Non-Euclidian Space-Time Planning and Management

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Non-Euclidian Space-Time Planning and Management

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ABSTRACT : *This Paper aims to broaden the debate around the necessary break with the current hegemonic scientific paradigm. This rupture presents itself in relation to the classic structure, composing the social imaginary of reality and being present in the molds of planning and territorial management. The research, which was part of a postdoctoral fellowship at UFRJ/LAGESOLOS, crossed the epistemological field of both Cartesian-Newtonian science and the non-euclidian paradigm. In this sense, it aimed to compare these conceptual mechanisms in an attempt to demonstrate that reality does not present itself within a causal, linear and fragmented context, however, it is identified with a systemic and discontinuous reading. Therefore, it chooses to demonstrate that, as reality is unpredictable, discontinuous and systemic, this paradigm ends up being methodologically broader and more acceptable.*

KEYWORDS - *Management, Non-linear, Planning, Space, Territory*

1. Introduction

The main objective of this article is to bring a constructive critique in relation to the dominant epistemology in planning and management in relation to space and time, and thus the non-Euclidean paradigm emerges as an alternative to the Cartesian-Newtonian reading of reality.

To achieve our goal, a survey was carried out based on sites such as researchgate, sites linked to virtual libraries of public universities in Brazil, sites with texts on the internet and personal collection of books and magazines.

The critique of management, based on classical science, is structured in the literature as non-Euclidean planning. Based on this term and looking for groups that are organized by the proximity of research, linked to clusters, little was found in relation to the works related to the theme raised in this article, especially Friedmann (1994) and Cao & Zhang (2015).

By debating this question, we intend to rethink the serious error of planners of verifying space as a great void and time as a linear sequence, where both time and space are treated as separate elements, contrary to modern spatio-temporal logic.

Realizing that, despite the serious conceptual errors that are linked to classical planning, we find that this subject is probably little debated due to the very essence of common sense. In order to bring this issue to the scientific debate, and aiming at synergetic processes that transform this reality, we seek in this article to discuss the Cartesian-Newtonian conceptual bases in relation to space and time, demonstrating their inconsistencies and flaws, as well as suggesting the knowledge of these elements (space and time) as a totality in totalization, where the content-forms are dynamized in a non-linear way and, often unpredictable.

Finally, the research demonstrates that space and time walk together, developing constant mechanisms of self-organized syntropy, where they are associated with the spatio-temporal evolution of places themselves. Thus, it is suggested that epistemologically rethinking planning and management becomes a necessity in the light of the complexity and uncertainties of the present day.

2. Development

2.1 Planning and management

Thinking about the conceptual debate, it becomes important, initially, to distinguish the difference between planning and management. This question is contained in the relationship of the former with prolonged time and of management with the now, therefore, with space, making planning and management a matter of space-time in its dialectic.

Since 1988, the planning and management of the environment and the territory have gained new momentum in Brazil, through laws that alter public policies committed to the participation of society in decisions about its territory, and to the construction of a perspective of sustainable development (PALAVIZINE, 2012).

This perspective is linked to the redemocratization movement in the country, inaugurated with the 1988 Constitution, considering that it provided a greater openness to social participation in the decision-making spheres, therefore, the interventions born from planning and its management mechanisms are understood from new logics, where the local society gains new possibilities to act. Participate and plan for your future.

However, even bearing in mind that planning is thinking about time (space-time), and despite the advance of democratic debates, little or nothing has been done in relation to what is verified about the scientific-epistemological molds, on which the treatment of how to think about planning is based, probably because this issue permeates the Cartesian-Newtonian logic. which, because it is given a priori, is standardized.

The classical linear and causal idea, linked to the technical-scientific revolution of the sixteenth and seventeenth centuries, and which is associated with predictability, tends to anticipate the future by giving science certainties that are often not confirmed, in view of the complexity existing in reality.

The classical paradigm also relates to the dissociation between space and time. Thus, in general, in the view of planners, space is similar to a three-dimensional box and time is seen as something linear and predictable. Planning and management end up generating the unreal, the antagonistic in relation to the daily life in which the geographical nuclei live daily.

The planning, based on the classical concept, verifies the space as a three-dimensional collector. "In this model, time is linear, with a uniform velocity and unidirectional. Time and space are non-relative and independent elements in planning" (CAO & ZHANG, 2013, p. 346). This logic usually ends up establishing strategies based on the linear time of plans ranging from 5 to 15 years. The authors further argue that "in Euclidean planning, time and space are assumed by planners as external containers for life" (CAO & ZHANG, 2013, p. 341).

The Euclidean model of planning is characterized by instrumental rationality that limits planning, leading it to seek the "optimal" means to achieve certain ends. His (three)two-dimensional spatial representations replace the discontinuous irregular space of practical paths with the homogeneous and continuous space of geometry (FRIEDMANN, 1994). Faced with the complexity of the variables that are inserted in the spatio-temporal systems, the current classical model, which underpins the planning molds, tends to succumb due to its fragility. Its future will possibly become incoherent with what was planned, and often obsolete in the light of technical-scientific advances (CAMARGO, 2009).

