

KNOWLEDGE AS SYSTEM: A LOGIC OF EPISTEMOLOGY

by

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Abstract : The philosophical logic developed by the Franco-Romanian thinker Stéphane Lupasco (Bucharest, 1900 – Paris, 1988) includes a systems approach to epistemology that complements independent work of von Bertalanffy and other general systems theorists. Basing his theory primarily on quantum mechanics, Lupasco proposed that the fundamental dualistic antagonism present in energy and accordingly in all phenomena could be formalized as a logic of an *included* middle with a semantics based on ‘reality values’ in place of truth values. This extension of logic provides a basis for the origin of systems in energy, and a metaphysics of knowledge considered as systems of real processes that follow the same dynamics of opposition. Applications to the epistemological problems of knowledge of knowledge and the infinite regress are suggested.

Résumé : La logique philosophique du chercheur franco-roumain Stéphane Lupasco (Bucarest, 1900 – Paris, 1988) comporte une approche systémique à l'épistémologie qui complète les travaux de von Bertalanffy et d'autres théoriciens des systèmes généraux. Basant sa théorie surtout sur la mécanique quantique, Lupasco proposa que l'antagonisme fondamental dualiste présent dans l'énergie et conséquemment dans tout phénomène puisse être formalisé en tant que logique du *tiers inclus*, avec une sémantique à valeurs de ‘réalité’ plutôt que de vérité. Cette extension de la logique fournit une base de l'origine des systèmes dans l'énergie, ainsi qu'une métaphysique de la connaissance considérée comme des systèmes des processus réels qui suivent la même dynamique d'opposition. Des applications aux problèmes épistémologiques de la connaissance de la connaissance et de la régression à l'infini sont suggérées.

1. Introduction

Despite the remarkable achievements of science in general and systems science in particular, there seems to be no adequate epistemological framework for development of a more responsible, ethical approach to their application. Potentially unifying theories proposed in the late 20th Century, such as dynamic structuralism (catastrophe theory), have been shown to have fundamental limitations. To a certain extent, systems theory and 2nd Order Cybernetics have become uncoupled from von Bertalanffy's original vision of a “science of wholeness”¹.

At the same time, the logic underlying work in all scientific fields, with the possible exception of quantum mechanics, continues to be based on classical or neo-classical notions of truth and/or non-contradiction. The possibility of a relation between these two situations suggests that a new view of logic may be called for. Newer ampliative adaptive and paraconsistent logics provide a better picture of some aspects of change, but they refer primarily to abstract semantic or mathematical domains and do not give a satisfactory interpretation of the dynamics of real-world systems and processes, in particular those involving knowing, the knower and the known.

In the paper, I propose a transconsistent logic (TCL) as a needed extension of logic to reality. I explore the relation between this logic and real systems and an epistemology that incorporates a concept of temporality and reflects the underlying physical/metaphysical organization of the world into systems. In this approach, the traditional boundaries between disciplines – logic, epistemology, ontology, and metaphysics – do not disappear, but they become more permeable. Recognition of the complex logical aspects of knowing may be useful in avoiding simplistic, binary models implying Manichean world-views.

2. A New Theory of Knowledge

In 1935, Stéphane Lupasco (Bucharest, 1900 – Paris, 1988) published his French State Thesis, entitled “On Logical becoming and Affectivity”, “*Du Devenir Logique et de l'Affectivité*”. The first part was sub-titled “Antagonistic Dualism”, “*Le Dualisme Antagoniste*” and the second “Essay on a New Theory of Knowledge”, “*Essai d'une Nouvelle Théorie de la Connaissance*”.

¹ Von Bertalanffy, Ludwig, 1969, *General Systems Theory*. New York: George Braziller, (revised edition)

In 1960, Lupasco published a major book “Energy and Living Matter”, “L’énergie et la matière vivante” in which he applied the philosophical logic he had developed to biological systems. He showed that the existence of any system at all necessarily implies the same basic metaphysical considerations that ground his logic of energy.

Lupasco’s ideas on life and systems have unfortunately remained in limbo, despite the significant theoretical support provided in the 1980’s by the theoretical physicist Basarab Nicolescu (Ploiesti, 1940 -) who placed them in relation to current work in quantum mechanics, epistemology and ontological levels of reality.

