valid data theoretical falsification, Lakatos (1922-1974) advocates "scientific research programs" formed by the union of theories around a central nucleus, a negative heuristic protective belt that preserves the nucleus and a positive heuristic layer that absorbs data without altering the nucleus. The objective of both is not to reach the truth, but to gain in credibility. For his part, Kuhn (1926) advocates a concept of growth of science through revolutions that involve immeasurable paradigms at play, while Feyerabend (1924) is sustained in the irrationality of science, inclined to go against the rules.

If the development of the sciences offered its conceptual vagaries, the discussions on the scientific method, focusing on the role of the a priori concepts, the mathematization of knowledge and the crucial role of the experiments and the criteria for the selection of hypotheses or theories have always remained valid. Two concepts of Feyerabend (1989, 2002) emerge here, useful for Morin's proposals. The first allows the theories to differ in different domains where there are no experimental results available and the second allows to leave the differences within a margin of

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error of the observed territory. Taken as a whole, these reasons facilitate an important freedom when it comes to theoretical construction.

It is considered that the *principle of causality* of Kant has shaped a milestone for modern philosophy, either in its phenomelogic or "deterministic" way, by which the phenomena are linked to each other, or in their "free" mode, as the ability to start something of phenomenic order without prior determination. It was also Kant who built a great system of concepts about space-time. Time has ceased to be the number of periodic movements, acquiring its own excess, its purity and its emptiness, moment from which, for philosophy movement will be subordinated to time. From then on, both *succession* and *coexistence* will be a mode of time, presenting itself as duration (coexistence) or permanence (succession). Space that according to Deleuze (1994a, 2008) will be a pure form of exteriority.

From the development of scientific disciplines, in physical investigations, Einstein (1879-1955) tried to find a formal and general principle of compatibility between the principle of relativity and the propagation of light, reformulating the notions of space and time, disappearing absolute time of classical mechanics and assuming absolute space its utility for the determination of spatial distance. According to Otero Carbajal (1993), a series of investigations allowed to establish the transformation of the space-time magnitudes of an event, when passing from one reference system to another, throwing down the notion of a privileged inertial system. It was the Special Theory of Relativity, 1905, that achieved the break with a harmonic and totalizing structure of the universe and then, in 1916, with the General Theory of Relativity, the notion of a space-time under the effect of a gravitational field, with a new geometry of the space-time continuum, of a non-Euclidean character. Thus, the *infinite and static* universe gave way to a *finite and dynamic* universe. This theory eliminates the basic epistemological presuppositions of classical physics, establishing the modern representation of the universe. It will be recalled that Planck (1889-1928) initiates another epistemological fracture with the notion of "Planck constant" or "how much of action" or "how much of energy", division of the energy continuum in finite elements, giving a constant and proportional value to its frequency, the introduction of discontinuity in the emission and absorption of energy is thus generated. Continuing with the line drawn by Otero Carbajal (1993), the next step was taken by Niels Bohr (1885-1992), presenting a model of the atom as a small positively charged nucleus surrounded by electrons that move around the nucleus in circular orbits, like the structure of the solar sys-

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tem, but with an attraction produced by electrostatic rather than gravitational forces. By 1925, Heisenberg (1904-1978) introduced the application of matrix mathematics, giving rise to matrix mechanics, on which quantum mechanics would be founded. In 1932 the "uncertainty principle" or "principle of indeterminacy" is announced, by which it is impossible to measure simultaneously and with absolute precision the value of the position and the amount of movement of a particle. By the same time the wave mechanics of De Broglie (1892-1987) and Schrödinger (1887-1961) were developed, associating to the propagation of a wave the movement of all corpuscles, facilitating the intervention of the Planck constant to link the magnitudes of the wave to the magnitudes of the corpuscle, arriving in this way with Max Born (1882-1970) to establish the physical character of quantum probability, which would break the foundation of classical epistemology. It was this principle that dethroned the strict principle of causality, by proposing the existence of a quantum of action, which would make deterministic prediction impossible, leading the studies towards probability. The current model of the universe contains the temporal asymmetry or the arrow of time, introduced by Boltzmann (1844-1906) with the second law of thermodynamics, which affirmed that the entropy of an isolated system, specifically its measure of disorder manifest, will increase with time.