The process of management and planning proposes that they drink from the epistemological sources from quantum mechanics, where the future is open, in view of the context of probabilities, which guide the sea of possibilities, which can be born from the process in a democratic management. The nonlinear developments find much more veracity in the Copenhagen Interpretation than in Laplace's predictable linear universe (CAMARGO, 2020).

2.2. The Popular Imaginary of Space and Time: Planning and the Question of Time Separated from Space

Still in relation to the issue of planning, Souza (2003) refers to the idea of the great challenge in the task of planning as an effort to imagine the future. For Souza (2003, p. 47), "There should be no doubt that planning needs to be referenced by a prior reflection on the unfolding of the current situation". The problem is, what's the outlook on what's to come? Is the linear causal view really guaranteed in predictability, or can the reading of the great dynamics that surrounds tomorrow, and that suggests a series of possibilities, only be understood by probabilities?

Trapped in the imaginary of space separated from time, and developed as a large empty extension, territorial planning ends up limited to serious conceptual errors, and its consequences unfold in the accentuation of social crises that develop, often in an unpredictable way, as a result of the very movement inherent to the complexity of space.

As a component of the social imaginary, this issue often goes unnoticed. However, all management is dependent on planning, and if it makes mistakes, how can we develop a management that is consistent with reality? If the norm, the legal rule, is tied to a planning logic that uses Newtonian linear time, how can it be managed in a truly scientific way?

The City Statute in Brazil, for example, is redone at least every 10 years in its Master Plan. How can we manage in a serious way, if the evolution of space does not respect this rule? The question of time and space, in fact, far surpasses the logic of a box-like space, where the elements are found, just as time is not just something that flows in its arrow without any relation to space. For this reason, Souza (2003, p. 51) argues that "in our days, planning is being prepared for the unexpected, the unpredictable, which makes any planning something at the same time necessary and risky".

However, planning and management are still stuck in the old paradigm, where the concept of Euclidean and classical space limits the perception of future reality. Classical science links itself to the reversibility of time and space in its determinism, demonstrating that it cannot relate to change (MASSEY, 2008).

Reality, due to its complexity, can only be understood in the light of the possibilities, linked to the indeterminacies of what is implied today, and which will be structured in a new set of elements tomorrow. In other words, the reality of today unfolds in tomorrow. Therefore, today's actions are generators of the change(s) that are born as a result of syntropy, which derives from different scales of space-time.

For this reason, in general, trapped in the imaginary of space separated from time, classical territorial planning ends up limited to serious conceptual errors, and its consequences unfold in the accentuation of social crises that develop, often in an unpredictable way, as a result of the very movement inherent to the complexity of space. And since this issue is not perceived by common sense, going unnoticed, how can we have a management of space based on this serious error? If the norm, the legal rule, is tied to a planning logic that uses Newtonian linear time, how can it be managed in a truly democratic way?

2.3. Isaac Newton (1643-1727), The Mechanistic Universe

The synthesis of the Cartesian-Newtonian scientific model refers to a mechanistic universe, which conceives nature as a linear, precise, causal and predictable machine. This machine universe, which so influences science to this day, possesses in the certainty of tomorrow the very essence of a society that is controlled and normalized by this dangerous logic.

However, although this way of thinking about reality dates back to the modern age, the origin of this logic is substantiated in Euclid, who lived in the third century B.C. Similar to the arguments presented by Newton in his Principia in 1687, Euclidean geometry is characterized by immutable and symmetrical space (SANTOS, 1978).

This way of thinking about time and space will be resumed during the technical-scientific revolution of the sixteenth and seventeenth centuries, due to the advances provided by the mathematical language, based on the calculations on nature developed by Galileo (1564-1642) and the implementation of Arabic numerals, as a fundamental element for the development of this science (CAMARGO, 2012).

This resumption of a model of space as a large receptacle was carried out by the Italian philosopher Tommaso Campanella (1568-1639) in his Phisiology. In this book, the author considered that God created space as a "capacity," a receptacle for bodies. As Santos (1978, p.126) exemplifies, "locus dico substatiam primam incorpoream immobiliem, optam et receptandum anne corpus".

This concept of receptacle is similar to how Newton (2010, p. 156) also conceived space, that is: "Absolute space, by its nature, without any relation to something external, always remains similar and immobile". Just as 'time was also absolute, true, mathematical always flowing by itself, without relation to anything external'. For this reason, Newton made time a measurable and linear element.

Newton associated the idea of the machine universe with God's own perfection. Precision, certainty and predictability would guarantee both science and society at the time a new path that overcame the Aristotelian syllogism, generating greater scientific logic for the understanding of the planet.

