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THE CORRESPONDENCE THEORY OF MATHEMATICAL OBJECTS: ON AUTOMATISM AND INTERSUBJECTIVITY[1]

La teoría de la correspondencia de los objetos matemáticos: sobre automatismo e intersubjetividad

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Abstract

This work promotes a philosophical reading of mathematics that responds to the political traumas of our time. The automated decisions driven by advanced information processing (AI) renews the prevailing tension of isomorphism or correspondentism between structural attributes of the mathematical sphere and those of the subjective sphere. Based on this tension, first, it is proposed to give a clear view on the difference between the methodological-instrumental and ontological-representational view of mathematics. Second, in order to give a new meaning to mathematical reality beyond an instrumental and formalist sense, Gaston Bachelard's view on mathematics allows to reflect on the relation within mathematics as a way of organizing experience. Therefore, it analyzes his study on mathematical determinism. With this, it aims to subvert the tension and classic political problem (automatism-intersubjectivity) driven in the digital-studies agenda.

Keywords: correspondence, mathematical object, determinism, intersubjectivity, Bachelard

Resumen

Este trabajo promueve una lectura filosófica de las matemáticas que responde a los traumas políticos de nuestro tiempo. Las decisiones automatizadas impulsadas por el procesamiento avanzado de información (IA) renuevan la tensión imperante de isomorfismo o correspondentismo entre los atributos estructurales de la esfera matemática y los de la esfera subjetiva. A partir de esta tensión, en primer lugar, se propone dar una visión clara sobre la diferencia entre la visión metodológico-instrumental y ontológico-representacional de las matemáticas. En segundo lugar, para dar un nuevo significado a la realidad matemática más allá de un sentido instrumental y formalista, la visión de Gaston Bachelard sobre las matemáticas nos permite reflexionar sobre la relación dentro de las matemáticas como una forma de organizar la experiencia. Por tanto, analizamos su estudio sobre el determinismo matemático. Con esto, pretendemos subvertir la tensión y el problema político clásico (automatismo-intersubjetividad) impulsado en la agenda de los estudios digitales.

Palabras clave: correspondencia, objeto matemático, determinismo, intersubjetividad, Bachelard

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Introduction

The deployment of automated decisions by means of computation renews the debates[2] concerning the prevailing tension of "isomorphism" or "correspondentism" between modelistic mathematical methods, the properties of the social universe, and the intersubjective field. The growing algorithmic interpellation associated with machine learning techniques that establish constant statistical correlations between and about properties unfolds schemes of similarity and difference between structural attributes of the mathematical sphere and those of the subjective sphere respectively.

In the face of one of the fundamental components of the political traumas of our times: the much-propagated narrative against the enclosure or determinism of human subjectivity by algorithmic ordering, this paper intends to offer an alternative reading. In order to achieve this, it addresses the correspondence theory of mathematical objects by reflecting on its methodological-instrumental (applied) and ontological-representational (pure) views. This aims to explore and philosophically debate the increasing automated (machine learning) classification within the cultural and subjective sphere where mathematics is applied. In turn, this problematic is related with Bachelard's epistemological studies regarding mathematical determinism where it is possible to find the traces towards its potentiality.

Regardless of the technology in use, we have been circumscribed mathematical objects, to a structure of emplacement (*Ge-stell*, in Heidegger's terms) manifested in the performativity of computational calculus. In this context, technological systems are defined as closed, fixed, determined, completely individuated formal systems and, therefore, lacking an inherent transformative reality. Under this perspective, the present essay, therefore, attempts to approach a non-deterministic reading of mathematical automation and its transformative character in order to understand and situate the nature of its objects, in relational and operative terms.

The potential or transformative character of mathematical reality[3] is re-signified in this work by means of the thought of the French epistemologist Gaston

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[2] Foundational debates of the logic-mathematics of the first half of the twentieth century carried out above all by the appreciation of symbolic logical procedures (Frege, Peano and Russell) and the treatment of the logicist program of Hilbert. Cf. Marek & Mycielski (2001).

