

## ON THE DISTINCTION BETWEEN INCOMMENSURABILITY AND INCONSISTENCY\*

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### Abstract

The aim of this paper is to analyse the differences between the notions of incommensurability and inconsistency. The concept of incommensurability taken into account is restricted to the one of non-trivial incommensurability, which, in turn, will be associated with local untranslatability. Logical, ontological, and epistemological differences between the two former notions will be depicted. It will be shown that incommensurability consists of a sort of non-contradictory opposition relation.

### 1. Introduction

The term *incommensurability* was introduced into contemporary Philosophy of Science with the aim of expressing a new notion, in opposition to reducibility; by no means was it used to transmit already-existing, well-known notions such as that of inconsistency. By coining this new expression (albeit new only in the field of the Philosophy of Science) Thomas S. Kuhn and Paul K. Feyerabend's aim was to attract attention to an unrecognised and insufficiently individualized phenomenon, characteristic of the relations between rival scientific theories. They referred to it highlighting the impossibility of defining the terms of a theory on the basis of the terms of the other<sup>1</sup>. Thus, this dealt with

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<sup>1</sup> Cf. Kuhn, T.S., *The Structure of Scientific Revolutions*, University of Chicago Press, Chicago, 1970, pp. 102-104, and Feyerabend, P.K., "Explanation, Reduction and Empiricism", *Scientific Explanation, Space, and Time*, eds. H. Feigl and G. Maxwell, *Minnesota Studies in the Philosophy of Science*, III, University of Minnesota Press, Minneapolis, 28-97, pp. 56-59.

denoting, by means of this new term, a specific phenomenon, distinguishable from others, that may be considered to be close, such as incompatibility.

Nevertheless, incommensurability has repeatedly been misunderstood by detractors in terms of global incommensurability. This would suppose a radical conceptual discrepancy, or total untranslatability between theories that deal with the same phenomena<sup>2</sup>. Consequently, all possibility of comparing conceptual systems belonging to alternative theories would be lost. If global incommensurability between alternative scientific theories were denied, the incompatibility between them could be explained by simply resorting to the notion of inconsistency. D. Davidson, D. Shapere and I. Scheffler<sup>3</sup> are amongst those critics that present a notion of incommensurability that is restricted to its global sense. They consider that incommensurability implies total untranslatability between the languages of rival theories. This type of translatability precludes even the contemplation of the possibility of contradiction, as the former demands the sharing of the same language in which the sentence of set of sentences may be affirmed and negated. As Kuhn has attempted to clarify in articles subsequent to *The Structure of Scientific Revolutions* (1962), the latter identification that is given does not fit in with his idea of incommensurability, which would consist of a local-type untranslatability<sup>4</sup>, so that the argument put forward by his critics would lose its validity, and incommensurability would once again be conceivable in a

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<sup>2</sup> Global incommensurability must be differentiated from what is referred to as trivial incommensurability. The former relates theories that, diverging radically in the conceptual plane, aim to report on the same phenomena. The latter is established between theories that, possibly coinciding in some part of their relative conceptual systems, do not apply to the same phenomena. An explanation of the distinction between trivial and non-trivial commensurability can be found in Balzer, W., Moulines, C.U., Sneed, J.D., *An Architectonic for Science. The Structuralist Program*, Reidel, Dordrecht, 1987, pp. 313-315. Both global and partial incommensurability (the latter will be referred to below) are included in the non-trivial variety of incommensurability, i.e., they occur between theories that deal with the same phenomena.

<sup>3</sup> Cf. Davidson, D., "On the Very Idea of a Conceptual Scheme", *Inquires Into Truth and Interpretation*, Clarendon Press, Oxford, 1984, 183-198, Shapere, D., "Meaning and Scientific Change", *Scientific Revolutions*, ed. Ian Hacking, Oxford University Press, New York, 1981, 28-59, pp. 44, 58, and Scheffler, I., *Science and Subjectivity*, The Bobbs-Merrill Company, Indianapolis, 1967, pp. 81-83.

<sup>4</sup> See Kuhn, T. S., "Commensurability, Comparability, Communicability", *Philosophy of Science Association*, II, 1983, 669-688, pp. 670-672.

partial, non-global sense. Other critics, such as P. Kitcher and H. Putnam<sup>5</sup>, explain a different argument strategy, focusing on the possibility of translating the languages of alternative scientific theories. Their work not only aims to defend translatability, but also to represent the discrepancies between scientific theories in the form of inconsistency. Kuhn responds to the new criticism by stating in which direction partial untranslatability would persist, thus preventing the reconciliation of incommensurability and inconsistency.

