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# Epistemological Considerations on Systemic Paradigm

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**Abstract** This brief study makes some reflections on the systemic paradigm and the claim that Reality is a system advocated by some thinkers. We argue that the General Systems Theory is an abstract theory relating to formal reasons that correspond to real systems scientifically established, and its development can facilitate the task mentioned, which is characteristic of ordinary scientific work.

***Keywords:*** *analytical process, knowledge, infinity, reality, synthetic process, system*

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## 1. Introduction

The label 'systems theory' is used here to refer to the achievements of this entire scientific enterprise. Although, to be precise, one should really speak of systems theor*ies*, in the plural, these theories have a common character and reflect a common perspective. They are transdisciplinary, being more abstract and general than specific scientific theories but less abstract and general than mathematics and philosophy. They are components for an '*exact and scientific metaphysics'* (Bunge, 1973) that is currently being developed but still awaits a full articulation.

When we study the relationship between physics, biology, ecology, psychology and other areas of thought we have found that the structure of the General Systems Theory provides a natural extension of scientific knowledge to other fields of concepts. Exploration of systems concepts in biology, medicine and social sciences has shown that systemic focus confirms existing parallels between modern science and some philosophy of ancient Greece, Kabbalah, Chinese Taoism and Zen Buddhism. There is a profound harmony between the concepts of life, evolution, environment, mind, consciousness, free will, etc.., which are expressed in the General Systems Theory and is a very consistent philosophical basis for our current scientific thinking.

Systems theory offers a view of the world that is more encompassing than any view provided by physics. From a physics-based 'theory of everything,' one would get only a theory about things that physicists study: to our understanding of life, human society and our natural environment. Unity of science cannot be gained by learning the fundamentals of physical reality; it can only be based on general principles that apply to all types of systems. By unifying science in this way, systems metaphysics gives us a new understanding of what we already know. One does not need to descend to the quantum level to see the world differently, and the distinctive features of quantum mechanics are largely irrelevant to the middle-scale domain in which we live. Consider instead the implications of simply understanding the world in terms of the categories of (a) matter, energy, information, and utility, (b) structure, function, and history, and (c) the actual and potential. These notions are central to systems thinking (Gerard 1958; Miller 1978; Kauffman 2000). Truly assimilating them would transform our sense of the world.

Systems theory not only helps us think in new ways about familiar facts, and counters the narrowness of received opinion, but may stimulate new explorations and discoveries. Given that the category of utility augments those of matter, energy, and information, one wants to go further. If matter-energy is adequate for the material realm, and information spans the material and the living realms but is more visible in the latter, and utility is distinct to the realm of the living, are there further realms and, if so, what categories are basic to them? There is at least one obvious other realm: just as life emerges from matter, mind emerges from life, so one might ask: what new scientific category will be central to some new scientific theory that helps us to understand mind not merely as information processing but as subjective experience? Despite major advances in cognitive science, what science has to say about this question is meager.

Value is central to the humanities and the arts, and systems theory connects science to these domains. This is possible because systems ideas apply not only to concrete systems but also to abstracted and conceptual systems, i.e., to systems abstracted from or not even grounded in material reality. Systems theories have the broad scope inherent to mathematics, but being less abstract than mathematics, they address themes that are ubiquitous in human experience, such as order and disorder, dynamics, representation, communication, differentiation and integration, and conflict. Connections to the arts and humanities have been made in various ways. Ideas of entropy, information, and order have been applied to communication and form in the arts. Ideas from nonlinear dynamics have been used in literary studies.

