Heterodox Logic and Law: Topics for a report on philosophy and hermeneutics

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Logics - more specifically the so-called *heterodox logic* – come to light in order to reveal from their own basis significant achievements for the fields of law and science in general. The purpose of this paper is not to recapitulate the classical issue of the logic of law, neither it is to review its history in reference to norms taken individually, but rather to spark preliminary considerations about such norms with the philosophical approach for legal sciences focusing on *heterodox logic*. The central thesis of *heterodox logic* applied to law is that intuition is based on uncertainty, ambiguity, vagueness and inconsistency without trivialization when dealing with contradictions and complementarities, as shown by the theorems that validate them. Thus, new questions are relevant to some problems referring to law structure or, in other words, to legal orderings. The role of *heterodox logic* lies in solving such problems. The importance of hermeneutics is unquestionable in the theoretical construction of law particularly for feeding the human and social nature of that knowledge. Nevertheless, it is impossible to deny a certain "epistemological crisis" in written law at the moment in regards to the complex social issues for which the jurisdiction will have to be, scientific, precise and satisfactory as much as possible.

Keywords: law, logic, hermeneutics, philosophy, paradox, contradiction

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1 Prolegomena to *heterodox logic* in law

For classic or orthodox logic, a proposition cannot be simultaneously true (T) and false (F), but it has to be one thing or the other and not both. This way, classic logic does not accept operations that contain contradictions. Also for classic logic, which is quite ancient and was substantiated by Aristotle, sentences that are perhaps vague or inaccurate cannot be considered logic.

However, from the 1960's and 1970's onwards along with transformations within society and habits and mainly with the development of science and technology particularly of electronic computing, new quite varied logical systems, which present themselves as able to turn vague things into accurate ones and able to operationalize contradictory and/or complementary sentences have started to be developed. These new systems were called "rivals" of classic logic and are known as *heterodox logic*.

It is important to note, however, that such logic systems (e.g. *fuzzy logics* and *paraconsistent logics*) are operationalized through mathematical and computing calculations in their practical application. Even so, they also have a philosophical foundation, which is also its epistemological monitoring. For this article, we are interested in this philosophical foundation, because from it a new hermeneutics for law can be derived. Thus, it is clear that in this brief essay we will not address the practical, computing or electronic application of *heterodox logic*, but we would like to register the news that such experiments have been carried out for example at the University of Campinas (UNICAMP) and at the Federal University of Rio Grande (FURG), in the states of São Paulo and Rio Grande do Sul respectively, both in Brazil. At the latter I have been personally taking part in studies concerning this matter. [1]

[1] CARNEIRO, M. F. 2009. *Paradoxos no direito* – lógica e teoria das categorias. Porto Alegre: Núria Fabris Editora. 2009. *Direito & Lógica* – Temas de direito perpassados pela lógica. 3rd. Edition, Curitiba: Juruá. 2011. *Notes on a way of thinking in*

Thus, the proposition of *heterodox logic* in the field of Law means a new philosophical, linguistic and hermeneutic approximation.

In order to talk about the insertion of new logics into judicial thinking, it is necessary to establish other criteria to map the intuitive concept of both truth and coherence[2] within law by taking into account that the pragmatic consequences of that truth are the most important thing. If we consider that analysis is an essential step with regards to the origin of a theory, it is understood that the aforementioned assertion requires a fair amount of plausibility.

The central debate on *heterodox logic* applied to law is that intuition[3] has its basis on uncertainty, ambiguity, vagueness and inconsistency without trivialization [4] when dealing with contradictions and complementarities as shown by the theorems that validate them. Additionally, *heterodox logic* requires adequate changes in the notion of deduction.

Such an event can be quite meaningful for law, because it means a change of paradigm within the existing legal theory according to reasons that will be examined in the following sections. Thus, the deadlocks that impede the continuation of big

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*paraconsistent logic in law***.** Social Science Research Network, New York, http://ssrn.com/abstract=1860334.

[2] "Truth" can be considered a semantic concept while "coherence" can be a syntactic concept. There resides one more reason for the necessity to make both of them compatible.

[3] When giving his inaugural class at the University of Amsterdam in 1912, diverging from Poincaré and Kant (about the discredit of Kant's space concept by non-Euclidean geometry), Brower sustained that "neo-intuitionists consider the separation of moments of life in qualitatively different parts to be reunited only while separated in time, as being the natural phenomenon of human intellect". (*apud* KNEALE, William *et* KNEALE, Martha. *O desenvolvimento da lógica***.** 3. ed., Lisboa: Fundação Calouste Gulbenkian, 1991, p. 680). Intuitionist concept represents a new paradigm from which derives interesting theories later developed.