Independently, during the same period, Ludwig von Bertalanffy completed the formulation of his General System Theory, and its notions of open systems, feedback and growth. Lupasco’s ideas about cybernetics were formulated in period 1945 to 1970, and obviously can be related to those of Weiner and Shannon as well as to those of von Bertalanffy and other early systems theorists. Nicolescu has called for a transdisciplinary “systemic methodology” to help bridge the differences in the different scientific foundations and systemic approaches of these and other workers.

I will look specifically here at the Lupasco-Nicolescu logic as a view of knowledge as system. Note that I am talking about something quite different from knowledge systems. These have an important place in current society, and will be amply discussed elsewhere at this Congress.

3. Epistemology and Reality

My theory differs from standard epistemology in one important respect. I do not believe that a conception of knowledge should depend on more or less ‘catastrophic’ counterfactuals. In my view, such approaches tend to associate epistemic aspects of reality with absolute unreality. Concepts such as “possible in principle” or “possible in other worlds” incorporate a mistaken assumption about physical reality that is fundamental and can lead to misunderstanding and destruction of the validity of arguments based on them. It is possible that there are other universes in which physical constants are different, but discussion of them does not add to our knowledge of this one. The fact that chemical bonds have a certain strength is metaphysically sufficient to exclude the possibility of flying horses, and skeptic arguments based on our being only “brains in a vat” and totally deceived about the reality of what we observe have become counterproductive.

The epistemology that derives from the Lupasco view of nature, is, in fact a naturalized epistemology that explicates some original insights of Quine and Varela, but is not subject to an ‘epistemic cut’ from physics. I will now show why and how I believe knowledge and epistemology, logic and metaphysics can be related without conflation.

4. A Transconsistent Logic of Energy

Based on the quantum mechanics of Planck, Pauli and Heisenberg and the cosmology of his day, Lupasco² proposed that the characteristics of energy - extensive and intensive; continuous and discontinuous; entropic (tendency toward identity or homogeneity – 2nd Law of Thermodynamics) and negentropic (tendency toward diversity or heterogeneity – Pauli Exclusion Principle) - could be formalized as a structural logical principle of dynamic opposition, an antagonistic duality inherent in the nature of energy and accordingly of all physical and mental phenomena, including events, states-of-affairs, information, propositions and judgments, etc.

The key Lupasco postulate is that every phenomenon, element or event **e** is always associated with an anti-phenomenon, anti-element or anti-event **non-e**, such that the actualization of **e** entails the potentialization of **non-e** and *vice versa*, alternatively, without either disappearing completely. The point of equilibrium - semi-actualization and semi-potentialization - is one of maximum antagonism or “contradiction” from which a T-state (T for “*tiers inclus*”, included third

² Lupasco, Stéphane, 1951 (2nd ed. 1987), *Le principe d’antagonisme et la logique de l’énergie*. Paris: Editions du Rocher

term) emerges, resolving the contradiction (or “counter-action”), as proposed by Nicolescu³, at a higher level of reality.

The logic that describes this picture of reality is a logic of an *included* middle, consisting of axioms and rules for determining the state of the three dynamic terms involved in a phenomenon (“dynamic” in its physical sense, related to real rather than to formal change, e.g., the facility of changing rules or conclusions.) In this formalism, the reciprocally determined values of the degree of actualization A, potentialization P and T-state T replace the truth values in standard truth tables, permitting a non-truth-functional semantics. In this logic, all three axioms of classical logic are modified, and contradiction is handled differently than in paraconsistent logics, logics in which the inference from A *and* non-A to any arbitrary conclusion (explosion) is not valid.

The logic of Lupasco-Nicolescu is based on the contradiction between A and non-A giving rise to a specific resolution (at another level of reality); it could therefore be considered paraconsistent. However, in Priest’s paraconsistent concept of true contradictions⁴, the two opposing terms, or true and false, are both actual at the same time. In my logic, if A is (predominantly) actualized, non-A is (predominantly) potentialized, and vice versa, alternately, without either ever disappearing completely. I have therefore designated this logic as a *transconsistent* logic (TCL).

TCL contains the law of the excluded middle as a limiting case, approached asymptotically but only instantiated in simple situations and abstract contexts, e.g., computational aspects of reasoning and mathematical complexity⁵. The objection can be raised against TCL that it is not a logic, as it fails to have the required formal structure. However, Béziau⁶ has shown that the essence of logic is not its formality, mathematical or other, and one is best off in speaking about logic *tout court*. The best definition of logic is perhaps a theory that captures patterns of inference. TCL does so, only the elements involved in the inference are models of the states of real processes rather than abstract propositions.