Efforts to develop a general theory of systems have been paralleled by similar aspirations in the humanities. Modern social and literary '*critical theory*' (Calhoun 1995; Culler 2000) and the movements of structuralism (Caws 1998) and semiotics (Hervey 1982) represent comparable efforts to achieve coherence in the social sciences, humanities, and arts. Sometimes referred to simply as 'theory,' this project seeks to occupy an intermediate niche between the abstract fields of linguistics and philosophy and concrete fields such as literature, political theory, psychoanalysis, and feminism. Resemblance to the niche that exact and scientific metaphysics seeks to occupy is plain: linguistics plays the role of mathematics as the means by which the world is modeled; the fields of literature, etc., play the role of the different scientific disciplines to which transdisciplinary theory is applied. The two projects—systems theory in the sciences and 'theory' in the humanities and 'human sciences'—have more in common than analogous placement of their epistemological niches. The structuralism of Piaget (1970) overlaps considerably with systems theory, and information theory is an important component of semiotics. In both systems theory and structuralism/semiotics, there is a pervasive abstraction. There is the same flirtation with the denial of objective reality and the affirmation of the arbitrariness of models; i.e., the abandonment of ontology in favor of the exclusive concern with epistemology, as if one could have one without the other. The 'constructivist' position is widely held within the systems community; Ashby (1976), who stressed the 'relativity' of models, was perhaps in this camp. Both movements share Spinoza as a 'patron saint' philosopher. But there is at least one major difference between the two: critical theory and postmodern Theory are highly political. While one can no doubt find in systems theory some ideological presuppositions and agendas, they are less salient than the hegemony of feminism, Marxism, and other ideologies in post-modern thought. This crucial difference makes a productive interaction between the systems theory and post-modernism unlikely, although interaction continues. The shift from structuralism and semiotics to deconstruction has been a shift in the direction of skepticism, nihilism, and obscurity; this limits the fruitfulness of the interaction.

It is specific for the systems research that, representing an object as a system, we always reflect the object through a discrete and finite set of elements and relations. At the same time, objects of the real world possess an infinite complexity and an infinite diversity of their properties. A task of the theory of knowledge is to overcome this contradiction and to single out from the infinite complexity of an object such a formation that gives knowledge about this object with attributes of explanation and forecast. It is the notion "system" that scientific knowledge employs for solving this task.

Fractals are a good example of what can happen when a systems process that was only glimpsed in the past (Leibnitz, Cantor, Poincare) suddenly becomes popularized and made more discernable by the onset of computers. Fractal structure and process is an example of a system "process" where a seemingly structural feature (pattern) is actually the result of an isomorphic process. What we seek is better elucidation of the process that leads to the fractal structure on all levels and in all domains in which it occurs. It is the process resulting in fractal form that is the isomorphy, not the fractals that result. All fractal structures in nature are actually approximate because the mathematical concept of fractal is realistically infinite. In fractal generating processes, simple recursive iterations can generate complex structures. This makes fractal-like structures simple to encode and gives systems the ability to generate interesting and very complex structures without having to store a lot of information. Fractal-like structures also optimally dissipate energy because of the potentially near infinite surface space on the fractal boundaries. While they dissipate energy effectively they also maximize coverage of an area, or branching into a space. Fractal-like structures are found in leaf development on plants, tree branching, clouds, blood vessels and animal coloration patterns.

## 2. Some Logics and Epistemological Considerations

Heraclitus says: Polemos (war, strife, confrontation) has engendered the universe. Polemos rules the world. The Greek philosopher, who wrote at the beginning of V century B. C.E, understood therefore, that the Cosmos is a theater of endless fight between adverse elements where perpetual change is born. Polemos appears as the main law of the Universe. Unity and struggle of opposites, eternal principle of universal dynamism, and all processes are dynamic, and static exists only in our minds, continual contradiction leading to significant paradoxes. This is the principle of dialectical thinking: Cosmos contradictorily contradictory. Moreover, we find these contradictions of Reality in our seemingly rational models.

Rational knowledge is formed experimenting with objects and events of our daily environment. This belongs to the Kingdom of Intellect whose function is to differentiate measure, compare, sort and categorize. Thus, we allow ourselves to create a world of intellectual distinctions, of opposites existing in relation to the other, this being the reason that knowledge is, in a way, a relative knowledge.

We try to demonstrate the impossibility of a complete vision of Reality, through models written in symbolic language: the formal mathematical language[1].

We know. But how do we know? The Myth of the Cave lets Plato think about the process by which we have knowledge. Simply, the soul already knows. The soul comes from the World of Ideas, although the material body has made him forget it. They are projected shadows onto the back of the cave, and allow us, from the World of Light, however imperfectly, to remember what we already know. We know when we remember.