[4] In general, a theory is trivial when it is possible to prove all within its semantically closed group. Not to prove all, however, is the most common occurrence, because there are truths not proven though theories which, in that case, are always incomplete (cf. GÖDEL, 1931).

and small debates and, consequently, the discovery of adequate solutions to several present demands can be overcome.

Moreover, the feasibility of making systems and subsystems complementary may provide the introduction of a new field for the scientific investigation of law.

There is also the facilitation of policies, if we so wish, in the composition of some types of hermeneutics in lawsuits that can now be differently addressed by *heterodox logic*.

However, the successful use of *heterodox logic* in law requires a change in intellectual behavior regarding comprehension based on intuitionism, since the concept of complementarity [5] , which is crucial in *heterodox logic*, presupposes the needlessness of mutual exclusion so that the incompatibility between systems does not mean that one must exclude the other (but only may).

The aforementioned logic, apart from its complementariness, enables the interchange between different language plans, which in terms of established deduction would bring up a breakdown of reasoning.

Heterodox Logic facilitates the access to resources between different languages, by enabling non-monotonic[6] operations to be complementary in a way that they contribute to the results of what is conventionally called "scientific truths", as such "truths" can be expanded by operations that are not reciprocally excluded among the models from which they originate.

Regarding law, whose patterns are comprised by facts, values and norms and which is made up of a spectrum that

[5] We shall deal with the concept of complementarity on future occasions.

[6] All the operations of reasoning create what is usually called "logical consequence". Each consequence relationship defines logic or what logical system is being used. In a monotonic logical system (which has one single tone) consequences should follow the same tone of this same system in which they are operationalized. For example, in a classic logic reasoning logical consequence should be equally classical. Such a thing does not happen with non-monotonic logics (which do not have only one single tone) and which accept compatible consequences with other systems, for example: an operationalized line of reasoning with the use of classic logic may accept a fuzzy, paraconsistent consequence, etc. In this sense, we can understand that non-monotonic logics are types of *heterodox logic.*

encompasses consuetudinary, praetorian, legal and sociological components over which jurisdictional contribution has its basis, it is of the utmost importance to have a logical, consistent and adequate tool for the scientific handling of those components, as well as a *decisum* that hasn't been hindered by vagueness and inconsistencies, contradictions or trivialities. Due to the fact that each one of the plans of such spectrum may be considered as a different degree, it is necessary to synthesize them in one crucial process.

In such situations, when an inference of non-monotonic order contradicts the conclusion instead of excluding one of the possibilities, both should be maintained and it is then possible to manage them heterodoxically.

Still, some adjustments will have to be provided. One of them concerns the non-simultaneity condition in appreciating the phenomena imposed by *heterodox logic* for an adequate description of the situation. Within law, whose order is structured with a basis on the causal nexus of imputation, the supposition of succession in time[7] between precedent and subsequent is crucial. As it can be noted, new poetics of the intuition of time are *a l'ordre du jour* [8] , since the traditional characteristic of "atemporality" of logic as knowledge accepted by the majority of scholars is maintained in *heterodox logic*. It is anticipated, however, that this situation of temporality as a prerequisite for knowledge in view of the atemporality of another knowledge will not scientifically involve serious consequences, but only philosophical ones.

Additionally, judicial thinking has expanded in its historical tradition through its argumentative, logical character that also became the rationality of law as it is nowadays; and according to Perelman[9] temporality is a characteristic (and even a condition) of legal argumentation.

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[7] RICOUER, P. 1994. *Tempo e narrativa***.** Tomo I, Campinas: Papirus, p. 261.
[8] BACHELARD, G. *L'intuition de l'instant* e *La poétique de l'espace***.** *Op. cit.*
[9] PERELMAN, C. 1997. *Retóricas* (translated by. Maria E. G. G. Pereira). São Paulo: Martins Fontes, p. 369 *et passim.*

The stir around the atemporal character of logic as opposed to the need for temporality in the subjects of legal argumentation and rhetoric comprises an *aporia* or a variable vindication, which does not alter the results of the theoretical course of those subjects. Meanwhile, it is necessary to think about the connection time/knowledge as Kant[10], Bachelard[11] and Terré[12] among others did.

The fact is that "*la structure de la norme n'est donc rien qui se produirait dans la nature, mais un mode de scientifique d'interprétation des conditions d'établissement et de fonctionnement des prescriptions juridiques*", as Müller[13] points out. Until now, norms included a univocal character in which contradictions were insolvable. Therefore, it is essential to consider the impact that the application of *heterodox logic* may exert in the structured scope of law. The normative properties that are more easily isolated, typified and controlled may comprise a fair sample for the beginning of the experiment that can be used by law as a reflection concerning the degree at which scientific practices acquire rational bases. [14]

Many questions would emerge from what we have exposed and everything points towards the threshold of a new moment for knowledge in which "knowledge in itself consists of saying and doing what is revealed through a pertinent listening along with and according to what arises on its own". [15] Moreover, the remarkable appanage of Logic, which is to scientifically establish itself and develop itself from the components that comprise it, is an interesting methodological counterpoint of Law, which in its

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[10] KANT, I. *Crítica da razão pura* (Estética transcendental do tempo e também da lógica transcendental), [s.l.].