In this logic, time and space thus become their own, singular elements, where time was thought of as a linear flow, and space, as a pure, empty, box-like extension, where objects were situated. Geometry then became synonymous with space.

The resumption, during the technical-scientific revolution, of this way of thinking about reality, thus becomes the essence of science in force during the times in which Newton lived and how he conceived the mathematics of his time. Therefore, qualities such as extension, constancy, infinity, and uniformity gave Newton the theoretical basis for his model of the universe.

For common sense and Newtonian cosmology, the concept of absolute space turns out to be part of the essence of nature itself. And, even after the advent of the Theory of Relativity, it still influences and is part of a large part of modern science, including geography itself, where part of the geographers thus lose their referential object, space (BLAUT, 1961). For this reason, spatiality has become a backdrop or a stage in the theater of life.

2.4. Space and Time in Immanuel Kant (1724-1804)

Still reflecting on the common sense of reality in our days, another author of relevance in science was Immanuel Kant (1724-1804). Being a great reader of Newton's work, Kant taught geography in Königsberg (former Prussia), and for him both space and time depended on our intuition, therefore, they are contained in the subjectivity of our senses.

For Kant, intuition originates what he calls space, so this intuition is not empirical, and is realized as being a priori, found in ourselves and existing before any perception of an object, thus, our senses, which are a property of our mind, generate the representation of any object as something outside of us and all together in space. In this sense, its representation must be originally intuition, and because it is given before all perception of any object, it cannot be empirical.

Being a pure intuition, which it calls space, it thus embraces all things that can appear to us externally. According to Kant (1999, p. 76), "these things are juxtaposed in space, and are understood as the result of our sensible intuition."

In Kant, space is inherent in sensibility, and it is there that the subject perceives the object as something spatially related. Therefore, it is possible to abstract what is in space, making it impossible to do the same with space itself, because, according to Kant (1999, p.76) "space is intuition itself".

For Kant (1999, p. 82), "taken together, time and space are pure forms of all sensible intuition, and thus make synthetic propositions a priori possible". And, given a priori, space and time are mere creatures of the imagination. Thus, for the philosopher, time is not a discursive concept, but also a pure form of sensible intuition. And Kant (1999, p. 78) adds, "Different times are just parts of precisely the same time".

This Kantian influence ends up becoming a mechanism that propagates itself as a "pathological something", where this synthesis space, which is configured in the integration of everything, being seen as a large box, which contains everything and which is intuition itself, ends up eliminating both from geography and from society, a large part of the scientific treatment, making it impossible to treat it empirically.

2.5. Structuralism and geographical space

Structuralism has in fact placed space, rather than time, as a fundamental element. However, we turned to the concept of structure, where space was related to synchrony instead of diachrony, thus losing movement, a fundamental element for understanding it (MASSEY, 2008).

These timeless structures can be conceived in geography, especially rooted in the neo-positivist school, which collaborated so much for planning with theories linked to the mathematization of space. For this school of thought, space was seen as an isotopic plain, where the differences or similarities between places are defined based on the measurement of their objects and phenomena, in which the applied statistical technique replaces the complexity of the place (SANTOS, 1978).

Here the region is considered from specific purposes: nodal region, industrial, climatic, etc. The region is a class of area, i.e., a collection of units, which is why it has served so much bourgeois planning. Geography thus became an instrument in the hands of those who only classified, but did not see the change, the alteration of processes in space and time (SANTOS, 1978).

2.6. Space and movement

Space isolated from time is related to stability, staticness, immobility, but space-time is movement itself. And, contrary to the Newtonian reading of time and space, this movement does not develop in an absolute way on every planet, it is relational to each geographical space and that integrates society-nature. Understanding space-time is a right of science, adjusting it to research is a necessity.

The controversy of the debate between time and space was born in the contradictions between Leibniz (1646-1716) and Newton (1643-1727), regarding relativity versus time and absolute space, where, for the first scientist, space is seen as a network of quantitative relations and for the second, as a unity that precedes and makes possible all relations that can be discovered in it. In this sense, as the Newtonian theory ends up becoming the hegemonic science model, the idea of integrated relations ends up being superseded by a notion of time isolated from space (FRAASEEN, 1992).

Leibniz sought in the dynamics of matter the refutation of the void existing in the concept of absolute space, for the philosopher there was full and relational space, where it could be conceived as a possible relationship in which coexisting objects can have with each other. For this reason, space in Leibniz is relational and integrated in its pre-existing harmony, and not a void as in the Newtonian concept (SITE, 2010).

For the German philosopher, things that move directly affect other things in the universe, thus giving his conception of relational space. Instead of the mechanistic view, Leibniz proposed a dynamic reading of reality, involving kinetic energy and infinitely small points, which would be the integrated monads (SITE, 2010).