Far from the Platonic position we can listen. In fact, it was Quine, in *Word and Object* (p. 3f), who made famous Neurath's analogy which compares the holistic nature of

[1] Principle of Semiotic Incompleteness (Usó-Doménech and Nescolarde-Selva, 2012; Nescolarde-Selva and Usó-Doménech, 2014; Nescolarde-Selva, Usó-Doménech, J. and Alonso-Stenberg, 2015): It is not possible to totally characterize a structure of objects or processes, through a language (formal or not), or to completely present a portion of "truth" that this language can express on these objects or processes through its deductive operation.

language and consequently scientific verification with the construction of a boat which is already at sea:: *We are like sailors who on the open sea must reconstruct their ship but are never able to start afresh from the bottom. Where a beam is taken away a new one must at once be put there, and for this the rest of the ship is used as support. In this way, by using the old beams and driftwood the ship can be shaped entirely anew, but only by gradual reconstruction.* The authors would like to extend these words as follows: *We are born as shipwrecked on the high seas stormy ocean of sensory data*. In addition, the ship of knowledge that we will board must be designed and built without means, starting with the materials we encounter at sea, the remains of other wrecks, but despite our zeal, no one can help us. Other sailors, with their own abilities, can contemplate, but just can actively impact the channeling of these materials, at least until such time that our ship could install a communication system involving the development of a common language to communicate..

As Kant said, based on the knowledge of things, the noumenon[2]- the thing itself - is inaccessible to us. Kant in Critique of Pure Reason (1781 [1998]) says: "The concept of a noumenon, i.e., of a thing that is not to be thought of as an object of the senses but rather as a thing in itself [...]"; But note that the terms are not used interchangeably throughout. The first reference to thing-in-itself comes many pages before the first to noumenon.

Knowledge has access only to the phenomenon. However, to Eastern thought, *phenomena are nothing. Nothingness is the phenomena.* Is not possible to affirm just one aspect, and completely deny the other. That equates to create a completely dualistic limited and misleading view. There is no noumenon, everything is non-noumenon. However, there is the law of interdependence that links the existence between them. The one hand is the phenomena, and another eternity, beyond any phenomenon. These two concepts go together, they are inseparable. Everything is impermanent, even though, according to our senses, everything seems permanent.

We have proposed here inaccessibility of noumenon to place the lines of our systemic view. We maintain that the systems begin with, are founded on, and are determined by our knowledge. Reality is systemic since we know and because we know and, depending on how we know. Because knowledge puts conditions and the main condition is the systemic nature of the acts that result knowledge.

Here's an example: a good shooter fires a gun and the bullet destroys a valuable vase. We say that the shot is cause of the behavior of the vase. Moreover, as Hume says, in our experience, there is nothing relating to this cause. The practice leads us to incorporate the belief to referred causation. Rather we should say that this relationship is the product of a rational activity that establishes the link between two events. In general, relationships are not the object of direct experience, reception for the senses. Being in this way, and because we know the relationship: where from? A radical empiricist would deny the authenticity of their use, at least in scientific knowledge? Because, there is another way to understand the relationships that we establish different from the constructions own of our reason? And another question: does it belong to any real correlation? And we insist that knowledge is studying real structures.

Relationships are the essential elements in the systems. Moreover, if they are mental constructs, we accept that the systems begin with our knowledge. Systemic structures that our models of reality conceived - that is, the reality as we know it - is the result of reason: this will be an analytical and rational position?

There is a system in the own knowledge of any object. For example: a table. I have the touch, color, heat, cold and a long list of perceptions. The concept of this table is the set of all these perceptions - or, rather, the properties discovered in these perceptions[3]. The concepts of things,

[2] The noumenon is a posited object or event that is known (if at all) without the use of the senses. The term is generally used in contrast with, or in relation to "phenomenon", which refers to anything that appears to, or is an object of, the senses. In Platonic philosophy, the noumenal realm was equated with the world of ideas known to the philosophical mind, in contrast to the phenomenal realm, which was equated with the world of sensory reality, known to the uneducated mind.