[11] BACHELARD, G. 1992. *L'intuition de l'instant* (chapitre III – L'idée du progrès et l'intuition du temps discontinu). 2. ed., Paris: Libraire Générale Française; and also *La poétique de l'espace*. 1998, 7. ed., Paris: Quadrige/PUF.

[12] TERRÉ, D. 1998. *Les dérives de l'argumentation scientifique*. Paris: Presses Universitaire de France.

[13] MÜLLER, F. 1996. *Discours de la méthode juridique*. Paris: Léviathan/PUF, p. 187.

[14] According to Notices of the American Mathematics Society, v. 45, nº 7 (Rev. Willian G. Faris), [s..l.], ago./1998, p. 874-6.

[15] HERÁCLITO. *Lógos* (fragment), *apud* HEIDEGGER, *op. cit.*

analogical[16] matrix of inductive nature that is axiomatically considered as a General Principle, uses some fields of knowledge in order to legitimate other fields in the composition of plans that are different from the reality and the languages that refer to logic. *Heterodox logic* may also act the same way due to its recursive, non-monotonic and complementary characteristics.

Thus, the new logics – more specifically *heterodox logic* – come to light in order to reveal from their own basis[17] significant achievements for the fields of law and science in general.

We will next have a look at aspects of the theoretical explanation of this idea.

2 Considerations on the logic of juridical orderings: the regularity of contradictions

In general, a good number of authors address legal logic through the prism of the development of both the history of logic and law itself. This approach clearly sparks discussions on subjects such as the Aristotelian syllogistic, the notorious questions of classic logic considered necessarily under their principles, namely, the third excluded, identity and non-contradiction, the dialectic signification in Hegel and the recovery of zetetics as a free form of argument concatenation.

Considerable progress can be noted when submitting law topics to deontic logic, which enables a renewed "exegesis" of legal texts despite the dilemma between law and morality that may still remain. These approaches naturally refer to problems of norm interpretation.

The purpose of this paper is neither to repeat the classical question of the logic of law, nor to examine its history in

[16] BRONZE, F. J. 1994. *A metodonomologia entre a semelhança e a diferença (reflexão problematizante dos pólos da radical matriz analógica do discurso jurídico***).** Coimbra: Universidade de Coimbra.

[17] *In* ARISTOTLE, *Organon:* "Real and first elements are those who get their credibility not from other elements but from themselves."

reference to norms taken individually[18], but rather to spark preliminary considerations on questions that are applicable to some problems referring to law structure or, in other words, to legal ordering.

Legal norms can be analyzed separately or in larger or smaller groups. They can also be analyzed through the way they organize themselves, which is how we aim to do it. Such a laborious and extensive task could not be circumscribed within the pages of this article. Nothing prevents us, however, from examining some of the fundamental concepts of the matter.

Firstly, we must agree that in order to understand structural matters of law it makes no sense to talk about one norm, but rather of a plurality of norms that comprise systematic groups called "legal orderings".[19] After that, we shall have a quick look at some of the main concepts and matters that affect legal orderings.

Aided by philosophy, legal theory tried for some time to find an ultimate point of reference in each ordering, which would be the original power of all norms and through which the ordering by itself would be justified. Bobbio[20] called this creative power "source of sources". This would be an absolute monistic ordering, but it is actually not like that. Orderings are extremely complex and sources are diverse: the norms in force originated from several classes such as moral, social, religious, common, and conventional classes. These norms can be external or internal to law, to the individual and to the State and become more elaborate if we consider that they present varying degrees of objectivity

[18] Generally, logic exercises applied to law are demonstrated though individual factual cases in the modal, deontic, or classic outlines. Less frequent are the allusions by logic to the juridical ordering as a whole, unless they be by hermeneutics and the General Theory of Law.

[19] MACHADO NETO, A. L. 1996. *Teoria geral do direito como lógica jurídica formal* (Cap. 2, A teoria do ordenamento como lógica jurídica). Rio de Janeiro: Edições Tempo Brasileiro, p. 74.

[20] BOBBIO, N. 1995. *Teoria do ordenamento jurídico* (presented by Tércio Sampaio de Ferraz Junior; trad. M. Celeste C. L. Santos). 6. ed., Brasília: Ed. UNB, p. 41.

and subjectivity, and that among them there are fields of influence that comprise limitations and self-limitations.