Results

These points indicate some of the challenges that have been faced regarding rationalism and direct our thinking toward future reformulations regarding knowledge of life processes and disciplinary crises to address them. A first challenge is related to the structure, use and understanding of language production. Concerning this and succinctly, in Chomsky's (1968) approach, the inscribed language is already found as mental representation and its analysis cannot ignore that its properties are given by mental processes. Linguistics provided the constitutive rules of the language system and according to the complex conception of Morin (1992), the recognition of the objective and autonomous reality of language does not exclude the human spirit/brain that produces it[1], nor the speaker subject, nor to the sociocultural interactions that give it consistency. The person makes the language that makes the person and society, in such a way that the human being speaks the language that speaks to him, in the middle of a statement that is as subjective as is anonymous or col-

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lective. The language emerges as a self-socio-organizer machine[2], which is within the socio-cultural machine and which is a double-articulated machine, functioning as a system of rules that make non-sense/sense and, at the same time, is associated with a logical and analogue machine that depends on the rules of the human brain machinery. If structural linguistics allows for a bridge between human and genetic language, generative linguistics establishes a union in the biological world through the brain. At this point, what is the meaning? An emergency that retroacts on the activities of the language and constitutes its global synthetic level. It virtually precedes the statement and establishes the signified-signifier-referent relationship, forming a loop in an orchestration of scattered senses, implying a psycho-cerebral process, a cultural background and an experience engrammed with the lived past. The hologram dimension of meaning is added in this point, which refers to its interdependent chains and conceived in the form of discontinuous and isolable unity, belonging, at the same time, to a systematic and organizing continuum. Language emerges, for Morin (1992), as a bio-anthropological rotating disc and an anthropo-socio-noological spinning disc. The complex dimension of language, fundamental to thinking about the human process, reformulates the inadequacy of rational theories as they have functioned, as systems of coherent ideas, with elements linked by inductive or deductive logical procedures to which their statements obey, installed with principles of non-contradiction and identity, typical of the core of the clastic logic. What seems impossible? For Morin (1992), overcoming the alternative between two propositions, the reaffirmation of truth, the logification of mathematics and a formal ontology that affirms an ontological absolutization. The isomorphism between thought, life and the universe can be taken by complexity, since it encompasses the infra-logical, the i-ogical and the meta-logical. The deductive logic has shown its faults when facing uncertainty, which, in the way of the event, takes the contradiction not knowing in advance what contradiction must be overcome, what must be safeguarded and what should be considered in its singularity, to open the thought from it. Morin (1992) will affirm that all knowledge is necessary, and all knowledge ends where another begins. Outside of the coordinates of space and time, phenomena lose their logical structure, entering intelligibility gaps that are not reducible to identity[3]. Complex morinean thought (1992) manages to take advantage of these "logical gaps", as with Gödel's theorem, by which the powerful and rich theoretical systems cannot eliminate the unspeakable-uncertain and the inconsistent-contradictory, existing true propositions that cannot be

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tested in the system to which they belong and be considered in a metasystem with meta viewpoints.

In the end, all logic is subject to *paradigmatic* control, understanding by paradigm the mode, rule or argument that acts under presuppositions or statements that make a set of values and beliefs. In structural linguistics, the term occupies a specialized place within the concept of two axes: the syntagmatic, horizontal axis referring to the word and language, and the paradigmatic or vertical, referred to language or code. Within the field of philosophy, Foucault (1985, 2002) introduces the notion of episteme, as that which defines the conditions of possibility of knowledge. Therefore, every paradigm determines the intelligibility and gives meaning to the governing logical operations, promoting and selecting categories that will be its guiding axes (the material, the structure, the spirit, etc.). The episteme takes control of discourse using its generative machine of installation of power and not being a stranger, but endogenous to the discourse and spirit of the subject; it obeys the transubjective power of the paradigm that challenges it. In this sense, the paradigm thinks of the "I think" and at the same time controls the logic that controls it. A paradigm is not falsifiable, it has an axiomatic authority and it has invisibility for the organization it controls, which makes it invulnerable. As Morin (1992) has said, it is reached by the cracks, erosions or collapse, which allow us to detect its order of causality and its delimitation of the world.