[3] Also, Mackenzie's study, recovered from Hansen's analysis (2021), draws attention to the historical aspect of mutability in the sphere of mathematical abstraction: "Which algorithm, what kind of abstraction, and which 'mathematical way' should we focus on? Like automation and calculation, abstraction and mathematics are historically mutable. We cannot 'move at the same level' without taking that mutability into account" (Mackenzie 2017 9).

Bachelard, "the creative power of mathematics to create reality (*la valeur realisante de l'idée mathematique*)" (Bachelard 1984 41). This assumption is an event of enormous significance to understand the tensions that occur within the current technological stage. Likewise, the recent study by Mark Hansen (2021) provides evidence through his analysis of Bachelard about the enriching relationship of the mathematical substrate in machine learning systems and Bachelard's phenomeno-technical studies: "We need to express in the common language of experience a deep reality, which is mathematically meaningful before being phenomenally meaningful" (Bachelard qtd. in Hansen 2021 58).

To achieve a coherent expression of the aforementioned "deep reality of mathematics", a commitment with Pythagorean-Platonic or Kantian positions is indirectly assumed. I shall underline the nomenclature's distinction between Plato and Kant at this point. Although in both cases the access to mathematical knowledge is approached by intuitive means, the term "mathematical object" or "numerical object" is reserved for Plato and the Pythagorean tradition. These expressions imply the genuinely independent existence of mathematical objects, whereas, in the case of Kant, it does not refer to mathematical objects, that is, to ontologies belonging to another order of reality, but to "a priori truths", namely, apodictic and structural categories that are already part of our psychic or psychological system and that allow us to organize every possible phenomenal experience for the representation of the world.

Beyond the many latent questions raised by this brief paper, in order to achieve conceptual clarity and to problematize this type of correspondence between mathematical-computational and subjective spheres, the paper is organized as follows. First, two types of correspondence (correspondentism) of mathematical reality are distinguished and developed: instrumental and representational. Second, we relate the correspondence problem or correspondentism, as we refer here, for accounting the problem of quantitative-determinism and subjective-indeterminism related to contemporary automated technology (AI). Third, taking up Bachelard's analysis in his work: *The new scientific spirit* (1934) it is analyzed Bachelard's methodological distinctions and extended its points of relationship with the previous arguments. Finally, conceptual philosophical and political reflections are derived with respect to the mathematical sphere.

1. Two positions on mathematical correspondentism

Broadly speaking there are two historical traditions from which the development of mathematical-philosophical thought unfolds: on the one hand, the theory of the properties of space (geometry) and on the other, the theory of numbers (arithmetic). Although correlated, the heritage of the former is methodologically based on the "axiomatic method" belonging to the Aristotelian tradition, while the latter is based on formal computational procedures that manipulate numerical objects, and which seem to correspond, on the contrary, to the Platonic-Pythagorean tradition (Klimovsky 2000 26).

On the basis of mathematical formal language, these two enclaves were historically developed and bridged, on the one hand, from an instrumentalist vision of mathematics (applied mathematics) in which its correlation with respect to the phenomenal order results from its application in various fields of factual sciences and their concrete objects of reference. Within this framework, there is no fixed claim about an ontological reality of "numerical or mathematical objects" but rather a discursive and imaginary existence of it. This pragmatist sense of mathematics becomes useful for interpreting, analyzing and intervening objects and properties of the effective reality. In turn, this perspective has a clear degree of affinity with the historical origins of mathematics, with its correspondence of measurement with concrete extensive spaces (e.g., surveying practice). This faithfulness between numbers and extensive spaces marks the first records of empirical inductivism, that is, of the collection of particular data from which general conclusions are derived.

On the other hand, the ontological or representational view of mathematics, the Pythagorean-Platonic type, is organized according to a primordial and transcendental reality of "mathematical objects" upon which the rest of the orders of reality unfold. In this perspective, mathematical objects hold an independent existence to phenomenal objects and subjective experiences and may thus be considered in line with pure mathematics (although not exclusively). Over time, this structural and modelistic perspective of mathematics has been built up in formalist or logicist schools of mathematics. Thus, its mode of existence can be conceived not merely in an instrumental way but also by an integral ontological existence of the "mathematical objects" themselves.