Another problem of the theory of legal orderings is its claim to completeness: few are the branches of knowledge that spread their arms to embrace the whole of social reality by means of an ordering as law does.

Beyond unity and completeness, orderings claim coherence.[21] We shall approach this topic briefly in the next section.

From the complex outline that characterizes legal orderings come serious scissions between theory and practice of law, as well as contradictions between the theories, the practices, and the theories and practices. Friedmann[22] points out that from the discrepancies between abstract principles and concrete decisions, several concepts of legal systems have proliferated since the beginning of modern period and, consequently, various methodologies were created to address those issues.

Kelsen developed the most clear and efficient theory in outlining a "grid"[23] of legal ordering by juxtaposing the norms ideally hierarchized, subordinated and connected in *nomostatics* and *nomodynamics*. It is a theoretical model of purism, rigor, and logical perfection whose application undoubtedly carries contradictions, lacunae, antinomies and other conflicts. However, modern law was without exception, influenced by it.

In this brief study, we shall focus on the matter of contradiction in ordering. Kelsen[24], for example, denied the possibility of contradiction between two legal norms in force, as follows:

> Given that two conflicting norms can both be valid – otherwise no conflict of norms would exist – the

[21] Unity, coherence and completeness are the fundamental element of juridical ordering, cf. BOBBIO, *op. cit.*

[22] FRIEDMANN, W. *Théorie générale du droit***.** 4. ed. Paris: LGDJ, [s.d.], p. 494.

[23] GAVAZZI, G. 1984. *Elementi di teoria del diritto (Struttura a gradi dell'ordinamento giuridico*). 2. ed. Torino: Giappichelli, p. 37.

[24] KELSEN, H. 1986. *Teoria geral das normas* (translated by. José Florentino Duarte). Porto Alegre: Sergio Antonio Fabris Editor, p. 281.

> statements on the validity of both norms do not represent a logical contradiction even when one norm defines a definite conduct as due, and the other norm defines the omission of such a conduct.
> The starting propositions of the validity of both norms: "'A' must be" and "'non-A' must be" do not represent a contrary opposition, because since both norms are valid, both are true.

For Kelsen[25], the validity of the norm lies in its existence when taking into account that deontic problems between morality and law hindered the logical-scientific construction of legal ordering that should be elaborated from a formal viewpoint.

Only true statements would have normative validity; false statements would be waived. Therefore, if all existing norms were true, they would be valid[26] and no contradictions would occur.

It is not necessary to comment on the consequences and difficulties empirically verified in the use of this line of reasoning or on the stream of theories that derived from it.

Hart [27] as one of his most worthy contributions has established the distinction between "existence" and "validity" of the norm by bringing new elements to reflection on legal systems, such as the supposition, acceptance and distortion of norms by the legislator, the judge and the society. Just as relevant are the considerations about the "pathology" of the legal system, which is verified in cases such as the incongruence between sectors and respective interests in a single ordering, ruptures and collapses between phases of the ordering that are replaced by the power of authority rather than by the reconstitution or restoration of the system itself.

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[25] *Idem, ibidem.*
[26] *Idem, ibidem* (item XII, *Enunciados sobre a validade de uma norma que com ela está em conflito – nenhuma contradição lógica*).
[27] HART, H.L.A. 1990. *O conceito de direito* (translated by. A. Ribeiro Mendes). Lisboa: Fundação Calouste Gulbenkian, p. 120.

The structuring of the ordering also depends on the contents and meaning[28] of the norms, as Larenz[29] points out. From that derives the existence of an inner and outer system of law, with the former being characterized as "open" and fragmentary, but with both sharing specific functions and being formed by principles.

The material character of these "factors" of law is naturally expressed through the structuring of an ordering and through the concrete questions of pragmatic evaluation, but their genesis is far more complex than that. Larenz[30] maintains that the "internal system" is only possible due to an "internal unity", from which a legal norm is a result for reasons of causality as we will examine later on[31] even if through the perspective of varied inferences.

In more recent readings on the structuring and systematization of legal orderings, hermeneutical matrices stand out as investigators of the "circular structure"[32] among meaning, functions, institutions and rules, whose theoretical lucubration is based on language.

Throughout the last decade, the systemic concepts of law, which were developed under the influence of the theory of systems, have become paramount. Among their most expressive dimensions, Teubner[33] can be pointed out with the autopoietic theory drawn out from an organization operated by orderings:

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[28] We shall not treat those questions at present, since they go throughout deep debates on hermeneutic and so are beyond the thematic limitation of this article.