[3] Let S be a subject, and O an object under specified conditions. Maddy's conditions (Maddy, 1990, 1996; Usó-Doménech and Nescolarde-Selva, 2012; Nescolarde-Selva and Usó-Doménech, 2014) for physical perceptions are as follows: The S perceives O if:
1. There is O. It is the absolute being, referent or designatum.
2. S has perceptual beliefs pB about O, in terms of the appropriate sort of concepts. Rather than talking about a physical object belief, one talks about the concept of a physical object, relative being or designata. This is based on the assumption that having a concept of a physical object entails that one has physical object beliefs.
3. O causes S's beliefs B about O.
To significances, that are consequence of perceptual beliefs pB on the part of a Subject S of an object O with certain characteristic C, we call perceptual significances (p-significance) and we denote as ps. Let ps be a perceptual significance, pB be a set of perceptual significances such that $pB = \{ps_1, ps_2, ...., ps_n\}$, $\wedge$ be an operation meaning "subject S **and** perceives O" (*perceptual conjunction*), $\vee$ be an operation meaning "subject S **or** perceives O" (*perceptual disjunction*). A perceptual field is a set pB that is a commutative group with respect to two compatible operations, $\wedge$ and $\vee$, with "compatible" being formalized by distributivity, and the caveat that the $\wedge$ identity ($ps_0$) has no $\vee$ inverse. Perceptual fields have the following properties:
1) Closure of pB under perceptual conjunction and perceptual disjunction.

$$\forall ps_1, ps_2 \in pB; \quad ps_1 \wedge ps_2, ps_1 \vee ps_2 \in pB$$

2) *Associativity of perceptual conjunction and perceptual disjunction.*

$$\forall ps_1, ps_2, ps_3 \in pB;$$
$$\Rightarrow ps_1 \wedge (ps_2 \wedge ps_3) = (ps_1 \wedge ps_2) \wedge ps_3$$
$$and \quad ps_1 \vee (ps_2 \vee ps_3) = (ps_1 \vee ps_2) \vee ps_3$$

3) *Commutativity of perceptual conjunction and perceptual disjunction.*

$$\forall ps_1, ps_2 \in pB; \Rightarrow ps_1 \wedge ps_2 = ps_2 \wedge ps_1$$
$$and \quad ps_1 \vee ps_2 = ps_2 \vee ps_1$$

*4) Existence of perceptual conjunction and perceptual disjunction identity elements*
There exists an element of pB, called the perceptual conjunction identity element and denoted by $ps_0$, such that $\forall ps_i \in pB; \quad ps_i \wedge ps_0 = ps_i$. Likewise, there is an element, called the perceptual disjunction identity element and denoted by $ps_{\aleph}$, such that $\forall ps_i \in pB; \quad ps_i \vee ps_{\aleph} = ps_{\aleph}$.

4) Existence of perceptual conjunction inverses and perceptual disjunction inverses

we notice similarities and differences. If included in the similarity function and separate the role of differences, then we classify things, include them in class. This fact is reflected in natural language that is in the form of nouns, adjectives and intransitive verbs. It is the same both in daily practice and scientific work, except on the systematization of the level achieved in the classifications based on the characteristics appealed to one and otherwise. Hume (1993) tells us that the reason introduces the relationship between the events and the reason is that which relates own perceptions in creating the concepts of everything and classes that relate these concepts[4]. So is there any way to escape to rationalism? The epistemological principle: *The whole is greater than the sum of the parts* is not easy to assume into crisis after the mathematical results of the XIX and XX century. This principle constantly brandished in the systemic world is not easy, because it involves the consequence that the whole is greater than its own parts. However, there are parties as big as the totality: Even the part of even numbers is as large as all of the Natural numbers. The part of the line segment is as great as the entire straight line[5].

We associate the term analysis with the disintegration in parts, synthesis being a reverse process. Today, a confrontation between supporters of the analysis and synthesis is absurd. One issue under discussion is that the analytic and the synthetic are fuzzy, vague concepts. It has been linked analytical to logical. In this sense, Descartes and Kant speak of the futility of Mathematical respect Logic. Indeed, for Kant mathematical truths are not analytic but synthetic. However, logic and mathematics do not require a priori sensible intuition. Let us remember that disqualification of Russell and Couturat made of Kant

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$$\forall ps_i \in pB;\ \ \exists \neg ps_i \,/\, ps_i \wedge \neg ps_i = ps_0$$

Similarly, for any a in F other than 0, there exists an element $a^{-1}$ in F, such that $a \cdot a^{-1} = 1$.

$$\forall ps_i \in pB;\ \ \exists \left( ps_i \right)^{-1} / \, ps_i \wedge_i \left( ps_i \right)^{-1} = ps_{\aleph}$$