The challenge with the latter view is that there is a methodological impossibility (a mathematical proof) to corroborate the existence of a reality of "mathematical objects" as such. Contrary to this ontological-representational position is the critique of the neo-intuitionist school to which Leopold Kronecker, Luitzen E. Brouwer, and Henri Poincaré belong[4]. The neo-intuitionist school holds that the existence of numerical entities is a product of the human mind, mental entities only recognizable by it. In this assumption, mathematical postulates respond to conventionalism, that is, they are mere conventions of the subjective experience of a cognizing subject, or in its constructivist aspect, mere constructs

[4] Also see Heyting (1931) and Natorp (1910).

based on the cognitive-perceptual experience and within which also belongs, in part, the mechanistic aspect[5].

When referring to a system of "pure mathematics", as for example Peano's system, it could be conceived, as a strictly syntactic or tautological system devoid of content with no other limit than itself, or it could be conceived as a system always already interpreted that owes its validity to a previously fixed interpretation which makes its reference possible. The origin of this debate traces back to one of the millenarian problems of referentiality from the 14th-century scholastic theory of logic (intentionality versus extensionality). This philosophical-dialectical tension remained an open source for the mathematical logicians of the 20th century who tried to capture and formalize expressions by shifting the intentionality away from the symbols and embedding them in their extensionality. The latter attempt would lead to a significant epistemic turn in the mid-19th and first half of the 20th century as Erich Hörl has shown (2018). This very epistemic shift from intuitive-based knowledge towards symbolic-based operations, where an entity from the outside could be abstracted and manipulated as a pure symbol within its formal relations, has been characterized by the author as the "rise of the axiomatic age".

The mathematical dynamis (*δύναμις*), its relational, ulterior and structurally primitive nature endow with directionality and orientation the house of the pawn of the symbol (*Bauer des Symbols*) *par excellence*, that is, the cognitive subject. By operating symbolically, "mathematical reality" frees itself from correlationism with phenomenal reality and transcends it by means of the formalism of its language. By means of this, the symbols come to have the character of "indeterminate" (*incertorum*), an adjective used by Leibniz to describe algebra (1875). Precisely abstraction, abs-tractus, "without stretch", as its etymology indicates, leads to the loss of space or concrete distances between two or more particular points.

The regressive (inductive), progressive (deductive) or analogical (transductive)[6] wave of thought thus discovers, in the purity of the symbol, that its openness to the relation with other symbols does not primarily rely on the arbitrariness of the language with which they are mentioned but on that relationship to which symbols refer. In other words, one can always modify and change one sign for another, to call three to the two is arbitrary, but that should not

[5] Regarding the mechanistic aspect, Newton, mathematics was concerned "*about* empirical (physical) objects extended in empirical (physical) space and constructed by God, nature or man" (Garrison 1987 612).

[6] This concept has been thought and developed by Simondon to emphasize not only the existence of relationships between information systems but the relationship taking into account the potentiality (pre-individual charge) of the individuals in question. Cf. Barthélémy (2012).

be confused with what the sign refers to. Thus, the fundamental and characteristic feature of mathematics resides in this capacity of referring to numerical entities, about (applied) or beyond (pure) phenomenal reality itself.

From the perspectivism of modern science, initiated by Galileo-Copernicus, however, Meillassoux situates the decentering of thought with respect to the world. Thought has the potential to access a world that is prior and ulterior to itself and indifferent to whether or not it is thought by thought itself: "Whatever is mathematizable can be posited hypothetically as an ontologically perishable fact existing independently of us. In other words, [...] what is mathematizable cannot be reduced to a correlate of thought" (Meillassoux 2009 117). The collapse of the capture of a cognizant subject with respect to mathematical reality implies the *déphasage* of that correspondentist relation or intersubjective correlationism that has historically shaped the philosophical tradition.