[29] LARENZ, K. 1989. *Metodologia da ciência do direito* (translated by. José Lamego). 2. ed., Lisboa: Fundação Calouste Gulbenkian.

[30] LARENZ, K. 1966. *Storia del metodo nella scienza giuridica*. Milano: Giuffré, p. 194 *et passim*.

[31] *Infra*, item 3, *Coherence as an essential element of Law methodology: a contribution from mathematics?*

[32] LAMEGO, J. 1990. *Hermenêutica e jurisprudência – análise de uma rec TEUBNER, G. 1989. O direito como sistema autopoiético. Lisboa: Fundação Calouste Gulbenkian.epção.* Lisboa: Fragmentos, p. 134 *et passim*.

[33] TEUBNER, G. 1989. *O direito como sistema autopoiético***.** Lisboa: Fundação Calouste Gulbenkian.

logical units and clauses, production and reproduction of its own elements[34] and self-reference in its constitutive processes.[35]

While Luhmann creates a "theory of differentiation" defining what is in and out of the legal system based on a radical sociological relativization, Theodor Viehweg[36], in his book "Topics and Law", presents the idea that thinking by problems (topics) may better capture the essence of legal structure than the systematic thinking that uses interpretation to present the unity of the whole.

For Viehweg's[37], a "topical system" may be a contradiction in itself, because a process that is poor in connections and only aims to point out ways, and that is also oriented as closely as possible towards the singular problem, would never pursue the idea of inner order and unity and would be, therefore, unsuitable for the basic concepts of system.

In the last couple of decades some movements have stood out in Brazil, such as the so-called "alternative law"[38], which played a relevant role because of the considerations it produced. However, we must agree that this dimension seems to bear a degree of self-annihilation, since its existence and activity can

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[34] ROTTLEUTHNER, H. 1986. *Un cas récent: l'autopoiésis dans le droit* (Le système juridique en tant que système autopoiétique), *in* Arquive de philosophie du droit, t. 31, (le système juridique). Paris: Sirey, p. 233.

[35] EWALD, F. 1986. *Le droit du droit*, *in* Archives de philosophie du droit, t..31, (Le système juridique). Paris; Sirey, p. 245.

[36] CANARIS, C. W. 1989. *Pensamento sistemático e conceito de sistema na ciência do direito***.** Lisboa: Fundação Calouste Gulbenkian, p. 243.

[37] VIEHWEG, T. 2002. *Tópica e jurisprudência*. (Translated by Kelly S. Alflen da Silva). Porto Alegre, Sergio Antonio Fabris Editor.

[38] In the late 1980's and beginning of the 1990's in Brazil, a group of brave judges from the state of Rio Grande do Sul who were outraged with the social inequality in the country and who believed that Brazilian laws were made to favor the wealthy, decided to make legal decisions according to what they thought would be more fair under the social perspective, even if the decision was not in conformity with the laws in force at the time. This way, this group of judges created a "parallel" legal system to the one that officially existed in Brazil and they called it "alternative law". Nevertheless, the coexistence of two simultaneous legal orderings within the same country is, for us, a type of *heterodox logic*, which is here exemplified by a concrete situation. The so-called "alternative law" lasted 10 years in Brazil but it is not in force nowadays, and today it is only a chapter within the history of law in this country.

both result in a non-establishment situation: it is possible to conclude, therefore, that the system seems to be of a non-supportive nature. In other words: the alternative law, as such, must always oppose the established law. If, by any chance, it becomes formally established one day, it would no longer be alternative (it would cease from "existing"). Consequently, it cannot establish itself in order to continue "being" alternative. In a way, its ontical nature can be considered alternating, opposing and ambiguous.

Besides, when making use of psychoanalysis, alternative law builds discourses whose typology is disparate compared to that of the established law from the perspective of linguistics. It would be captivating to find out through what way and how far can logic be responsible for shortening the distance between such opposite ends.

One of the current trends within the study of orderings is the one that is trying to find "into the system a new kind of internal statement"[39]: what determines behavior or the "rules of the game", what the organizational games of the activity of justice are, and what its "praxeological" forms[40] are.

This trend makes a wide use of analogy between the artificial formalization of legal language in its recreational *status* and the relationships of interdependence among *statements* that have existed since prior to the aforementioned formalization. It investigates segments and degrees of regulation and indetermination, internality and externality, as well as paradoxes in the legal system. Gaps of uncertainty and recursivity in the systematization of law can be observed.[41] It is probable that soon we shall be facing new perspectives of interpretation on the formation and structuring of orderings starting from the irrational for example and among others, as it has already happened in

[39] OST, F.; KERCHOVE, M. 1994. *Le jeu: un paradigme pour le droit*. Paris: LGDJ.
[40] FRENCH, *Le droit dans la forme praxéologique du jeu, ibidem*, p. 190 e ss.
[41] KERCHOVE, M.; OST, F. 1992. *Le droit ou les paradoxes du jeau***.** Paris: Presses Universitaire de France.