After Leibniz, this conception of reality is structured based on the research developed by Minkowiski (1864-1909) in his space-time continuum and the Theory of Relativity created by his student Einstein (1879-1955)

(FRAASEEN, 1992). These scientists have generated a new structure that does not separate space from time. General relativity combines the temporal dimension with the three dimensions of space, to form what is called space-time, bringing another way of perceiving reality.

This mechanism is also perceived in the spatial dynamics proposed by Santos (1997) and Camargo (2012), for them the notion of four-dimensional space or a relative space, presents its perception as a system of non-mathematical relations that develops in time also in its relativity.

Santos (2014), by stating that space is the general interconnectivity between the system of actions and the system of objects, teaches us that the processes generated by actions are the foundation of the fourth dimension, the temporal dimension that integrates the other three: height, width and depth. This is space-time.

The comprehension of geographic space refers to the understanding of the society that animates it, because space without society is only the landscape (SANTOS, 2014). For Santos (2014), space is the unequal accumulation of times, this concept for the geographer, refers to the idea of the different temporal phases that cross the history of humanity, and that are linked to different stages of spatialities perceived from their technical means. Initially, the natural environment, where technology has not yet imposed itself;; Then the technical environment, which in the Brazilian case, can be represented by the introduction of sugar mills brought from Portugal; the technical-scientific environment, which emerged from 1945 onwards and characterized the broader integration of science and technology; Finally, from the 1970s onwards, the technical-scientific informational environment, characterized by the space dynamized by information technology and its nuances.

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These conceptions, linked to technique, materialize in space different unequal landscapes, which guide the researcher to the understanding of the phases of expansion of capital over time. When a society undergoes a change, geographical forms, or objects, take on new functions. Thus, as Santos (1997, p. 49) states, "the totality of the mutation creates a new social organization". As its economic-spatial dynamics changed exponentially

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When a place self-organizes itself for socioeconomic reasons, or reorganizes itself in a functional way (as in the case of the gentrification of peripheral areas), its geographical objects, by their nature, will be linked to new functions, thus generating, as its economic-spatial dynamics exponentially altered, new systems of actions. This mutability of space can be understood in the light of space-time, where each place has in itself a logical and totally singular dynamic. The landscape of each place, reproducing its history of changes, gives it its uniqueness and differentiates it spatially-temporally from other places.

An example is the innovations that have brought intense significance, transforming regions from the advent of railways, telegraph, automobiles and more recently telecommunications. Even so, as Saquet (2015) verifies, business rhythms are different in different places, so are mutabilities.

The movement of totality in totalization does not reach everywhere equally, at least directly, since the fact that a given point is reached by the impact of new variables can change the hierarchy of the region, imposing a new spatial order. Thus, each place affected by this movement is in a position to react on this whole. This process forces the place to change, leading it to change in its own dynamic, singular, but not to the same extent as the place that was directly impacted. Where, according to Santos (2003, p.31) "if they cannot create new forms or renew old ones, social determinations have to adapt".

Each place has its own spatial arrangement. This arrangement, which is unique, is intrinsically linked to a larger moving structure, that is, it is linked to the process of social production at different scales of both space and time, or space-time.

2.7. Spatio-temporal velocity of places

The Chinese city of Shanghai, which as its economic-spatial dynamics exponentially altered, over short periods of time altered its geographical objects. Soon new objects, new functions and new logics of the systems of actions integrated into these new objects materialized spatial mutability in a rapid way; on the other hand, all over the planet, different places of lesser expression seem to us to be "frozen in time" (CAMARGO, 2012).

Different production times, direct influence on the space-time of each place. For Saquet (2015, p. 82) "times are unequal times, also lived in a singular x universal relationship, at different speeds, complexities and intensities". As "each society wears the clothes of its time" (SANTOS, 2003, p. 25), time and space are the moment and, as in physical relativity, they are intrinsically related, and their evolution depends directly on how the unique dynamics of each place develop both on the local and national scales and how the international rebound occurs in its reality.

This dynamic of interconnected networks causes the old content-forms to be revitalized, changing their functions and renewing their structures thanks to new processes that often bring new objects and, logically, new actions to the local space. At the same time, geosystemically, the place is reordered in a proportional way in terms of how the integration between human actions and natural exchange flows occurs. The action that involves society refers to Bohm (1980), where the new brings what is implied and that unfolds later in a way, often unexpectedly, frightening mainly the management model based on a planning based on the logic of absolute time.

2.8. Totality in totalization

Understanding space as a totality is a fundamental theoretical construction, in view of the examination of the complexity of factors that make up the spatial context of any place. It is important to highlight that analytically it becomes problematic to evaluate space from the fragments of totality, under penalty of making a mistake in trying to understand the reality that happens in an integrated way.

. Space should be considered as a totality in a constant process of totalization, that is, of change related to its internal structure (system of actions and objects) and the external influences it undergoes (SANTOS, 1997). This integration recalls, once again, Leibniz's monads, who considered as an essential property of cohesion the pre-established harmony that exists in bodies and not their extension (SITA, 2010). The responses of the flows are unique, relational to the variables of a given event.