Opposing aspects of phenomena that are generally considered independent can thus be understood as being in the dynamic relationship suggested, namely, as one is actualized, the other is potentialized. Problems due to the assumption of an absolute independence or separation between elements (e.g., local/ global, part/whole, set/member of set, rational/irrational, etc.) can be approached from this standpoint.

5. The Origin of Systems in Energy

Von Bertalanffy defined open systems as a set of elements standing in interrelations that can be seen as coherent dynamic entities, emerging from those interrelations and capable of leading to processes of self-organization. General System Theory involves the formulation of principles that are valid for systems in general, whatever the nature of the component elements and the relations or forces between them.

Lupasco formulated *his* conception of the formation of systems *via* a set of dynamic constitutive relations:

(1) A relation of antagonism (attraction – repulsion). This determines the possibility of all systems: systems are not possible if there is no force of repulsion or exclusion which prevents the ‘agglomeration’ of the elements, and not possible if nothing attracts or associates two or elements; they all fly apart, so to speak. (I consider here that repulsion; exclusion and dissociation are equivalent terms.) Accordingly, for a system to form and exist, its constituents, either by their nature or the laws that govern them, must be able, at the same time, to both attract and repel one

³ Nicolescu, Basarab, 1985 (2nd ed. 2002), *Nous, la particule et le monde*. Paris: Editions du Rocher

⁴ Priest, Graham, “Paraconsistent Logic”, 2000, in Gabbay, D. and Guenther, F. (eds.), *Handbook of Philosophical Logic*, 2nd edn. Dordrecht: Kluwer Academic, p. 259

⁵ Kirshbaum, David, 2002, *Introduction to Complex Systems*, <http://www.calresco.org/intro-htm>

⁶ Béziau, Jean-Yves, 2004, “What is a Logic?”, paper for publication

another, associate and dissociate, to integrate and disintegrate. Every system is therefore a function of two antagonistic forces, linked to one another, constituting a relation of antagonism⁷.

(2) A relation of contradiction or essential difference of type (homogeneous – heterogeneous). This argument is similar to the first: a system would not be possible if all its constituents or elements were strictly identical, strictly also meaning with relation to their location and configuration in space-time. They would be ‘confounded’ in the same continuity or homogeneity. No system would be possible, either, if all elements were totally heterogeneous, without some degree of homogeneity that would prevent this diversity not only from not being a system, but even a set. The principle of exclusion applicable to electrons, discovered by Wolfgang Pauli, which requires their individualization according to spin, is the basis for the emergence of atomic systems, permitting the build-up of shells of pairs of electrons of opposite spin. This relation has also critical implications for the theory of sets and the Axiom of Choice. Every system thus implies at the same time homogeneity (identity) and heterogeneity (diversity).

Systems *require* the energy involved in these dynamic relations in order to exist. Since all their constituents and elements, according to the equivalence of mass, energy and information, must consist of energy, systems instantiate the indicated dialectical characteristics. These notions provide another perspective on the phenomenon of feedback in complex systems. As an antagonistic energetic duality, each element is a system, and all more complex systems are generated by such by their subsequent interactions of the same kind, leading to systems of systems, systems of systems of systems, etc., transfinitely, resulting in “systemogenesis” or emergence, especially, at the biological, mental and social levels.

5.1 Dynamic Systems Theory

Dynamic systems theory (DST) claims, as I do, that the same basic laws that govern physical systems also govern the laws of cognitive (or cognizing) systems. Therefore, cognitive systems can be described by the mathematics of physics, especially, of non-linear dynamics rather than by the computational symbolic systems approach, which uses the rules of (classical and neo-classical) logic and syntax. Thus proponents of DST believe that differential equations are the most appropriate tool for modeling human behavior and human knowledge.

According to the theory in this paper, however, this position only displaces the philosophical and metaphysical problem. The usual notion of infinitesimal calculus is that it captures the simultaneously continuous and discrete nature of changing phenomena. Change at an instant is what calculus presents in formal terms. But this begs the question of whether reality is composed of ‘instants’ in the sense used in the theory. If it is not, then calculus, like classical logic, is *not* capturing the essential property of real processes and systems.