Aesthetics. These readings will certainly bring up a wider range of questions and contradictions.

In this quick journey through the theories of ordering and of systems of law, it can be noted that, although there is a remarkable methodological evolution that goes from the most rigid, traditionally symmetrical and static forms to the more fluid, plural and flexible concepts, it is evident that contradictions can be found in some formulations. If such problems are intrinsic to law (by its very nature and objective), we need to find a way to deal with them. And that is where the role of *heterodox logic* lies.

3 Coherence as an essential element of law methodology: a contribution from mathematics?

Throughout the history, there have been concerns of intelligence about coherence in logic, in philosophy and in law as well as in other areas of knowledge.

Traditionally, according to Bobbio[42], legal coherence comes from the fundamental precept of the legalistic principle of justice (*pacta sunt servanda*), which he calls the principle of legality. Regarding coherence, Bobbio understands that the principle of non-contradiction is its most legitimate expression.

Evidently, this line of reasoning is compatible with the definition of law as a "deductive system": a particular ordering is a system while all legal norms are derivable from some general principles (called general principles of law). According to Bobbio[43] this mindset on the formation of law derives from the Euclidean geometry and is strongly based on Leibniz.

Bobbio[44], when commenting on the tendency of what he called *giuridificazione della logica* through modern dimensions of law, advises on caring for the "ontological" preservation of logic, which must not be reduced by Law to a rule of conventions

[42] BOBBIO, N. 1955. *Studi sulla teoria generale del diritto***.** Torino: Giappichelli.
[43] BOBBIO, N. *A ci ência do ordenamento jur ídico* (*in* Teoria do ordenamento jur ídico). *Op. cit.*, p.77.
[44] BOBBIO, N. *Op. cit.*

and serve as ready-to-use solutions. Otherwise, instead of contributing to the meaning of coherence in Law, it would perhaps cause its detriment.

Tautologies are also an applicable resource to the validation of coherence through the rationality of law. This way, according to Vernengo[45]:

> A valid normative line of reasoning could be reduced, through analogical techniques, to a sequence of propositional and deontic formulae, whose set would ultimately comprise a conditional whose antecedent is integrated by the premises, and whose consequential is integrated by the conclusion. If such a conditional were tautological, we would have logical validity guaranteed and thereby, the need for a line reasoning.

Tautologies, as we know, result in demonstration. In any case, ever since roman jurisprudence within the scope of law rationality, the "touchstone" of convincing (and even of persuasion) begins with the formula "if p then q", which presupposes the construction of hypotheses after which the main propositions announce the legal solutions.[46] This is, therefore, one of the early days of coherence in law.

However, in the scope of general epistemology, the concept of coherence has been changing. It is no longer possible to talk about coherence alone, but rather it is necessary to talk about it in a wider context comprising the idea of "reflexive balance"[47] among the elements of the system. On the other hand, cognitive sciences reveal a considerable range of uncertainties in a way that the balance is not guaranteed.

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[45] VERNENGO, R. J. 1976. *Curso de teoría general del derecho***.** 2ª ed., Buenos Aires: Cooperadora de Derecho y Ciencias Sociales, p. 105.

[46] PASQUIEU, C. 1979. *Structure logique de la règle* (*in* Introduction à la théorie générale et la philosophie du droit). 5. ed., Paris: Delachaux et Niestlé Éditeus.

[47] BONJOUR, L. 1998. *The elements of coherentism (The concept of coherence***)**, *in* Epistemology: the big questions). *Op. cit.*, p. 215.

Nonetheless, what is coherence after all? By synthesizing several theories developed about it, we could nowadays agree with Bonjour[48]:

> Intuitively, coherence is a matter of how well a body of beliefs 'hangs together': how well its component beliefs fit together, agree or dovetail with each other, so as to produce an organized, tightly structured system of beliefs, rather than either a helter-skelter collection or a set of conflicting subsystems.

It is understood that this "hanging together"[49] depends on different types of inference, evidence and explanatory relationships that slide through a variety of reflexes. However, in order to understand them it may not be necessary to follow the admonition of Bachelard[50]: *"Détruite la symétrie, servir de pâture aux vents"*, because it is accepted that theoretical extensions occur through axioms – even when there is the saturation of axioms.[51]

Coherence in law is also based on hermeneutics[52], which systematizes interpretation and executes the application of law in

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[48] BONJOUR, L. 1998. *The elements of coherentism (The concept of coherence*), *in* Epistemology: the big questions). *Op. cit.*, p. 215.