5) *Distributivity of perceptual disjunction perceptual conjunction*

$$\forall ps_1, ps_2, ps_3 \in pB;$$
$$\Rightarrow ps_1 \vee \left( ps_2 \wedge ps_3 \right) = \left( ps_1 \vee ps_2 \right) \wedge \left( ps_1 \vee ps_3 \right)$$

A perceptual field is therefore an algebraic structure $\left\langle pB, \wedge, \vee, \neg, ^{-1}, ps_0, ps_{\aleph} \right\rangle$, consisting of two abelian groups:

1) pB under $\wedge$ , $\neg$ , and $ps_0$;

2) pB \ {$ps_0$} under $\vee$ , $^{-1}$, and $ps_{\aleph}$, with $ps_0 \neq ps_{\aleph}$,

with · distributing over $\wedge$

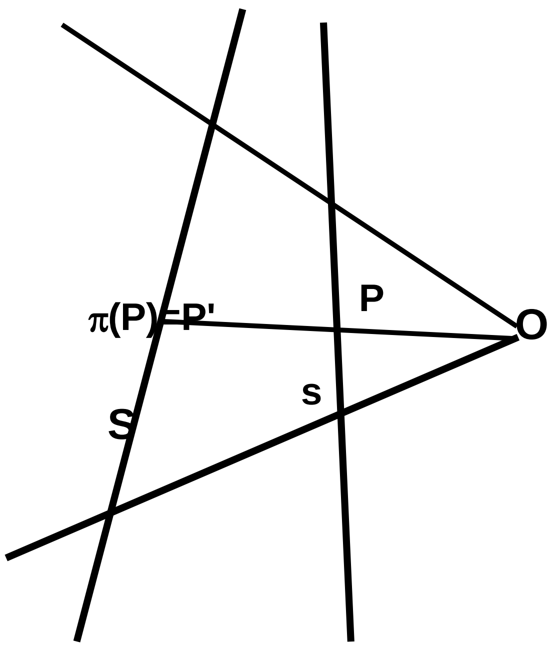
$\wedge$ perceptual conjunction identity element ($ps_0$) means no perception of any object. $\vee$ perceptual disjunction identity element $\left( ps_{\aleph} \right)$ means perception of all objects including "silence" or "blanks". $\neg ps_i$ means no perception of the object whose perceptual significance is $ps_i$ $\left( ps_i \right)^{-1}$ means perception the complementary to $ps_i$ and "silences" or "blanks".

We should ask ourselves how subject S, located before a perceptual field in which there are innumerable perceptual significances $ps_1$, to highlight precisely one and leave us perceive others. How is this possible, that the circumvented objects $O_i$ have also been perceived, if they do not lack quantitatively ostensible traits to justify no perception? It is a function of the perceiving subject. The unperceived is a significant. In other words what is not perceived is also a component of what is experienced, which can be placed in the heart of a polisyntagmatic chain that makes up the total discourse. That perception implies, in the logical sense of the word, what has ceased being noticed and somehow is discovered in what has been experienced[3].

By group theory, applied to the abelian groups ($pB^{\times}$, $\vee$ ), and ($pB$, $\wedge$ ), the perceptual conjunction inverse $\neg ps_i$ and the perceptual disjunction inverse $\left( ps_i \right)^{-1}$ are uniquely determined by $ps_i$ . Similar direct consequences from the perceptual field axioms include $\neg\left( ps_1 \vee ps_2 \right) = \left( \neg ps_1 \right) \vee ps_2 = ps_1 \vee \left( \neg ps_2 \right)$ , in particular $\neg ps_i = \left( \neg ps_{\aleph} \right)$ as well as $ps_i \vee ps_0 = ps_9$ .

[4] All the objects of human reason or enquiry may naturally be divided into two kinds, to wit, Relations of Ideas, and Matters of fact. Of the first kind are the sciences of *Geometry, Algebra, and Arithmetic* ... [which are] discoverable by the mere operation of thought ... Matters of fact, which are the second object of human reason, are not ascertained in the same manner; nor is our evidence of their truth, however great, of a like nature with the foregoing.(*An Enquiry Concerning Human Understanding, Section II)*

[5] a) Two sets are equipotent when there is a bijection between them.
b) Every infinite set contains a subset that is equipotent with the set N of natural numbers.
c) Definition of Dedekind: The necessary and sufficient condition that a set is infinite, it is equipotent to any of its parts.
d) A set is said countable when it is equipotent with N.
e) Every infinite set contains a countable subset.
f) Any part of a countable set is at most countable.