For this reason, we also adopt the idea of Santos (1997), who analytically verifies the totality from the categories form, process, structure and function, in which its verification should never reveal its spatio-temporal simultaneity. In this analytic and quantum logic, all elements are interconnected, making it impossible to understand their elements in isolation.

Santos (1997), by listing the categories form, process, structure and function, as integrated and moving analytical elements, brings us the idea of space-time in its dynamics. Function is associated with the processes that are the very dynamics that lead to action and interaction. The structure is related to the integration of the systems of actions and the systems of objects; Processes, as said, are actions in time and form is the visible, external aspect of an object constituting a spatial pattern. The understanding of the interactions of space leads us to spatial totality, that is, space as a whole in motion, which is the form-content in its spatio-temporal relation.

2.8.1. The Totalization Mechanism

Understanding totality as a concept that means space, totality in the process of totalization, will always be an incomplete totality, since it is always seeking to totalize itself. At each moment of its evolution, the totality undergoes a metamorphosis, becoming a real-abstract in search of being a real-concrete (Santos, 2014). It is the logic of order-disorder-reorganization-new order, which occurs as an evolutionary spiral (MORIN, 1977).

Regarding this evolution, applied to geographic space, Santos (1997, p. 120) explains that "the historical process is a process of separation into particular, specific things. Each new totalization creates new individuals and gives the old things a new content."

This structured, real totality is a finished "perfect" reality, always in self-organized reordering, the totality ends up in a constant movement in search of another level of equilibrium, so we must distinguish the constructed totality from the totality under construction.

As Santos (2014, p. 116) states, "Totality is reality in its entirety." Therefore, for Kosik (2002), totality is the reality of a "structured whole" that was dialectically constructed. And, remembering that the process of totalization (change in time of a totality) is relative to each place based on its dynamics, or how the dynamics of each structure occur (system of actions and system of objects that work integrated).

This constructed totality, in each location, represents a specific moment, becoming a concrete totality, which is transformed into a structure. The materialization of the process of a concrete totality is, for example, in the instantaneity of the propagation of modernities, which ends up dismantling the organization of the previous space (SANTOS, 1997).

This mechanism, of technical propagation, intensified globally, especially from 1945 onwards with capitalist expansion, known as the internationalization of capital (SANTOS, 2014). This process has generated new demands for the planet, altering landscapes and economies. Thus, Kosik explains (2002, p. 59) "The genetic-dynamic conception of totality is a presupposition of the rational understanding of the emergence of a new quality".

External action is only a "detonator", a vector that enters the system, being a new driver, but it is not the fundamental factor of this impulse, because the whole can only be known from the understanding of each fraction that participates in the evolutionary process. Therefore, Santos (2014) teaches us that the whole can only be understood by the joint movement of all its parts through the process of totalization. As Santos (2014, p.116) verifies, "This process of dismantling the whole, fragmentation and recomposition is a movement by which the single becomes multiple and vice versa".

The movement of the totality generates changes in the balance between the different instances or components of society, altering processes, demanding new functions and attributing new and different values to geographical forms. Society in motion generates its own response in space, which is its mutability.

2.9. Planning and management

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However, although this way of thinking about reality dates back to the modern age, the origin of this logic is substantiated in Euclid, who lived in the third century B.C. Similar to the arguments presented by Newton in his Principia in 1687, Euclidean geometry is characterized by immutable and symmetrical space (SANTOS, 1978).

This way of thinking about time and space will be resumed during the technical-scientific revolution of the sixteenth and seventeenth centuries, due to the advances provided by the mathematical language, based on the calculations on nature developed by Galileo (1564-1642) and the implementation of Arabic numerals, as a fundamental element for the development of this science (CAMARGO, 2012).

This resumption of a model of space as a large receptacle was carried out by the Italian philosopher Tommaso Campanella (1568-1639) in his Phisiology. In this book, the author considered that God created space as a "capacity," a receptacle for bodies. As Santos (1978, p.126) exemplifies, "locus dico substatiam primam incorpoream immobiliem, optam et receptandum anne corpus".

This concept of receptacle is similar to how Newton (2010, p. 156) also conceived space, that is: "Absolute space, by its nature, without any relation to something external, always remains similar and immobile".

Just as 'time was also absolute, true, mathematical always flowing by itself, without relation to anything external'. For this reason, Newton made time a measurable and linear element.

Newton associated the idea of the machine universe with God's own perfection. Precision, certainty and predictability would guarantee both science and society at the time a new path that overcame the Aristotelian syllogism, generating greater scientific logic for the understanding of the planet.

In this logic, time and space thus become their own, singular elements, where time was thought of as a linear flow, and space, as a pure, empty, box-like extension, where objects were situated. Geometry then became synonymous with space.