The theory I propose overcomes another problem associated with DST. If cognitive agents are concrete dynamical systems that instantiate mathematical models, there is a contradiction between a continuity of representational states at lower levels and obvious content discontinuity at higher levels. As has been shown by Calvo Garzon⁸, return to models that are less abstract and closer to or more clearly derivative from physiological structures would be desirable. To the extent that in TCL, structures are possible that instantiate both continuity and discontinuity, it provides a better basis for the insights of DST.

5.2 Second Order Cybernetics and the Schwarz Model

To place the TCL theory in perspective, I need to discuss the further evolution of cybernetics, due to the generalizations by Heinz von Foerster (1911 – 2003) toward second-order cybernetics, the cybernetics of observing systems and the elaboration of the notion of *autopoiesis* (self-production) by Maturana and Varela. These ideas have all led to substantial new insights into

⁷ Lupasco, Stéphane, 1962 (3rd ed. 1986), *L'énergie et la matière vivante*. Monaco : Éditions du Rocher, 1986 (hereinafter *EMV*), p. 332

⁸ Calvo Garzon, F., “The Dynamic Field Approach: Bridging the Representational Gap”, paper presented at the Conference *Dynamic Ontology*, Trento, September 8-11, 2004

the structure of existence. Again, though, von Foerster, at the end of his life⁹, talked only of “circular causality” as a source of dynamic development and self-organization and did not, as pointed out by Eric Schwarz, propose mechanisms about the way spontaneous (sic) order can emerge in nature. The “Neuchâtel Model” of Schwarz, places all these concepts, plus those of autogenesis (the self-production of rules of its production by an entity), in terms of planes (or levels) of structures, information and totality. Schwarz’ model is useful in that objects and laws are not separated and do not appear to operate within the constraints of a static, binary Aristotelian logic, but form complex wholes which are existing (non-physical) entities.

As has been noted by others, however, the Neuchâtel Model an *ontological* model that maintains three ontological levels, “from science through epistemology to being”¹⁰. Logical networks appear at the second plane or level of information, in which appear the full set of personal and transpersonal cognitive phenomena, including, but not limited to knowledge and ideas, value systems and so on.

The Schwarz ontology generates three basic epistemological categories for the study of natural objects: objects, relations and wholes. “Priority is not to conserved things (energy/matter) as in physics, nor to timeless non-contradictory statements as in binary logic, but to the permanent and ever-changing self-referential whole which is that which emerges from the ontological dialogue between objects and relations.”

A basic exists between Schwarz’s theory and TCL, however. The former is a meta-model rather than a model of reality such as TCL, providing “idealized patterns of a meta-language”. It does not apply to concrete real-world systems, but rather represents the “production processes by which the systems of the world are made.” TCL, in particular in its oppositional-energetic aspects, is intended to model the real world *directly*. The contrast with Schwarz’ ontological view of nature can be seen in the following citation:

“In holistic approaches, ..., where the world is not reduced to a problem of reality or non-reality, but where existence has two aspects, reality of things and validity of relations, the question of the mind-body connection is not a problem but the normal state of affairs. Mind and brain are the two aspects of a human being, like (sic) the laws of nature (the field of possibles) and the physical cosmos (the explicit actual) are the two aspects of the universe.”

In TCL, I take the same key pairs of opposites - things and relations and possible and actual – and establish the dynamic relation between them. Mind and brain are, indeed, parts or aspects of an individual human being, and TCL provides a further basis for understanding in what way the three are related. The relations or interactions between elements are as important as the terms themselves, as in relational quantum mechanics, which is the physical theory that offers the closest parallels I have found to the TCL system.

6. Dialectics and Methodology

What may be considered new in the TCL approach is a methodology that looks for the contradictorial or antagonistic aspects of any phenomenon, and makes that antagonism the basis for any attempted explication or deeper understanding. The intention is to relate that phenomenon, ultimately, back to the foundational opposition inherent in energy at the microphysical level. To the extent that the most important factors in this approach are the relative actuality and potentiality of the opposing elements plus the tendency to identity or diversity, it may be considered an ontological approach, involving categories of process, potentiality and actuality. At the same time, it is also an

⁹ Van de Vijver, Gertrudis, 1997, “Conversation with Heinz von Foerster 02/06/1995” in *Cybernetics and Human Knowing*, Vol. 4, No. 1, pp. 3-16

¹⁰ Schwarz, Eric, 1997, “Toward a Holistic Cybernetics; From Science through Epistemology to Being”, *ibid.*, p. 17-50

epistemological investigation of modern science, a description both of mind and logical and existential phenomena.