As far as the two perspectives of mathematical correspondentism are concerned, when asked about the correlation of mathematics with respect to effective reality, neither mathematics as an instrument (e.g., mechanistic approach) nor mathematics as an absolute model (e.g., set theory), regardless of the axiomatic system, manage to capture or enclose, in a sufficiently faithful way, the complexity and contingency of the properties identified in the social universe.

Nonetheless, with the focus on modeling applications of algorithms, these distinctions continue to be fruitful for reflection for understanding the tension between the mathematical sphere and those of the subjective sphere. The same, rely mostly on mathematical techniques from probabilistic and statistical theory for knowledge representation (Boden, 2016) and, in a sense, partially and approximately capture a possible state of phenomena. Through the application of these methods, there is also the underlying question of whether their application in the social universe is limited to a deterministic and instrumental view or, as they evolve, they can also contain the deposit [*dépôt*] of a reality rich in potentials. Mackenzie is quite correct in posing the following question: "Given that mathematics and algorithms loom large in machine learning, how do we address their workings without preemptively ascribing potency to mathematics or algorithms?" (2017 9).

Precisely, part of the root of the cultural and political traumas in the contemporary digital era results from how we grasp the complexity of mathematical correspondentism (instrumental-representational) when relating it to the intersubjective sphere. This political trauma is summarized in: the increasing delegation of responsibilities and decision-making by algorithms, which calls into question the repertoire of freedom as a decision-making mechanism. Therefore, the question that essentially unfolds is, what does this double perspectivism of mathematical correspondentism bring to our present time?

If it were the case that the revelation of patterns at the numerical level of certain partialized realities (often historically biased) were sustained through a merely instrumental and operational interpretation of mathematics, what is revealed mathematically by computational means would possibly only express a state of contingent organization with respect to the world and nothing more. If, on the contrary, mathematical organization were not merely instrumental but denoted an ontological reality *in extenso* to all possible orders, not only decision making but all spheres of reality would be unveiling, unfolding a primordial and structurally networked mathematical reality.

2. Quantitative-determinism and subjective-indeterminism

Through his epistemological proposal within the framework of relativistic science, Bachelard situates mathematical reality not in a merely instrumental sense, as it is also the case with logic, but as a primordial source of transformations and configurations based on its transcendent, indeterminate and contingent character with respect to sensible data.

This philosophical reading of mathematics is aligned with the dissociation of mathematical physics from reality (geometric magnitudes) and its association with probable reality (measured magnitudes) (Ortega y Gasset 1958). This event allows algebraic representation[7] to transcend and free itself from any particular object, experience and intuition, freeing itself even more from any particular numerical object to represent any of them. For example, under the algebraic symbol x "all numbers can be that any" (1958 20). In this new phase, the symbol acquires a new potentiality in which there is no longer correspondence by extensive affinity with reality as such, but rather, the symbols themselves obtain the character of reality through relations.

Already in the symbolic and formal stage, mathematical indeterminacy reaches its characteristic ambivalent sign through, on the one hand, the mechanizable and determined aspect of the formal-logical rules and, on the other hand, the impossibility of determining its own becoming through a finite method of the formal system itself, an event that Gödel unveils in his famous metamathematical proof (1931)[8].

The techniques that have aroused so much interest, especially since the beginning of the century, known as machine learning, can be roughly regarded as the mathematical-statistical prediction of a precise state of reference. These

[7] Ortega y Gasset (1958) points out, in turn, that algebra as a "way of thinking" makes possible the regular form of analysis, that is, deduction.
[8] Due to space constraints, I expand on this topic in my article: Prado (2021).

references are based on subjective information of approximate, probable and uncertain values. Embedding concrete attributes into well-defined categories (classes) and associating them to reference values entails the loss of distinctions within the phenomena in question. This organization of the real occurs at the level of totalities and of gregarious behavior and not through particular individualities. The holistic character of statistical individuation opens a dialectical process towards general tendencies which is a characteristic of the completeness towards which any system of mathematics aspires.