Classic diagram to indicate that two segments of different length are equipotent,

The points of the segment s may be in one correspondence with the segment S by projection Π of center O.
In Euclid's *Elements*, the common notion fifth (in the reorganization carried out by Proclus) is the postulate: "*The whole is greater than the parts*". However, this postulate is only valid for finite sets. Although Galileo had already indicated that could be many even natural numbers as natural numbers, the authentic break with the intuitive evidence held by such common notion, corresponds to George Cantor. The firsts demonstration, which implied the existence of infinite sets of different types, and supported by the concept of bijection, was given in 1874, indicating Cantor that the set of algebraic numbers were countable, while the set of transcendental numbers was not.

at first, on the occasion of analysis carried out by modern logic in mathematical reasoning. However, we cannot forget the vindication of Kant by Hintikka (1984). Moreover, this author makes some comments that we find interesting for our purposes. Kant considers the subjects in the tests that mathematicians make of them. Hintikka emphasizes the fact that this resource is inevitable to subjects, when they are relations. It is, without a doubt, the most striking difference of modern logic with the logic of Aristotelian syllogisms, together with the complete symbolization of language. Characteristic, as we shall see, is also useful for our purpose. According to Hintikka, in the language of relations, constituent structures are determined, coming to be determined as pieces of a puzzle, and sometimes require the existence of certain types of individuals in adjacent pieces, fitting and forming the puzzle. It is worth looking at this simile tells us that these relationships are escapades to each of the pieces separately.

Here, the sense of analytical refers to conceptual analysis, without consideration of the subject. The inevitable recourse to the consideration of individuals determines the synthetic thing. This resource is inevitable in logic of classes, but it is not in the logic of relations. Moreover, if one of the elements of the system is the relationships, the synthesis will be one of its features. Because what we want to say is that the development of our knowledge is based on a constant tension between analysis and synthesis, exchangeable upon reflection, but difficult to conceive of one without the other.

Our concrete knowledge is events, occurrences of properties captured in a moment through the senses. In addition, although we assume that systems already exist, we will do as if they were not. However, we assume in our knowledge of the system there is a record in which such events are analyzed in the sense of unbundling. We dare to defend it incorporating into some certain type of system in the very fact of the record. However, we can try to classify them. However, classification involves the design of a set of relationships between specific events relating to properties captured therein. Moreover, if we talk about relationships, synthesis will exist in the sense that it is inevitable reference to the singular. We can create classes and design a system on classes that start from events that we have selected

Let us analyze this system: We are concerned about a certain group of their classes, as other people a different group. We wonder if it is feasible to create a system that gives rise to events, from class A in relation to the occurrence of events in classes B and C. A realistic would correct the question: will be whether the events of the classes A, B and C form a system and which would be this. On the other hand, someone accuse us of twisting the problem proceeding analytically. This problem exceeds a simple classification. We seek to transcend the system of knowledge developed in the search for a different system. A supporter of inductive Ideas speaks abstracting a second system from the systemic reality. However, a supporter of deductive thoughts says that we must build a model system organizing our records according to time. It means that although we offer a system organizing the event records, we cannot yet say that in this way there is a real correlation to the events which they belong.

Supporters of deduction tell us that laws should be subject to experimentation, trying to determine the relationships designed. It is also possible that in the attempt to purify the system, decides to proceed analytically again. The most probable thing will be that we have sub-systems, or disjointed visions of possible actual system studied. Our knowledge, although adjacent, cannot be systematized. Is it feasible to consider each of these parcels the rest? This requires a synthesis. Because, again, the possible relationships between the areas, institutions and/or systems that are not yet connected - ignoring as have been related - must be built, tested, corrected, refuted, revised, etc.. in an integration process that involves the design of a new cognitive system in which we do that appear not detected relationships. Of achieving, this pack of selected Reality comes to constitute a system, different from the original. Not that the reality has evolved for we know, but as has been known, is organized in a different way. What remains, then, the confrontation between analysis and synthesis?