A second *challenge* has been to integrate the notions of chance and necessity, and the search for resolutions within the *paradigms* that complicate current thinking. In this sense, Solórzano (2009) states that Kuhn (1922-1996), in 1962, opened a new path in thought, giving a conceptual status to his notion of paradigm as the starting point for scientific practices, which include theory, law, instrumentation and application, together with the consideration that the transition from one paradigm to another occurs through "scientific revolutions" that favor the disappearance of initial divergences.

The sciences enter a process of *becoming* that makes clear that their discoveries are extensive episodes and not isolated events since the emergence of the anomalies. For Deleuze and Guattari (1994), becoming is not correspondence of relationships, nor similarity, nor imitation or identification of these; it is not evolution and does not belong to the order of filiations, but of alliances, because it brings beings and things into play at different scales. In this sense, it is located "between" the terms, making transverse communications between the heterogeneous. It is this

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process of becoming in science, in the reflection of Solórzano (2009), which favors the opening of the disciplines for a more complex dialogue of knowledge, since it has been the perception of its anomalies and the crises arising from the change of paradigms, which has forced us to abandon previously consolidated procedures and to tolerate conceptual reformulations, favoring the imprint of novelty in sciences.

It has become necessary to find a principle of explanation richer than that of simplification and more in line with the paradigmatic moments of knowledge: *the complexity principle*. This aims to establish communication between what is analyzed and distinguished, opening a dialogue between order, disorder and organization, to specify levels of production and manifestation of phenomena. How would the progress of knowledge, from the opening and crises of the disciplines, be considered from now on? If the idea of progress has been associated with the idea of rationality and the idea of order with that of organization, now order must advance and not disorder, organization and not disorganization. The irreversible degradation of energy offers a physical universe with a principle of agitation, dispersion and disorganization in a sustained double play: progress in organization and order, and its interruption by degradation and dispersion. Thus, the complexity advances in its Morinean conceptual framework (1982) with the idea that progress, far from being a linear and irreversible notion, involves uncertainty, as it struggles in it, the struggles against that degradation.

In short, if determinism was based on a general, causal and true law, the advance of complexity led us to consider that *order* adopts different singular forms, with emergencies and constraints, and the *organization* makes a set producer of stabilities and regulations. The dialogue with disorder in its polarization has an objective side of agitations, dispersions, irregularities, instabilities, random encounters, events and accidents, noises and errors, in interaction with a subjective pole where the unpredictable and the indeterminate occur. It is the use of macro concepts that will allow us to go around different realities, submitted to an interconnected study. What macro concepts will be useful? The complex dynamics of order and disorder, uncertainties and their relation to bifurcation points, self-organizing systems, the notion of event or eventual situation and the transdisciplinary vision.

In the reflection of Morin (1992, 2006), a deterministic world and a random world exclude the dimension of the human spirit, a challenge that invites us to work with order as well as with disorder and its interaction with disorganization and the environment. This tetragram will be a

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fundamental macro concept that offers the opening of a dialogical game that allows thinking, both in the one and in the multiple, both in man and his spirit as in life and its mysteries.