The resumption, during the technical-scientific revolution, of this way of thinking about reality, thus becomes the essence of science in force during the times in which Newton lived and how he conceived the mathematics of his time. Therefore, qualities such as extension, constancy, infinity, and uniformity gave Newton the theoretical basis for his model of the universe.

For common sense and Newtonian cosmology, the concept of absolute space turns out to be part of the essence of nature itself. And, even after the advent of the Theory of Relativity, it still influences and is part of a large part of modern science, including geography itself, where part of the geographers thus lose their referential object, space (BLAUT, 1961). For this reason, spatiality has become a backdrop or a stage in the theater of life.

2.12. Space and Time in Immanuel Kant (1724-1804)

Still reflecting on the common sense of reality in our days, another author of relevance in science was Immanuel Kant (1724-1804). Being a great reader of Newton's work, Kant taught geography in Königsberg (former Prussia), and for him both space and time depended on our intuition, therefore, they are contained in the subjectivity of our senses.

For Kant, intuition originates what he calls space, so this intuition is not empirical, and is realized as being a priori, found in ourselves and existing before any perception of an object, thus, our senses, which are a property of our mind, generate the representation of any object as something outside of us and all together in space. In this sense, its representation must be originally intuition, and because it is given before all perception of any object, it cannot be empirical.

Being a pure intuition, which it calls space, it thus embraces all things that can appear to us externally. According to Kant (1999, p. 76), "these things are juxtaposed in space, and are understood as the result of our sensible intuition."

In Kant, space is inherent in sensibility, and it is there that the subject perceives the object as something spatially related. Therefore, it is possible to abstract what is in space, making it impossible to do the same with space itself, because, according to Kant (1999, p.76) "space is intuition itself".

For Kant (1999, p. 82), "taken together, time and space are pure forms of all sensible intuition, and thus make synthetic propositions a priori possible". And, given a priori, space and time are mere creatures of the imagination. Thus, for the philosopher, time is not a discursive concept, but also a pure form of sensible intuition. And Kant (1999, p. 78) adds, "Different times are just parts of precisely the same time".

This Kantian influence ends up becoming a mechanism that propagates itself as a "pathological something", where this synthesis space, which is configured in the integration of everything, being seen as a large box, which contains everything and which is intuition itself, ends up eliminating both from geography and from society, a large part of the scientific treatment, making it impossible to treat it empirically.

2.13. Structuralism and geographical space

Structuralism has in fact placed space, rather than time, as a fundamental element. However, we turned to the concept of structure, where space was related to synchrony instead of diachrony, thus losing movement, a fundamental element for understanding it (MASSEY, 2008).

These timeless structures can be conceived in geography, especially rooted in the neo-positivist school, which collaborated so much for planning with theories linked to the mathematization of space. For this school of thought, space was seen as an isotopic plain, where the differences or similarities between places are defined based on the measurement of their objects and phenomena, in which the applied statistical technique replaces the complexity of the place (SANTOS, 1982).

Here the region is considered from specific purposes: nodal region, industrial, climatic, etc. The region is a class of area, i.e., a collection of units, which is why it has served so much bourgeois planning. Geography thus became an instrument in the hands of those who only classified, but did not see the change, the alteration of processes in space and time (SANTOS, 1982).

2.14.Space and movement

Space isolated from time is related to stability, staticness, immobility, but space-time is movement itself. And, contrary to the Newtonian reading of time and space, this movement does not develop in an absolute way on every planet, it is relational to each geographical space and that integrates society-nature. Understanding space-time is a right of science, adjusting it to research is a necessity.

The controversy of the debate between time and space was born in the contradictions between Leibniz (1646-1716) and Newton (1643-1727), regarding relativity versus time and absolute space, where, for the first scientist, space is seen as a network of quantitative relations and for the second, as a unity that precedes and makes possible all relations that can be discovered in it. In this sense, as the Newtonian theory ends up becoming the hegemonic science model, the idea of integrated relations ends up being superseded by a notion of time isolated from space (FRAASEEN, 1992).

Leibniz sought in the dynamics of matter the refutation of the void existing in the concept of absolute space, for the philosopher there was full and relational space, where it could be conceived as a possible relationship in which coexisting objects can have with each other. For this reason, space in Leibniz is relational and integrated in its pre-existing harmony, and not a void as in the Newtonian concept (SITE, 2010).

For the German philosopher, things that move directly affect other things in the universe, thus giving his conception of relational space. Instead of the mechanistic view, Leibniz proposed a dynamic reading of reality, involving kinetic energy and infinitely small points, which would be the integrated monads (SITE, 2010).

After Leibniz, this conception of reality is structured based on the research developed by Minkowiski (1864-1909) in his space-time continuum and the Theory of Relativity created by his student Einstein (1879-1955) (FRAASEEN, 1992). These scientists have generated a new structure that does not separate space from time. General relativity combines the temporal dimension with the three dimensions of space, to form what is called space-time, bringing another way of perceiving reality.