The empirical work of scientists was considered antagonistic to the logical constructs of rationalism, a priori developed by systems of the philosophical and religious beliefs. Empiricism and logic have been considered, most of the time as opposites. We must be cautious with the use of the terms rationalism and empiricism, because both are misguided. Two opposing schools: one says that the reason is the only source of true knowledge, and is based primarily on logic and mathematics, the other asserts that all knowledge comes from experience, and in particular, the experience of our senses. Therefore, for the rationalist school, knowledge of the external world is analytical and derivative deduced from certain first principles: the Book of Nature written in the formal language is Mathematics, Mathematical Physics being a simple extension. As for the empiricist school, experience induces knowledge, ie knowledge is synthetic. It is not surprising therefore that in the world of science, the sciences themselves, will begin the process of segregation of philosophy, and that through the rational exercise, philosophical thought and religious systems (belief systems), interfere with the normal task

Empirical knowledge of scientific was at first a mere collection of analytical and dispersed knowledge. No wonder that in such circumstances, to incorporate those truths comparable or similar links belonging to the Mathematics, became a desirable goal. In fact, mathematics was assimilated, not as a method of discovery, but as a useful tool in organizing the products that had been obtained by the scientists themselves. Moreover, recognition of the exercise of Reason came with the use of mathematics. Moreover, recent developments in logic are crucial. Mathematical Logic reduced its language completely up to symbolism, ie, a language not interpreted. Thus, the relationships established affect new forms of statements, being indifferent to content. Not exist, with the use of the new logic, the risk of including extraneous elements to scientific results. Leibniz's ideas are reborn here: universal calculus and the common language for all sciences. Just as the concept of possible unity of all scientific knowledge.

Although it may seem paradoxical, the two key instruments developed by empirical rationalism will be critical to incorporate empirical to the development of science. Because if not, how to identify the different sciences? How do they differ from each other? What characterizes the scientific knowledge in front of a different knowledge? How can we connect the different knowledge? These are questions that are largely related to the issues that concern the systemic thinking. And how do we identify the different sciences? First, are the conditions involved in the title, if is made abstraction of logical and mathematical symbolism, which are all directly or indirectly empirical or experimental; that is, are directly verifiable consequences, or that there are logical consequences directly verifiable. Second, they share the method so that they can establish their truths: the hypothetical-inductive-experimental method. They differ in their ontology, or its reference phenomenal typology resulting in the use of specific terminology for each of them, although they may share sections of this terminology, plus Logic and Mathematics. We do not consider scientists any proposition not verifiable or not established as experimental method.

Carnap (1934), when he speaks of the unity of science sees this as a problem of Logic of Science, but not as an ontological problem. He does not think about reducing any process to a single type of process. For Carnap, the problem of the unity of science has two relative aspects:

1) Logical relationships between terms.

2) Logical relationships between laws of diverse Sciences.

The first condition is a prerequisite. The second becomes indispensable.

For Russell, the importance of logic in empirical science does not reside - as happens in mathematics - on inference. Rather, his interest lies in analyzing and understanding the identity and difference in ways not easily detected in the absence of a logical symbolism. Returning to Carnap, and referring to the unity of scientific language, research is a task of the Logic of Science; and for this reason it is a task of logicists, as a member of the scientific community. Would consist of properly fix the specific wording of each area of knowledge and the way they are committed to the experience, as well as those that are shared, including their semantics, along with other ideas. Thus, each chapter of scientific knowledge would be established mainly - where be feasible - so much semantics and syntax of its own laws. Clearly, this does not mean unification in a system, or knowledge in a certain type of phenomena. A possible axiomatization required to connect its diverse and well-known laws, something more than a simple classification of refined language. A logical classification that relates logical structures favors the establishment of the desired links. Also promotes mainly the analogical reasoning and identification of structures in different unsuspected environments. As Carnap concludes, if the terms of the various sciences involved have any logical relationship to other sciences (like the relationships established in the reduction of the respective languages to a homogeneous base) would not be feasible to combine these laws to derive searching a solution. Although it is also true that the links established by this reduction may be insufficient. Undoubtedly, the scene would be different if the script was changed, if we could achieve the unit of the laws: something as diffuse as a Science of Science, or in other words, the system of all scientific knowledge. Now, it seems to make sense the aphorism: *The whole is greater than the sum of its parts*. However, there is a restriction: this means that no full knowledge is susceptible to be unified in a system, any system.