The confusion arising around the notion of incommensurability has had disastrous consequences for the lively philosophical debate surrounding it. In the arguments on this theme, the different participants have rarely referred to the same type of problem. Due to this, the objective of the current work is to differentiate between the notions of incommensurability and inconsistency, to confirm them, and to emphasise the specificity of the former. To this aim it will be necessary to determine the type of non-contradictory opposition relation that characterises incommensurability. It will be shown how the opposition between groups of sentences that are only contradictory in that some of them produce a form of exclusion between both groups, is different to that brought about by a contradiction amongst all of them. With the aim of simplifying the analysis, *inconsistency* and *contradiction* will be used as synonyms. Similarly, only cases of contradictions that are established between pairs of sentences will be considered, as the examples of incommensurability that are habitual in the literature refer to pairs of scientific theories. Needless to say that, in spite of defending the possibility of the logical treatment of some aspect of incommensurability, the theories amongst which this may be the case, and which are considered herein, are of an empirical and not a logical nature. This, as will be stressed throughout the work, has important consequences for the relation between the logical plane and the epistemological and ontological ones.

Given that inconsistency presupposes the existence of a common language in which this relation may be given or not, firstly I will examine up to what point untranslatability is required by incommensurability. In order to analyse this matter, I will base my arguments on some of the

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<sup>5</sup> Cf. Kitcher, P., "Theories, Theorists, and Theoretical Change", *The Philosophical Review*, 87, 4, 1978, 519-547, "Implications of Incommensurability", *Philosophy of Science Association*, 2, 1982, 689-703, *The Advancement of Science. Science without Legend, Objectivity without Illusions*, Oxford University Press, New York, 1993, pp. 272-291, Putnam, H., *Reason, Truth and History*, Cambridge University Press, Cambridge, 1981, pp. 113-124.

ideas expressed by J. Hintikka in *On the Incommensurability of Theories* (1988). I will avail myself of them in order to propose a notion of incommensurability which maintains its coherency by being restricted as little as possible.

## 2. Relation between incommensurability and untranslatibility

Firstly we should explain the importance of the question of translatability with regard to the topic with which we are dealing. It can be seen that, on one hand, the relation of inconsistency demands that the statements that are connected by it should be expressed in the same language. On the other hand, the relation of non-contradictory opposition, which in the present work is associated with incommensurability, requires the existence of two sets of sentences which contradict each other in one of their subsets, which, in turn, requires that the sentences of these subsets should be formulated in the same language or in mutually translatable languages (the same not occurring in sentences that do not belong to this subset). It is assumed that local untranslatability permits the existence of a certain set of statements that are translatable and either mutually consistent or inconsistent.

Throughout the last few decades, the idea that incommensurability implies local untranslatability has been gaining power. A model-theoretical treatment of the matter makes it possible to analyse it in greater depth, emphasising conceptual discrepancies that are characteristic of incommensurability and not linked to untranslatability. Incommensurability would be explained by virtue of radical differences between empirical conceptual frameworks, these being expressed in only partly untranslatable languages. Hintikka<sup>6</sup> (1988) proposes the substitution of the notion of deductive consequence by the model-theoretical consequence in the analysis of incommensurability. Using the interrogative model of enquiry, upon which Hintikka bases his argument, we can see how incommensurable theories that partially share the same language are affected by consequential incommensurability, as there are certain relevant questions for both theories which, nevertheless, are not answered by both theories, i.e., their respective classes of intended applications (in which the responses to such questions are included) overlap. This analysis enables us to appreciate the function of the language shared by theories, by showing the possibility of forming questions that are equally relevant for them.

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<sup>6</sup> Hintikka, J., "On the Incommensurability of Theories", *Philosophy of Science*, 55, 1988, 25-38.

### 3. Differences between incommensurability and inconsistency

There are four fundamental types of differences between incommensurability and inconsistency: logical, ontological, epistemological and semantic. Needless to say that the enumeration of the differences between each type does not aim to be exhaustive. Equally obvious is the interconnection between each of the manners of discrepancy, which will be highlighted in as far as it is considered to be of special interest for the analysis of incommensurability. It will not be necessary to dwell once again upon semantic divergences, given that in the previous section untranslatability has already been established as a necessary though not sufficient condition for incommensurability. Moreover, translatability has been introduced as a necessary though not sufficient condition for inconsistency. Let us now examine the initial three forms of discrepancy that are noted.