Lupasco described this methodology as follows:

“...in the presence of every element or event, of every system and every structure, as of every system of systems and structure of structures, one must extract their internal dialectics and seek the contradictory antagonistic dialectics of every antagonistic and contradictory element or event, of every system and every structure, of every system of systems and structure of structures. It is this method of cognitive investigation of phenomena, whatever they may be, that I call the *Dialectomethodology* of knowledge.” “...to discern, behind every operation of thought, a contradictory duality, a duality inherent in the thought itself, to show, at the same time, that a qualitative logical becoming (*devenir*), essentially existential and phenomenal, develops according to this transcendence of thought by itself, establishing a monism which signifies nothing, in reality, but the actualization of one of the terms of this duality on top of the potentialization of the contradictory term.”

It is in the analysis of knowledge in the next Section, that the “dualistic and contradictory character, at the same time, of both logic and existence”, can be seen to be necessary in order to explain the possibility of a knower and a known, to elucidate their relationship and to acquire the notion of knowledge as system.

7. A Metaphysics of Knowledge

Before discussing the consequences of the application of the principle of dynamic opposition to the epistemic process, I need to establish an appropriate notion of knowledge itself. Knowledge is usually discussed in terms of an independent subject *S* knowing something, where that something is a proposition – that such-and-such is the case, an entity, such as a person or place, or a skill, how to do something. Each of these three areas has a large literature, in particular that of propositional knowledge, which has given rise to endless debate about knowledge as justified true belief. The theory I will propose avoids many of the dichotomies associated with the standard static, reified notions of knowledge. In TCL,

- a) knowledge is a dynamic *process*, inseparable from the knower and knowing, which are also processes;
- b) the elements of these processes are systems, systems of systems and so on;
- c) internal and external aspects of knowledge are not only not totally separated, but are related contradictorily, that is, to the extent that one is actualized, the other is potentialized.

On the other hand, as I have suggested above, the principles of TCL are grounded in science, and we must accordingly consider that its epistemology is also so grounded. My view of the grounding of epistemology in science supports the idea of naturalized epistemology as discussed in the comprehensive review article by Feldman¹¹. This approach suggests that Quine’s reduction of epistemology to psychology was not as radical as generally considered. If one returns to his original discussion of the foundation of science¹², it would appear that Quine was forced to accept its bifurcation into a theory of concepts or meaning, and a theory of doctrine, or truth: “for this applies

¹¹ Feldman, “Naturalized Epistemology”, *The Stanford Encyclopedia of Philosophy (Fall 2001 Edition)*, Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/fall2001/entries/epistemology-naturalized/>

¹² Quine, William van Orman, 1969, *Ontological Relativity and Other Essays*. New York: Columbia University Press, Chapter 3 “Epistemology Naturalized”

to the epistemology of natural knowledge no less than to the foundations of mathematics.”¹³ I propose that Quine’s initial position that science could not be deduced from observations was because the only logic he had available was one that applied to, and was in fact a reduction from, mathematics and set theory. It was into such a “logic” that he did not want to translate natural science. Without a different logic, such as the one proposed here, one is indeed no “farther along today than where Hume left us.” My transconsistent logic can support the development of a formal dynamic epistemology of experience, in which epistemology and natural science are reciprocally ‘contained’. (I would like to reassure epistemologists who might worry, as Sosa did, that there is ‘nothing left’ to epistemology. Epistemology, like science, logic and ontology, retains its full value as a perspective and as a discipline, even if not totally separate from the others.)

The concept here of the absence of separation between subject and object, between knowledge and action, qualitative and quantitative and other classical pairs of dualities is not original as such. Edgar Morin, for example, insists that cognitive processes are both products and producers of the ‘hyper-complex’ activity of the mental apparatus.¹⁴ Morin, however, conceives of the dualities in cognitive processes as fully actual *at the same time*. These processes construct objects, structures and laws of the external world, and knowledge tends to divide or split (*dédoubler*) this external world into a mental universe that places the mind in correspondence with that which it wants to or believes it knows.