This mechanism is also perceived in the spatial dynamics proposed by Santos (1997) and Camargo (2012), for them the notion of four-dimensional space or a relative space, presents its perception as a system of non-mathematical relations that develops in time also in its relativity.

Santos (2014), by stating that space is the general interconnectivity between the system of actions and the system of objects, teaches us that the processes generated by actions are the foundation of the fourth dimension, the temporal dimension that integrates the other three: height, width and depth. This is space-time.

The comprehension of geographic space refers to the understanding of the society that animates it, because space without society is only the landscape (SANTOS, 2014). For Santos (2014), space is the unequal accumulation of times, this concept for the geographer, refers to the idea of the different temporal phases that cross the history of humanity, and that are linked to different stages of spatialities perceived from their technical means. Initially, the natural environment, where technology has not yet imposed itself;; Then the technical environment, which in the Brazilian case, can be represented by the introduction of sugar mills brought from Portugal; the technical-scientific environment, which emerged from 1945 onwards and characterized the broader integration of science and technology; Finally, from the 1970s onwards, the technical-scientific informational environment, characterized by the space dynamized by information technology and its nuances.

For Santos (2014), space is the unequal accumulation of times, this concept for the geographer, refers to the idea of the different temporal phases that cross the history of humanity, and that are linked to different stages of spatialities perceived from their technical means.

These conceptions, linked to technique, materialize in space different unequal landscapes, which guide the researcher to the understanding of the phases of expansion of capital over time. When a society undergoes a change, geographical forms, or objects, take on new functions. Thus, as Santos (1997, p. 49) states, "the totality of the mutation creates a new social organization". As its economic-spatial dynamics changed exponentially

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When a place self-organizes itself for socioeconomic reasons, or reorganizes itself in a functional way (as in the case of the gentrification of peripheral areas), its geographical objects, by their nature, will be linked to new functions, thus generating, as its economic-spatial dynamics exponentially altered, new systems of actions. This mutability of space can be understood in the light of space-time, where each place has in itself a logical and totally singular dynamic. The landscape of each place, reproducing its history of changes, gives it its uniqueness and differentiates it spatially-temporally from other places.

An example is the innovations that have brought intense significance, transforming regions from the advent of railways, telegraph, automobiles and more recently telecommunications. Even so, as Saquet (2015) verifies, business rhythms are different in different places, so are mutabilities.

The movement of totality in totalization does not reach everywhere equally, at least directly, since the fact that a given point is reached by the impact of new variables can change the hierarchy of the region, imposing a new spatial order. Thus, each place affected by this movement is in a position to react on this whole. This process forces the place to change, leading it to change in its own dynamic, singular, but not to the same extent as the place that was directly impacted. Where, according to Santos (2003, p.31) "if they cannot create new forms or renew old ones, social determinations have to adapt".

Each place has its own spatial arrangement. This arrangement, which is unique, is intrinsically linked to a larger moving structure, that is, it is linked to the process of social production at different scales of both space and time, or space-time.

2.15.Spatio-temporal velocity of places

The Chinese city of Shanghai, which as its economic-spatial dynamics exponentially altered, over short periods of time altered its geographical objects. Soon new objects, new functions and new logics of the systems

of actions integrated into these new objects materialized spatial mutability in a rapid way; on the other hand, all over the planet, different places of lesser expression seem to us to be "frozen in time" (CAMARGO, 2012).

Different production times, direct influence on the space-time of each place. For Saquet (2015, p. 82) "times are unequal times, also lived in a singular x universal relationship, at different speeds, complexities and intensities". As "each society wears the clothes of its time" (SANTOS, 2003, p. 25), time and space are the moment and, as in physical relativity, they are intrinsically related, and their evolution depends directly on how the unique dynamics of each place develop both on the local and national scales and how the international rebound occurs in its reality.

This dynamic of interconnected networks causes the old content-forms to be revitalized, changing their functions and renewing their structures thanks to new processes that often bring new objects and, logically, new actions to the local space. At the same time, geosystemically, the place is reordered in a proportional way in terms of how the integration between human actions and natural exchange flows occurs. The action that involves society refers to Bohm (1980), where the new brings what is implied and that unfolds later in a way, often unexpectedly, frightening mainly the management model based on a planning based on the logic of absolute time.

2.16.Totality in totalization

Understanding space as a totality is a fundamental theoretical construction, in view of the examination of the complexity of factors that make up the spatial context of any place. It is important to highlight that analytically it becomes problematic to evaluate space from the fragments of totality, under penalty of making a mistake in trying to understand the reality that happens in an integrated way.

. Space should be considered as a totality in a constant process of totalization, that is, of change related to its internal structure (system of actions and objects) and the external influences it undergoes (SANTOS, 1997). This integration recalls, once again, Leibniz's monads, who considered as an essential property of cohesion the pre-established harmony that exists in bodies and not their extension (SITA, 2010). The responses of the flows are unique, relational to the variables of a given event.