#### 3.1. Logical differences between incommensurability and inconsistency

There are two principal logical differences between incommensurability and inconsistency: a) the manner of exclusion between the related elements of the domain (which will be revealed by the study of the truth tables); b) the order of the logic in which each relation is established. We now go on to examine each of these differences.

a) Differences in the form of exclusion. The formal characteristics or conditions of contradiction are: - logical falsity in virtue of the logical form (logical constants), and mutual exclusivity of the truth functions, i.e., from the truth or falsity of one of the propositions the truth or falsity of the other is inferred, and vice versa. We will see that in the case of incommensurability neither of the two conditions is fulfilled. On the other hand, logical falsity is not implied, as it does not conjugate the affirmation and negation of the same single formula, rather it substitutes a given set of formulae by another alternative one, which always includes some form of contradiction with a number of the formulae from the substituted theory. Conversely, although two incommensurable theories cannot be equally true, it is possible for them both to be false. Incommensurability leads to a peculiar form of opposition, according to which the falsity of one theory does not imply the truth of the other, as the contradictory aspects being found in conjunction with others may make them both false. We know that each one of the incommensurable theories exceeds the content of the other, which, as Kuhn points out, is patent in the residue or losses resulting from translations between them. Regarding the truth or falsity of incommen-

surable theories, perhaps the peculiarity that both may even be true in a certain sense should be examined. As we are dealing with empirical theories that are constantly being confirmed, their truth or falsity would not be totally decidable, rather assessable in a gradual manner. Both the Popperian notion of approximate truth and the sophisticated falsificationism founded by Lakatos seem to respond to the intuition of gradual confirmation of scientific theories.

Two propositions connected by a contradictory opposition relation cannot both be true at the same time; nor at the same time can they both be false. Moreover, the contradictory opposition relation is one of the forms of relation between truth functions. For example:

A	$\neg A$
V	F
F	V

Examining the reciprocal dependence of the truth-functions in relation with the truth and falsity values, we obtain the table shown above. Contradictory functions are mutually exclusive, being not possible for both to be true, or both to be false; the truth of one implies the falsity of the other, and vice versa. Let us now observe the truth-functions and truth-tables corresponding to non-contradictory opposition relations. Once again, these are mutually exclusive functions, although not in the same manner as the contradictory ones. Let us examine the following case:

A	$\neg A$	B
V	F	F
F	V	V

A	$\neg A$	A	$\neg A$
V	F	F	
F	V	F	

A B	$\neg A$	$\neg A$ B
V V	F	F
V F	F	F
F V	V	V
F F	V	F

Incommensurable theories are made up of propositions that are connected in the manner shown in the above example, or ones from which propositions that are connected in that manner can be inferred. They are incompatible, although they are connected by means of a type of opposition relation different to that of contradiction. The preceding functions cannot be simultaneously true; nevertheless, they could both be false. Aristotle labelled this peculiar form of opposition *contrary opposition*. In their characterisation, M.R. Cohen and E. Nagel have pointed out the little attention and poor treatment of which it has been the object<sup>7</sup>. Let us look at the following example, in which Ptolemaic and Copernican astronomy are used as reference scientific theories. “The Earth revolves around the Sun” and “The Sun revolves around the Earth” constitute a pair of non-contradictory statements. Nevertheless, within each one of the theories where each one of them would be affirmed as true, a pair of contradictory statements could be deduced on the basis of the two previous ones. The following would be a possible result: “The Sun is the centre of the Universe” and “The Sun is not the centre of the Universe”. In order to deduce these pairs of contradictory statements it will be sufficient to add to the first of the aforementioned pairs, in one case, “the Earth is the centre of the Universe” (the statement from Ptolemaic astronomy) together with “If the Earth is the centre of the Universe then the Earth does not revolve around the Sun” (proposed for both theories), in the other, “The Sun is the centre of the Universe” (belonging to Copernican astronomy) and “if the Sun is the centre of the Universe then the Sun does not revolve around the Earth” (statement proposed for both theories).

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<sup>7</sup> A clear explanation of the different types of non-contradictory opposition, including the one mentioned herein, can be found in Cohen, M. R., Nagel, E., *An Introduction to Logic*, ed. John Corcoran, Hackett, Indianapolis, 1993, pp. 65-71.

Instead of thinking of mere sets of propositions, let us now think of sets of propositions that comprise the linguistic part of incommensurable scientific theories, on one hand, and of pairs of contradictory statements on the other. The relation between the former, i.e.  $\neg(T_1 \wedge T_2)$ , paying attention to their manner of exclusion, could be represented in the following manner:

A B	A B	$\neg(A \wedge B)$
V V	V	F
V F	F	V
F V	F	V
<b>F F</b>	F	<b>V</b>

The last line of the table shows the possibility, which is not shared by the contradiction relation, that both theories are false. This can be due to two different kinds of reasons which may intervene in combination: a)  $T_1 \wedge A \wedge \neg A$  or  $T_2 \wedge B \wedge \neg B$ ; b)  $T_1 \wedge S_{o1}$  and  $S_{o1}$  is false or  $T_2$

$S_{o2}$  and  $S_{o2}$  is false (where  $S_o$  stands for *observational statement*).