From a less rigorous horizon than the logical-formal one, when applied in approximative-statistical methods, mathematics also reveals a photograph of sets, classifications and their properties, which opens the debate of correspondentism or isomorphism between spheres (quantitative-determinism and subjective-indeterminism). In the search for a way to subvert this classic oppositionalism at the philosophical level, on which the majority of the critics of the digital humanities[9] operate, there is still (a clear Simondonian effort) to bring together these spheres through the same process of continuous becoming and continuous transformation. Thus, from an ontological-representational framework, these correspondentisms, without being subject to the deterministic classification of mathematical automation, produce in their ongoing interrelation potential modifications with respect to the very properties that condition the course of their becoming.

In this way, not only do they no longer exist independently of each other, but the potential development of the properties found at the intersubjective level (e.g., properties that together define the orientation of attention and decisions), when organized as numerically as encrypted predictions, gives shape to a relational environment.

In accordance with today's technological practices, the reorganization of attributes (data) corresponding to categories (classes) belonging later to sets (patterns) is observed through the correspondent capture of mathematical-statistical functions. This practice is also part of an open process of capturing relationships, a potential and ontogenetic index of a reality to be unfolded, to be unveiled by means of the constant experimental and theoretical rectifications that are part of the constant critical-evaluative process of mathematical-computational science.

[9] Thus, a possible conciliation with respect to algorithmic extension and mediation in society would consist, for its part, in dropping the Heideggerian veil between thought and calculation in order to allow critical thinking about these new mediations, and therefore these new forms of intersubjectivity.

In line with Bachelard, the epistemological and ethical challenge of modern science, in the opposite sense to the Cartesian one (which starts from the simple to reach the complex), intends to carry out the search for "diversity beneath identity" (Bachelard 1984 139) and where it is the small patterns that often reveal the sharpest key readings about reality. This turn is not only epistemological but essentially ethical-political since it is equivalent to a design that tries to demand the emergence of the complex, the particular, the individuated, "the emergence of qualities in the whole not evident in the parts" (1984 142) or in Deleuzian terms, the "singular" before the "ordinary".

It is important not to overlook the fact that this character of "resemblance" or "correspondence" relation between the phenomenal and the mathematical level derives, in large part, from the notion of "function" where what enters into correspondence is the symbolic order[10]. Such observations are in line with today's statistical techniques of machine learning, whereby the numerical pattern is the result of a partial correlation with one or some aspects of the phenomenal pattern but is not completely representative of it and its state varies constantly. Hence, the common attributes of a huge amount of data always result in a partially representative and contingent state of a particular state of facts.

The identification and association of a behavior or decision making (which in its intersubjective sphere are supposed to be rich because of their polyvalent character) to a given numerical pattern, leads to the premature conclusion that this would imply the elimination of the uncertainty, imprecision and creativity "characteristics" of human practices. According to which, they would not fit with a numerical entity and, even less, to its possible automatism. It is exactly there where the notion of determinism relative to the numerical-quantitative nature requires critical revision.

3. On Bachelard's notion of determinism

Bachelard's formidable contribution allows us to capture the tendency and the transforming power of mathematics as a criterion for the construction of the epistemological problems of science and of reality itself, that is, the capture of relations within mathematics is what allows, in the last instance, the "mathematical organization of experience" (Bachelard 1984 34).

Motivated above all by the theoretical contributions of non-Newtonian science, Bachelard's epistemological study traces through a dynamic and historical

[10] Deleuze already recognized part of this problematic index in the differential calculus: "a sort of union of mathematics and the existent, it is the symbolic of the existent" "a means of fundamental exploration [...] of the reality of existence" Deleuze (2006 65).

scheme the "processes of objectification" and empirical extensionality of the history of science through its onto-epistemological precedent: mathematics. The French epistemologist points out: "to study phenomena one must engage in purely noumenal activity; it is mathematics that opens new avenues to experience" (1984, 60).