For this reason, we also adopt the idea of Santos (1997), who analytically verifies the totality from the categories form, process, structure and function, in which its verification should never reveal its spatio-temporal simultaneity. In this analytic and quantum logic, all elements are interconnected, making it impossible to understand their elements in isolation.

Santos (1997), by listing the categories form, process, structure and function, as integrated and moving analytical elements, brings us the idea of space-time in its dynamics. Function is associated with the processes that are the very dynamics that lead to action and interaction. The structure is related to the integration of the systems of actions and the systems of objects; Processes, as said, are actions in time and form is the visible, external aspect of an object constituting a spatial pattern. The understanding of the interactions of space leads us to spatial totality, that is, space as a whole in motion, which is the form-content in its spatio-temporal relation.

2.16.1. The Totalization Mechanism

Understanding totality as a concept that means space, totality in the process of totalization, will always be an incomplete totality, since it is always seeking to totalize itself. At each moment of its evolution, the totality undergoes a metamorphosis, becoming a real-abstract in search of being a real-concrete (Santos, 2014). It is the logic of order-disorder-reorganization-new order, which occurs as an evolutionary spiral (MORIN, 1977).

Regarding this evolution, applied to geographic space, Santos (1997, p. 120) explains that "the historical process is a process of separation into particular, specific things. Each new totalization creates new individuals and gives the old things a new content."

This structured, real totality is a finished "perfect" reality, always in self-organized reordering, the totality ends up in a constant movement in search of another level of equilibrium, so we must distinguish the constructed totality from the totality under construction.

As Santos (2014, p. 116) states, "Totality is reality in its entirety." Therefore, for Kosik (2002), totality is the reality of a "structured whole" that was dialectically constructed. And, remembering that the process of totalization (change in time of a totality) is relative to each place based on its dynamics, or how the dynamics of each structure occur (system of actions and system of objects that work integrated).

This constructed totality, in each location, represents a specific moment, becoming a concrete totality, which is transformed into a structure. The materialization of the process of a concrete totality is, for example, in the instantaneity of the propagation of modernities, which ends up dismantling the organization of the previous space (SANTOS, 1997).

This mechanism, of technical propagation, intensified globally, especially from 1945 onwards with capitalist expansion, known as the internationalization of capital (SANTOS, 2014). This process has generated new demands for the planet, altering landscapes and economies. Thus, Kosik explains (2002, p. 59) "The genetic-dynamic conception of totality is a presupposition of the rational understanding of the emergence of a new quality".

External action is only a "detonator", a vector that enters the system, being a new driver, but it is not the fundamental factor of this impulse, because the whole can only be known from the understanding of each fraction that participates in the evolutionary process. Therefore, Santos (2014) teaches us that the whole can only be understood by the joint movement of all its parts through the process of totalization. As Santos (2014, p.116) verifies, "This process of dismantling the whole, fragmentation and recomposition is a movement by which the single becomes multiple and vice versa".

The movement of the totality generates changes in the balance between the different instances or components of society, altering processes, demanding new functions and attributing new and different values to geographical forms. Society in motion generates its own response in space, which is its mutability.

3. Conclusion

This article is an attempt to demonstrate that the Cartesian-Newtonian framework is insufficient to explain reality, as it is complex, non-linear and often unpredictable. In view of this enormous deficiency, the research presents as an alternative the logic of the discontinuous evolution of space-time. Non-Euclidean or systemic planning refers to an epistemological stance on the part of the researcher and his team, which is not limited to Cartesian and Newtonian analyses of reality.

The look of space-time on planning should reinforce the vision of a planet open to unpredictability and future non-linear possibilities. In this reading, the spatio-temporal velocity needs to be understood in the light of the rationality inherent to the complexity of each place. Actions on geographic space, which often dynamize events that will have negative responses for the planet, must be reviewed within a view that rethinks space and time as integrated elements that evolve discontinuously.

This reading of reality responds epistemologically to a planet that functions on the basis of systemic rules. Rules that lack a social and scientific reading, which goes beyond the imaginary of an empty space and a time that walks linearly as a causal response to previous events.

Planning, based on the discontinuous evolutionary understanding of space-time, means being prepared for a new scientific posture that is coherent with reality. It means that transdisciplinary teams must integrate, based on the understanding of the place as a totality in the process of totalization.

The team must thus understand the variables that make up the events, dividing itself into research subteams similar to the local instances (which are in themselves totalities) (CAMARGO, 2020). And, you must also realize that there is nothing isolated, only interconnectivity links, which make the place its very essence. The content-form thus assumes a relational stance to its future self-organized movement. This non-structuralist reading allows the researcher to see the real and not be deluded by the false reality born of his imagination given *a priori*.

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