[49] *Vide*, in this sense, studies on the distinction between *probabilistic consistency and logical consistency in coherentism*, por BONJOUR, *op. cit.*

[50] BACHELARD, G. 1998. *La poétique de l'espace***.** 7. ed., Paris: Quadrige/PUF, p. 3.

[51] CAVAILLÉS, J. 1997. *Sur la logique et la théorie de la science* (preface par Gaston Bachelard et postface par Jan Sebestik). Paris: VRIN, p. 83 *et passim.*

[52] MÜLLER F. 1996. *Discours de la méthode juridique***.** Paris: L.G.D.J.; BULYGIN, E. 1988. *Norma jurídica y analisis logico***.** Madrid, Centro de Estudos Constitucionales; AZEVEDO, P. F. 1989. *Critica à dogmática e hermenêutica jurídica***.** Porto Alegre: Sérgio Antônio Fabris; EWALD, F. 1986. *Le droit do droit, in* Archives philosophie du droit (Le système juridique). t. 31, Paris: Sirey; FRANÇA, L.1994. *Hermenêutica jurídica***.** 3. ed., São Paulo: Saraiva; FRIEDMANN, W. 1965. *Théorie Générale do droit***,** v. VI (Bibliotéque de philosophie du droit), 4. ed., Paris,: Librairie Générale de droit et de jurisprudence; ANDRADE, C. J. *Hermenêutica jurídica no Brasil***.** São Paulo: Editora Revista dos Tribunais, [s.d.]; CUNHA, P. F. 1995. *Princípios de direito (introdução à filosofia metodologia jurídicas***).** Porto: Rés; ECO, U. 1995. *Os limites da interpretação***.** São Paulo: Perspectiva; BLEICHER, J. *Hermenêutica contemporânea***.** 1980**.** Lisboa: Edições 70 Ltda.; OVIEDO, J. M. M. 1972. *Formacion y aplicacion del derecho (aspectos atuales***).** Madrid: Instituto de Estudios Políticos;

factual cases by providing guidelines for the solving of lacunae, antinomies, contradictions and for the normative integration, efficacy and efficiency, as well as for the articulation between norms that are principal and derivative, direct and indirect, imperative and facultative *plus quam perfectae, perfectae, minus quam perfectae, imperfectae*, etc.

Nowadays, legal hermeneutics focuses its attention especially on efficiency and efficacy of laws, on their intra-ordering transit and also on pragmatic reflexes of normative application and integration.

Within the development of law, our concern is the functionality of programmatic norms (which depend on other norms that regulate them in order for them to become factual), as well as the generic and laconic spaces that superior norms may contain, whose specification is found in the staggering statements articulated to the legal arrangements that are hierarchically inferior. This way, parts of the contents are lost, formal mechanisms may become anomic and, effectively, contradictions occur.

Regarding the occurrence of contradictions, legal hermeneutics is responsible for regulating the subsidiary use of principles, for instructing their normative uses and for other commonly known things.

The importance of hermeneutics is unquestionable in the theoretical construction of law, particularly for feeding the human and social nature of that knowledge.

On the other hand, it is nowadays difficult to deny a certain "epistemological crisis" in positive law due to the complex social issue for which the jurisdiction will have to be scientific, precise and satisfactory as much as possible.

PALMER, R. E. 1989.*Hermenêutica***.** Lisboa: Edições 70 Ltda; SCHAPP, J**.** 1997**.** *Problemas fundamentais da metodologia jurídica*, Porto Alegre: Sérgio Antonio Fabris Editor; LARENZ, K. 1983. *Metodologia da ciência do direito* (trad. de José Lamego), 5. ed., Fundação Calouste Gulbenkian: Lisboa, among others.

In Warat's[53] opinion, in order to produce satisfactory results, the rigorous knowledge meant to be constructed for the legal world must respect the logical properties of scientific discourse by producing derivations of the principle of imputation and this way providing a significant dimension to the explanations that started from the principle of causality.

But, at times of uncertainty, how can the logical properties of the scientific discourse in law be preserved? Which line of reasoning can be a better protection against (or for) ambiguities?

If the quickest answer that comes to mind is "mathematics", it is convenient to remember that Kant[54] remarked that "all the lines of reasoning of mathematicians come from the principle of contradiction" and that a scientific proposition can only be known by another, which is deduced from it.

If according to Pitagoras[55] the elements of numbers are the elements of all things and the whole universe is harmony and number, Jaeger[56] reminds us that the Greeks' concept of numbers had originally a qualitative linguistic connotation, which only later on evolved towards quantitative abstraction. There are also common semantic questions pointed out by Szabó[57] between the Greek mathematical proof method and the terminology used in the dialectic method commented by mathematicians on how Lobachewski's hyperbolic geometry and Riemann's geometry revolutionized concepts after two thousand years of Euclidean axiomatization. Similarly, Eichler reconceptualizes symmetry through modular forms, demonstrating how an object can be transformed and look the same after that.