In observing atomic physics[11] and microphenomena, Bachelard recognizes the dynamic and relational nature within mathematical physics, which converges and subsumes experimental physics since, according to his philosophical-epistemological framework, the reality of the objects of analysis are not found in the objects themselves but acquire the status of reality through relationships, and these relationships are precisely mathematical. Hence, the problem of determinism[12] is, roughly speaking, associated with the individuality or individual qualities of objects belonging to a set, which is, for the French epistemologist, an error of elementary realism, an illusory simplification.

According to Bachelard, reality, corresponds to this metaphysical function of uncovering (resembling *die Unverborgenheit* from Heidegger) the self-evident givens at the phenomenal level: "The belief in reality is essentially the conviction that an entity transcends immediate sense data; or, to put the same point more plainly it is the conviction that what is real but hidden has more content than what is given and obvious" (Bachelard 1984 31-32).

Although methods depend on the empirical erudition of the phenomenon and the definition of their own objects of analysis depends on the methods, Bachelard explains that any concept or method is always provisional and it is the mathematical framework[13] that allows them to reorganize themselves: "Little by little the dialectics of mathematical thought enters into the empirical realm. Methodological change follows the contours of mathematical argument" (1984

[11] Above all, due to his interest in statistical phenomena, the emphasis is on the study of thermal propagation. According to Bachelard, preceded by Biot, Furier was the first to found a mathematical theory of heat. See, Bachelard (1928)

[12] The qualification of "deterministic mechanicism", whose origins dates from the astronomical mathematics of the period of modern physics inaugurated by Newton, is due to the objective and deterministic rigorousness of the laws of Newtonian physics founded on mechanical practice and the simplicity of the intuited forms and hence its relationship with Euclidean geometry. Bachelard summarizes: "Working together, astronomy and geometry protect the determinate character of the phenomenon against all doubt" (1984 103). This physical determinism has, on a large scale, a strong association with a rationalizing attitude towards the systems that make up reality, which are marked by the identification and generalized delimitation of their behavior and reduced to an absolute mechanicity.

[13] This is largely due to the fact that mathematics has been taken since antiquity as a paradigmatic model of the scientific method due to its rigorous deductive level. More information in: Klimovsky (2000).

137). In this last quotation, the priority of mathematical reality over phenomenal reality is explicit and evidences the non-instrumental but structural treatment of the role of mathematics. This abstract structural level is precisely the one that communicates and relates the objects of analysis at the phenomenal level.

The determinism criticized by Bachelard is found in the hypothetical deductive system of classical Newtonian mechanics, in which it is possible to determine the particular state of a phenomenon according to the initial conditions (position and velocity) in a specific time and space. In order to avoid philosophical confusions, it is important not to confuse mathematical determinism (logical deduction) with physical determinism (causality). The first one refers to the inherent properties of the phenomenon[14] itself (logical-epistemological) and the second one, to the "a priori form of objective knowledge" (gnoseological). However, in his analysis, Bachelard himself turns the gnoseological study into problems of logic, particularly problems of predication, since the analysis of the properties inscribed in the phenomenon-object is regarded from the identification and belonging (or not) of property within a set. Certainly, the position of the French epistemologist in this respect is radical: "We have neither the right nor the means to ascribe individual qualities to elements defined as members of a set." (1984, 130).

The framework of determinism from the logical-epistemological analysis, according to Bachelard regards it as possible to determine the class (the set) but not the properties, which causes a contradiction in the (bivalent) logic within the phenomenon[15]. Thus, the determinism of the phenomenon and its properties do not correspond to the numerical forms and their quantitative character but to the relations between signs and their qualitative character. The intrinsic problem behind properties-identification lies in the claim that in order to explain the behavior of phenomena it is sufficient to resort to the essential properties inherent to each individual phenomenon which leads to the conclusion that relational properties (by nature opposed to inherent properties) play no role whatsoever. Precisely in the opposite sense and in rejection of knowledge through data-sense's ordinary experience, Bachelard, in formulating the epistemological conditions of mathematical physics, recognizes the relational character of mathematical objects by affirming that it is the relations that constitute the properties of the object and

[14] Under the notion of "phenomenon" both solids and gases are included, without privileging either of the two, since both, as statistical, respond to the laws of probability.