This picture is typical of those in which valid insights fail as explanations due to the assumption of idealized, abstract entities (*e.g.*, here, mind and knowledge itself). The approach papers over the antagonistic aspects of real, energetic phenomena and their requirement for both simultaneity and succession. It is only possible in a classical logical view of space-time to talk about tangled simultaneity in the brain and the real, or the brain’s reproducing simultaneously the multiple simultaneity of the perceived phenomenon.¹⁵

The approach of transconsistent logic to knowledge resolutely includes it in reality. In this view, knowledge in a biological organism originates in, and can never be totally separated from, the set of processes that constitute its existence, including its systems of perception and action. All these processes, in my theory, instantiate both reciprocal degrees of actuality and potentiality and different tendencies toward identity and diversity. Two lines of argument are presented that illustrate the operation of the principle of dynamic opposition in regard to knowledge.

7.1 The Process Argument

I have discussed elsewhere how my transconsistent logic supports a processual view of reality, extending the process philosophy and semantics of Nicholas Rescher.¹⁶ In addition, the principles and applications of TCL can be looked at from a formal ontological standpoint, on which a book is in preparation. Here, I can only list, without detailed discussion, the key aspects of TCL, or “logic in reality”, for knowledge that are the consequences of the instantiation of the fundamental principle of dynamic opposition or antagonism.

1. Because energy implies antagonism, and antagonism always implies a potentialization becoming actualized and an actualization becoming potentialized, the former can be seen as a final cause and the latter as an efficient cause. A living system is thus a system of efficient and final causes, due to its constitution by these processes of alternating (heterogenizing) actualization and (homogenizing) potentialization.
2. Actualizations that are converted to a potentialized state – reactions, behavior, perceptions, constitute not only final causes for the organism but also, at the same time, memory. Memory is always dualistic: a memory of the dynamism of heterogeneity which produces,

¹³ Ibid., p. 71

¹⁴ Morin, Edgar, 1986, *La méthode 3. La connaissance de la connaissance*. Paris: Editions du Seuil, p. 204

¹⁵ Ibid., p. 120

¹⁶ Brenner, Joseph E., “Process in Reality; A Logical Offering”, 2005, for publication in *Logic and Logical Philosophy*.

when actualized, structural permanence, invariance, resistance to change, objects which tend to conserve their identity.

3. A memory state is a dynamism, a potentialized dynamic system. Memories are localized in the brain but not in the usual sense of a neural network or neural correlates of consciousness, but as the potential states of one system or another.
4. The memory of living system is composed of threats or attacks on its integrity, constituting a 'data base' of information that is equivalent, in this dynamic picture, to knowledge.
5. This 'knowledge', however, is not a static volume of data, but a set of operations, processes of knowing (*connaître*) that I not only know, but also *am*. I do not know some independent things, I am those things in a potential state, that is, at the state of memory and final cause. In this sense, I am also, as a knowing agent, the exterior (threatening) world that I have interiorized in a potential state. When such a process of knowledge/memory becomes actualized, however, it stops being teleological, and changes to a process of action, with its major aspects becoming unconscious.
6. Since every subject-object system involves an antagonism or dynamic interaction of subject and object, every process of knowledge is oriented toward an object, an objective reality, which has the inverse characteristics of the subject. At the microphysical level, the subject-observer perturbs the object-observed, but at higher levels, subject and object cannot be conceived of independently of their mutual perturbation. A living system is a subject-object, in which the subject is the active locus of heterogenizing actualizations and the object is the passive locus of homogenizing potentializations.

7.2 The Epistemological Argument

In this line of argument, the elements subject to the above systems relations are the knower and a knowable or a known. Other, related dualities 1) ignorance and its conversion to knowledge and 2) an exterior and an interior reality, must also exist. The essential hypothesis is that the knower does not and cannot know himself in the act of knowing (one can't know two things at once), insofar as he knows or is in a process of knowing.

Let me summarize the consequences of this:

- the act of knowing implies being in the presence of existences, non-existences or some complex of the two;
- during the knowing, these existences, entities, etc. cannot be in the knower, since he does not know himself as such, but must be exterior to that which knows, insofar as it knows. The result is a split into an external existential knowable or known and an interior unknowable knower, each alternately repressed by and repressing the other.

If this is the case, how can the knower, who does not know himself as such, be certain that he is a knower who knows a knowable or known, in other words, that he is the site of an operation between the terms of a duality? He cannot see himself as knowing, and nevertheless he knows he knows, that something is in the presence of something.