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[53] WARAT, L. A. 1995. *Epistemologia jurídica da Modernidade.(in:* Introdução Geral ao Direito), Porto Alegre: Sergio Antonio Fabris Editor.

[54] KANT, E. *Crítica da razão pura* (Introdução, item V, Os juízos matemáticos são todos sintéticos), *op. cit.*

[55] ARISTÓTELES. *Metaph*. I, 5, 985 b.

[56] JAEGER, W. 1995. *Paidéia* (translated by. Artur M. Parreira). São Paulo: Martins Fontes, p. 205.

[57] SZABÓ, Á. 1967. Greek dialetic and Euclid's axiomatic**.** In LAKATOS, J. (Ed.) Problems in the philosophy proceeding of the international coloquium in philosophy of science. London, v. 1, North-Holland P. Co. Amsterdam.

Comparisons between ancient Babylon's mathematics and the Vedas[58] reveal that this knowledge evolved differently among peoples through history in a way that precision and scientific objectivity, as we understand them nowadays, are a relatively recent product in the science of philosophy, and it can be said that they vary according to the evolution of logical-mathematical concepts. Thus, it is clear that mathematical concepts evolve, transform themselves and with them also logic and the so-called "truth, precision, and objectiveness" as characteristics of science. That is why we question whether the time has come to bring knowledge to factual terms by taking into account that the new logics present a sufficient level of theoretical development, which makes them, therefore, a competent application tool.

In any case, the imbrications between mathematical laws - to which logics are correlated - and knowledge have always been essential. Within mathematics, the concept of "burden of proof" is much more subtle and deep and it reverberates in some way on the formulation of knowledge.

For Kneale[59], "logic (...) will always be studied together with other subjects that are relevant to the organization of knowledge" and "this relatively simple subject is central in the great tradition of the European concept of science".[60]

This way, the attention of law towards logics in its current state of art is full of significations in which *heterodox logic* takes up an outstanding role.

4 Partial conclusions

We have seen within diverse concepts and theories about legal ordering that the communication of the meaning of the norm, in its inner articulation of the law system, has given rise to

[58] SEIDENBERG, A. 1978. *The origin of mathematics* (*in* Archive for History of Exact Sciences). C. Truesdell Ed., Vol, 18, nº 4, Springer-Verlag: Berlin-Heidelberg-New York, p. 323.
[59] KNEALE, W.; KNEALE, M. 1991. *O desenvolvimento da lógica***.** 3. ed., Lisboa: Fundação Calouste Gulbenkian, p. 751.
[60] *Idem, ibidem.*

significant inquiries. Similarly, hermeneutics solves the problem of lacunae, efficacy, and antinomy of laws while also leaves questions unanswered.

In part, the insolubility of paradoxes in the theoretical and theoretical-practical fields of law was attributed to its intrinsic nature, which deals with questions of human and social reality (therefore inaccurate and contradictory), while simultaneously looks for a scientific systematization molded on precision and objectivity and based on the logical principle of non-contradiction.

However, new logics systematize themselves in a way that they are able to derogate or enable changes regarding established principles. Among them, *heterodox logic* is particularly intriguing, because it allows the complementarity and/or interfaces between contradictory premises (and not merely the elimination of one or another of those premises), and because it stands out as a working space to manage not only contradictions but also contingencies ($T \curlywedge F$), which are common to impasses of praetorian solutions and jurisprudence in general.

Despite having been explained in this article under its deductive aspect, *heterodox logic* can also be useful for inductive logical application research and debates, as we will see in the following studies.

Thus, according to the content exposed, we are faced with a new tool that is capable of bestowing on law the object of its eternal *recherche*, which is logicalness in paradoxical decision as an essential contribution to the ideal of justice. It is necessary to consider the questions that arise from the use of the so-called *heterodox logic*, which are essentially expressed by considerations regarding the degree of scientificity and the rationality which law is based on as a scientific knowledge; and regarding the freedom to think, to choose, and to change systems and methods.

Finally, to conclude, in practical terms beyond from possible contradictions, vagueness and inaccuracies that may perhaps exist within the legal ordering of one single country, from our

perspective, what is called *heterodox logic* can still find a big scope of application within the conflicts between different countries or within international law where several negotiations can have unsuccessful results. Therefore, *heterodox logic* could be a useful tool also for Diplomacy and International Courts; at first under a philosophical and hermeneutic viewpoint, and possibly in the near future through electronic or computing applications depending on the results of the scientific experiments that are currently being carried out.

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