If order is coproducer of organizational phenomena and disorder is not identified with chance, what would chance specifically contribute? In the immediate term, a random element to ontological determinism that tries to hide the problem of the human spirit before reality and at the same time a complex map, without a stable framework and as a place where *events* arise. The notion of an event that depends on a temporal ontology will also become a fundamental study, since it is time that marks everything with a coefficient of "eventuality". There is a systemic thought in which Von Foerster (1960), Bateson (1971) and Atlan (1970) have the possibility of conceiving a science of becoming, which houses the possibility of thinking that change is a relationship drawn between the system and the event, between self-generated phenomena and heterogeneous phenomena, between the development of an internal logic and the accidents that deploy and question it. Continuing with the thought of Morin (1982, 1988), life is an evidential and singular system for everyone, and in this system the events constitute the different states of a cycle that is repeated, such as birth, reproduction or death. Life as a carrier of *complex self-organizing systems* is in an uninterrupted state of disorganization-reorganization, where all kinds of aggressions (not injurious) are stimuli that maintain the vitality of the system through action on the part phenomenal (not on the generative part). Specifically, in social systems and human development, by introducing the temporal variable in thought, we will arrive at the notion that time is a movement towards disorder and life is born of chance and develops in relation to the aptitude to use the richness of that chance. Where is the event hosted? Morin (1982) places it on the boundary between the rational and the real, in the epistemological and ontological interaction between order, disorder, chance, necessity, chaos, cosmos, system and event.

Conclusion

If rationalism has allowed the development of disciplines and has also closed the way to major integrations, promoting the study of transdisciplinarity from complex thinking has become necessary through the development of a paradigm that distinguishes, opposes and separates domains for communicate them without reduction. Max-Neef (2004) will

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say that specifically *transdisciplinarity* will be what is between disciplines, through them and beyond them, being the presence of several levels of reality and its action dynamics what ethical and organizational responses can offer to lead the human being towards a deep ecology. If the method will not be to find a "unitary" principle of all knowledge, we will think of that metabolism that exchanges information self-organizedly with the environment using a logic as probabilistic as flexible and generative. The *morinean paradigm* contains categories and concepts of intelligibility with their logical relations, their governing operations, ideologically shaped by the conditions of organization of ideas and semantically determined by intelligibility and meaning. In this way, every paradigm expresses the axiom in which it is founded, and every society is the product of intercomputations and intercogitations between individuals that make it, retroacting with it. There is a cultural imprinting in which the paradigmatic instance is located with its dark core, where standards and models are updated from the very heart of the instance. It is conceivable that the paradigm is dependent on cerebral and spiritual instances, mythological, cultural, social and historical, in virtual production planes. But to give direction to such thought of Morin (1982), it will become fundamental to have as guiding light the three morinean principles that, leaving the simplicity, allow to think in the passage of the disciplinary conceptualizations towards complexity: the dialogic principle, by which one term suppresses the other, but they collaborate in the organization of the complex, since this principle is what allows duality to be maintained in unity; the principle of organizational recursion or swirling process, by which products and effects are at the same time causes and producers of that which produces them; the hologrammatic principle, where the smallest point of the image contains almost all the information of the represented object.

There are several epistemological concerns that drive a change of thought today: the union between theory and action, innovation as an effect of creative processes, the technical applicability for greater assertiveness and the relationship drawn between virtuality and current plans. "Epistemologizing knowledge" is that sustained task of methodically putting emerging conceptual categories to the test to analyze the problems that are remembered as such. What becomes necessary? As stated, the law of transdisciplinarity, the systemic metaphor and the unified theory of knowledge based on the theory of self-organization and the dynamics of complex systems.

The individual is faced with a science that comes out of simple situations, before a study of human processes that grow in complexity,

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with a psychology that must be sustained in this difficult exchange between the inside, the outside and its always complex mixing zones, with permanent crises at the level of behavior, of feeling, of the construction of thought, of the sign, the symbol, the image and the representation, at different unconscious and conscious planes of production. A current philosophy is already present that has not ignored this challenge and the thought of Morin that, together with the transdisciplinary contributions, facilitates the path towards change and growth.

Notes

1 The concept of spirit / brain can be related to the notion of three planes of the brain, the scientific variables and the brain of overflight in Deleuze and Guattari (2001, "From chaos to the brain").

2 It can be complemented with the notion of "abstract machine of language" in Deleuze and Guattari (1994, "Postulates of linguistics" and "Conclusions: concrete rules and abstract machines").

3 This definition is complemented by the studies of Deleuze (1994) "Fifth series, of sense" and "Fourteenth series, of double causality".

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