[15] Beyond the fact that it is not possible to reduce the deductions of science to the analysis of syllogistic consequences, contradiction is held according to the parameters of the Aristotelian logic of the excluded middle. Nonetheless, in agreement with the observations of quantum science, Reichenbach in 1944 proposed a logic with three possible values: true, false, indeterminate and no fourth possibility. See his work, *Philosophic Foundations of Quantum Mechanics* (1944).

its belonging to the set. These relations imply mathematical correspondences, which due to their character of openness, coherence and transformation, allow a relational and not fixed reading on the phenomenon at stake.

Furthermore, there is another determinism from the gnoseological view, referring to the way of knowing the (statistical) phenomenon which is not based on the identification and belonging of the property to a set but on the methods to know it. With respect to the latter, phenomena are subordinated to two categories: mathematical determinism (associated with logical deduction) and physical determinism (associated with some kind of causality). From this follows a corresponding methodological differentiation: "Causality is an idea of a qualitative order, whereas determinism is of a quantitative order" (Bachelard 1984 111). For the former, the *cause* of the phenomenon is observable, that is, it obtains its truth value through evidence (or intuition in the Cartesian dictionary) and, therefore, predictions relevant to the phenomenon itself are achieved simply through the act of recognizing (*reconnaître*) while, on the other hand, for the latter, the act of *sensu stricto* knowing (*connaître*) requires a deterministic proof or an unequivocal mathematical expression.

In this second order of distinction, the phenomenon ceases to be associated *in extenso* with the qualitative order and becomes associated with the quantitative order. This analysis has its problematic root in the shift from the realist view to the probabilistic view, that is, from the notion of object as an individual, clear and separate entity and in which "the real object is through its membership in a class" (Bachelard, 1984, 128) to a probabilistic notion in which the individuality of the object is lost and where "objects have no reality except in relations" (1984 132). This is precisely where the indefinite and polyvalent character of the relations operates, which allow the object the alternation of opposed states, therefore, the statements or states of facts do not receive the category of reality but of probability.

Now, returning to the gnoseological level, and from a very abstract point of view, it could be noted that determinism plays a more dominant role in relation to the symbol than in relation to the numerical element, and this is perhaps because the number quantifies (cardinality) or orders (ordinality) and does not fundamentally represent a particular fundamental state of the phenomenon. The latter points to the ontologically relational property of numerical entities, which is precisely why Bachelard calls it "science of relations" (1984 165).

4. Conclusion

Back to the ontological-representational view, the ongoing mirroring between attributes (states) and symbols (values) allows for unfolding mathematical objects as not exclusively based on the empirical phenomenon (although applicable to it) but as "the pattern of discovery" (Bachelard 1984 55). Regardless of who is the experimental or cognitive subject (human or autonomous agents) producing the interpretation and agency of symbols, this is an event indifferent to the mathematical reality itself. Its transformative character is not reduced to the objects it refers but to the further relational and potential character that allows such objects and their properties to take shape in the first place.

The creative rectification of mathematics open to a state of variable correlationism between different orders of reality restores the fact that "modern science has accustomed us to working with statistical objects, with objects whose attributes are in no sense absolute" (Bachelard 1984 119). Under this treatment, what is usually missed, is that in the problematic of correlationism or isomorphism between properties of mathematical-intersubjective spheres what is at stake is its political correlate. Thus, with the loss of the particularities and complexities of the phenomenon of analysis emerges its reconstruction of statistical basis at a relational level.

One of the main ethical-political challenges does not pertain so much to the correspondent debate between numerical and phenomenal reality, but rather to how intersubjective processes are currently configured on the basis of that associative and dissociative mathematical activity, sometimes hidden, sometimes patent of properties or elements that become part of the decisions of the subjective sphere. The founding mathematical relationship between the social dimension and its respective automatisms thus reveals a common isomorphism and correspondentism, which responds to its location and operability within part of mathematical reality itself.

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