I will use the same form of counterfactual argument as in the discussion of systems. Basically, if the knowable or known were something completely other or different than the knower, there would be existence and non-existence, but they could not exist as objects of knowledge relative to the knower. On the contrary, if the knowable or known were identical to that which was knowing, there would exist in the presence of itself, but neither knowable or known or knower, because there would be no place for a separate process of knowing to appear. Therefore, for knowledge to exist, the knowable and the known must be neither totally identical to nor totally different from, the knower.

To complete this argument, I assume, following the fundamental postulate, that existence and non-existence and the knowable and known in which they manifest themselves are dualities

with contradictory terms, for one to be actual, the other must be potential. The problem for the knower is the following: to know he must suppress this contradictory duality at the same time as depending on it for his existence. The knower, being as indicated neither the same as nor different from the knowable or known, becomes the antagonist of it. Since the known cannot know itself and the knower does not know himself as “being”, the knower knows something that is contrary to him. This defines itself as something external, rejected or repulsed. But the only way to reject something contradictory that defines your existence is to retain it but potentialize it, decrease its “activity”. Destroying it would result in the disappearance of knowing, knower, knowable and known. Full externalization would mean losing contact with it; internalizing it would make it just as unknowable as the knower himself is as knower. Thus the only thing a knower really knows is what is potential or virtual, and this will be his reality. The object, the world and everything that opposes this reality, of which he is nonetheless the conscious site, appears unreal, false, or ‘unknowable’. Knowing thus becomes a process of repression, not of what is identical to or extraneous to the repressing system, but that which is contradictory to it. Let me try to support this perhaps counter-intuitive concept of knowing: when we know or do something, we do not know (or pay attention to) our knowing of it. We can focus, by another cognitive act, on our knowing, which does not know itself as such, and so on. That we only know what is repressed is because of the opposition, conflict or contradiction between the knower and the known and the inability of the knower to see himself as knowing although he is still the locus of an activity of some sort;

Summarizing, the core of this approach is the same as above: we *know* only what is potential – what is conceptual and ‘ideal’, the inverse of that which is relegated to the unconscious and according to which we act. The actual is always impossible to know, due to the nature of knowing itself, a concept that corresponds to the general idea according to which one cannot act, contemplate, etc. and see oneself act, contemplate, etc. at the same time. The known is neither totally identical nor totally other than the knower. The dualities are contradictory: for one to be (mostly) actual, the other must be (mostly) potential. The two are not both actual at once, but as one is actualized, the other is potentialized.

7.3 *Toward a Knowledge of Knowledge*

The major problem of any theory of knowledge¹⁷ is how such a theory is possible, how one can know that one knows and establish a knowledge of knowledge. As soon as one thinks, one knows something, the process of the knowledge of that knowledge starts, and there would appear to be nothing, ‘logically’, to stop it. Continuing this process ‘to infinity’ would mean that a true or complete knowledge of knowledge is not attained and does not exist, which is contradicted by the fact that one knows that one knows. One could not say that one does not know that one knows, since by that very fact, one knows that one does not know that one knows and the problem reappears. In Section 7.5, I suggest how the regress can be avoided.

It can be shown that various universal theories fail to explain and even exclude the possibility of knowledge of knowledge. These theories, monism of identity, monism of diversity or non-identity, parallel universe duality and pluralism of pure heterogeneity all fail by the same form of counterfactual argument as above.

In the present theory, the knower is not in the known, but it is an element or entity or process that is contrary and contradictory to the knower. Together, they constitute antagonistic dynamisms such that it is the process of alternating actualization and potentialization that converts known to knower and *vice versa*. A known becomes a knower since ‘knowledge’ is not the knowledge that a knower ‘has’ but is a *process* that is active in the knower. As a part of an individual’s total mental structure, this process, in a non-metaphorical sense, ‘knows’ or becomes a knower as a consequence of the dialectics of antagonism.

¹⁷ Lupasco, Stéphane, 1935 (2nd Ed 1973), *Du Devenir Logique et de l’Affectivité. Essai d’une nouvelle théorie de la connaissance* (Thesis II). Paris: J. Vrin, p. 73

In knowing an identity, one potentializes it by the actualization of non-identity (or another pair of contradictory terms), which disappears from consciousness. Thus the (process or action of) knowing-of-identity, as it knows non-identity, knows the knowing-of-non-identity and *vice versa*. This is an example of the process of knowledge of knowledge. The process can develop indefinitely, but alternatively and reciprocally and not in a flight or regress toward some kind of transcendence. The process of knowledge of knowledge is a logical becoming of contradictory dynamisms able to go from potential to action and inversely.