In his famous theorem, Gödel showed that if arithmetic is consistent will be incomplete, ie, any consistent system of arithmetic is always a subsystem, in the sense that there are arithmetical truths to be outside. A similar result establishes Arrow in Decision Theory, when determining a function for a group whose members have made their choice in front of several alternatives, always a rational group decision prevails. This principle seems, a priori, be a mere tautology, and if so, does not say anything. Because it would be difficult to question if Gödel said, *until the system is not complete, it is not complete*. Because if it does not have this meaning, what is being asserted? Which among the linked parts, relationships also exist? Besides, is that they are not parts of the whole? So if it is claimed that the system is a Reality, is this a scientifically established statement? We think it is not. In this case, it must be a project or program that seeks to promote research in the line of unification into a single cognitive system all the knowledge of cognitive scattered fields. However, how this integration can be feasible?

One way to carry out the integration is leaving the specialized scientific knowledge, with a deep study that can agglutinate or synthesize in global systems. If this is the idea that Laszlo (1998) points when he talks about the prospects that open in front of the philosophical considerations when using a General Systems Theory as an integrative language, let us doubt of two things:

1) The first is a task for philosophers, as it is a task of empirical research. If Reality is not a well known system, because relationships that join any optional components are ignored, the discovery of these components is the subject of an experimental investigation of the same nature as the experienced for the components themselves.
2) The second refers the case of be feasible a integrative metalanguage, that integrate the given languages. Moreover, we revert to the starting point: we would have achieved the unity of science in regards to reducing their language to a homogeneous base.

Now if we can understand when Laszlo (1984) tells us that General Systems Theory relates to mathematical logic and formal apparatus. That is, an interdisciplinary doctrine that elaborates the principles and models applicable to systems without regard to their particular species, elements and forces implied, as von Bertalanffy points out in the commentary to his proposal.

## 3. Conclusions

The potential role of systems theory should not be exaggerated. The systems program is an auxiliary enterprise that complements mainstream science. Universities will never be reorganized along Pythagorean lines and systems categories—order, dynamics, information-processing, morphogenesis, agency, adaptation, etc.—will never supplant the conventional materiality-based organization of scientific knowledge. Systems theory is too abstract to be more than supplementation. But this supplementation is needed for the continued development of science and for its successful application to human needs. Science now encounters major difficulties arising from the exponential growth of knowledge. Even within the same field scientists often cannot understand one another. There is little integration across scientific disciplines, and virtually none between science and other aspects of culture. Technology steadily advances in power and its applications are uncontrolled.

We believe that the General Systems Theory should be understood in the same way that Chomsky's Universal Grammar: an abstract theory of languages. Therefore, this would be the systemic concept of Mathematics. We have nothing to object to this argument. Still, we think it is a way to continue the journey. However, it is not alone in the path of travel. If people think they are saying that the development of a General Systems Theory has eliminated the problem of the unity of science involving their laws, we must say no. Not only we does not affirm, rather we say categorically no. Not even if understand that, we can in principle generate all possible systems. Still remain the task of identifying all possible systems of which we are seeking, which is corresponding to our eventual system under study. Also, this is a task of empirical research and we believe leads to a paradoxical situation. Paradox is not so much in the sense of the contradictory, but it is still surprising. We will not be, indeed, who deny that somewhere success is achieved, but let us say it is not the best route to travel. The purpose is undoubtedly *synthetic*: looking bringing together those parts into a whole. However, it is also an *analytical* process. Of the same nature as was the position of the first rationalism. It seems that with the claim of the synthetic, systemic people are sinning of analytical. We must recognize that we like a situation of this nature. We stand as a convenient a constant dialectical tension between analysis and synthesis. We do not intend to defend the abolition of the analysis.

The idea of developing the General Systems Theory should always be welcome. The concept of the system, different types of systems will always be a useful tool for an empirical search of systems. However, as happens to logic and mathematics, and with regard to the creation of empirical knowledge, one walks behind the experience without being able to advance through scientific knowledge. This may be the paradigm of a certain conception of our knowledge and the basis of cognitive science. As a general theory is not a research program whose results allow the luxury of the unit of scientific laws, but if it is an abstract theory relating to formal reasons that correspond to real systems scientifically established, and its development can facilitate the task mentioned, which is characteristic of ordinary scientific work. As a scientific project, is no different from other scientific research projects. Another thing is its place in the soul of systemic research scientist. Moreover, this *per se*, justifies the path taken.

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