7.4 Knowledge-as-Such and Intuition

A contradictorial relation exists between knowledge and knowledge of knowledge, but also between knowledge-as-such and intuition or intuitive knowledge. Two differentiations need to be made between them, how they occur and what their respective functions are as protagonists in the drama of knowledge. The discussion proceeds as follows: given any cognitive process, a logical becoming is involved since knowing means inhibiting one antagonistic factor by another. Actualization and potentialization constitute, at the same time, the mechanism of both knowledge and logical becoming, both involving alternation between states in which one term is (almost) fully actualized and then the other is (almost) fully potentialized. The knowledge associated with the strongly actualized terms is the identifying knowledge-as-such, the major content of the cognitive field. The statistical process of oscillation 'leaves behind', however, a minor, accidental knowledge or known that can be designated as intuition. Intuition is thus an embryonic non-identity, an unexpected and brief 'irrational' invasion of the cognitive field, discontinuous, without a conscious relation to what is occupying consciousness. In terms of cognitive power, there are intuitions that could be just as strong as knowledge as such, but as a non-identity, a logical but heterogenizing negation, a perturbation, what is given by intuition is the contradictory inverse of what is given in knowledge-as-such. Theories of intuition most similar to mine propose that everything is both intuition and knowledge at the same time, and that one cannot exist without the other.

From the point of view of difference in function, what is primarily retained in the conscious mind are identities and synthetic rationalities, while what constitutes intuition is the knowledge of movement, time, intensity, the heterogeneous, etc. Thus one does not 'see' change itself, but one identity replacing another, but the change is 'felt', i.e., known intuitively. Other functional examples that can be developed are those of intellectual consciousness vs. active consciousness, the first the consequence of biological becoming, where science dominates and intuition is avoided; the second of macrophysical becoming and 'action', in which intuition is essential and the role of formal knowledge is reduced.

7.5 Ending the Infinite Regress

To repeat, knowledge of knowledge is the output of a developing (becoming) antagonistic duality. On the one hand this blocks knowledge as such, and on the other hand this duality is the foundation of knowledge of knowledge, as a self-knowledge of this duality, considered as an epistemic agent. It is this that also leads to the stopping of the process of knowledge of knowledge, which might otherwise go towards a knowledge of knowledge of knowledge, etc., (infinite regress), precisely because of the self-sufficient reciprocity of knowledge processes that are absolutely antagonistic. At first (or third) reading, this may look like a tautology, or at best a circular argument. I believe it is closer to what has called (at least for non-dynamic, binary logical systems) a virtuous or productive circle. It cannot be equated with what Quentin Smith refers to as "benign regress", since this still involves an infinite series of steps. This hypothesis can be restated as follows: because the elements of the knowledge of knowledge are antagonistic, while participating in the overall becoming of the world, they are fully self-sufficient – no new information is transferred by additional oscillations - stopping the infinite regress.

It is possible to *imagine* an infinite regress as a process that does not stop, but in practice, in reality, one stops it, or it stops itself. This is an example of the kind of real, factual and dynamic

situations that I believe are the ones that can and should be addressed through a systems approach that uses the logical tools provided by TCL.

8. Conclusion. Knowledge as System

In summary, knowledge is a system in the sense of being a complex set of relations between the knower, knowing and the known, whose elements are mental processes and sub-processes in dynamic states of actualization and potentialization. Knowledge (the known) and knowing are considered as systems of systems that share the same underlying metaphysics as systems in general.

The principles of the ternary, transconsistent logic of reality I propose enable the functional integration of this view of knowledge with current advances in systems science. The TCL framework assigns domains of application of binary and ternary logic to systems in computational and complex non-computational contexts respectively. Of the latter, human cognitive systems involving knowledge, reasoning and meaning are the most important examples. Such application of TCL requires a shift from the current focus on the axioms and formalism of both classical and neo-classical propositional and mathematical logic as the criteria of a valid logical approach. Consideration of the contradictorial aspects of knowledge, as a supplement to existing methods of inquiry, could provide useful insights for the development of a new transdisciplinary scientific, philosophical and social agenda.