The non-contradiction principle governs the exclusion relation between the contradictory propositions:

$$\neg(A \wedge \neg A)$$

In this case, it follows that:

A	$\neg A$	A $\neg A$	$\neg(A \wedge \neg A)$
V	F	F	V
F	V	F	V

The final two lines of the table exhaust the possibilities by which exclusion between contradictory propositions could be resolved. As opposed to that which occurs with incommensurable theories, the possibility of both A and  $\neg A$  being false is ruled out.

The hypothetical or provisional character of scientific knowledge together with theoretical pluralism are two characteristics of science that explain the differences in the type of exclusion between one opposition relation and another (contradictory and incommensurable). These features would increase the plausibility that two false theories, (partially



false), may coexist successfully. It should be borne in mind that both the verification and the falsification of a theory are gradual.

Incommensurable theories are alternative as: 1) they are incompatible; 2) they successfully report the same set of phenomena; and 3) they differ in *a priori* aspects related to each theory. On the contrary, it would be erroneous to affirm the alternative character of inconsistent propositions as even though 1) would be fulfilled, 2) and 3) would not.

b) Divergence in the type of logic order in which these relations are established. Inconsistency can be established within a first-order logic; however, given that incommensurability relates conceptual frameworks, it requires the quantification of properties and/or predicates in order to determine the differences between the relations and concepts of both theories, leading to the use of a second-order logic. It should be noted that, in any case, all logics of a higher order can be reduced to ones of a second order. Following the ideas of H. Gaifman in this regard, conceptual frameworks will be understood as interpreted languages or fragments of interpreted languages in which the constitution of recognised facts is expressed<sup>8</sup>. Given that empirical scientific theories deal with empirical facts, they will also have conceptual frameworks of an empirical nature. The specificity of each conceptual framework is given by the set of 'self-evident' truths within that framework. The function and theoretical complexity of empirical conceptual frameworks is analysed in the following section.

### *3.2. Ontological differences between the terms of the incommensurability relation and the terms of the inconsistency relation*

Speaking of ontological processes leads us to suppose that there exists a clear notion of ontology. This, however, is not the case, and neither is it the aim of the present study to present one, so that in the remainder of this paper I will refer exclusively to certain generic aspects that are characteristic of our representations and knowledge of the world. That is to say, my comments in this sense will be restricted to those ontological (non-metaphysical<sup>9</sup>) aspects that deal with conceptualisations of the world by means of which we have access to this world or through which it is shown to use. I refer to the role of presupposed

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<sup>8</sup> See Gaifman, H., "Ontology and Conceptual Frameworks. Part I", *Erkenntnis* 9, Reidel, 1975, 329-353.

<sup>9</sup> It is beyond the scope of this paper to discuss the existence, or not, of a reality that is independent of cognitive subjects.

conceptual frameworks in descriptions or other conceptualisations of the world.

Incommensurability between scientific theories arises from the discrepancy between the empirical conceptual frameworks that are characteristic of them. The ontological dimension alluded to depends on this type of conceptual framework. For the formulation of contradictory sentences the use of some conceptual framework – though not necessarily empirical – is required in which they make sense and in which it is guaranteed that they both refer to the same thing, on one hand to affirm something about what is referred to, and on the other in order to negate it. For this reason, and returning to the theme that we are dealing with, the following points of divergence between incommensurability and inconsistency regarding the ontological argument should be pointed out: a) presuppositions and theoretical levels in which the relations are established; b) propositional attitude (on one hand, the intention of formulating a series of true sentences about the world, on the other, not necessarily so).

*a) Presuppositions and theoretical levels in which relations are established*

The notion of presupposition that is used in the present work should be understood in a wider sense, such as that which it is necessary to assume in order to affirm either the truth or the falsity of a statement (or set of statements). Incommensurability is a relation that links scientific theories, each one of which includes or presupposes two empirical conceptual schemes: one that is common to both, and another, non-shared one, that gives rise to incompatibility between them. On the other hand, inconsistency relates sentences or groups of sentences which do not include, although they do presuppose, a conceptual scheme which, in this case, has to be coincident and not necessarily empirical. The reason for it having to be coincident has to do with the contradiction being established on the basis of something shared by its two elements, namely, one single statement that is affirmed and negated. In other words, each one of the terms of a contradiction presupposes the same conceptual framework as the other, since, otherwise, it would not be guaranteed that that which is affirmed and negated refers to the same thing.

According to what has been said, the pair of relations incommensurability/commensurability, must be understood as belonging to a more basic level than inconsistency/consistency, since the evaluation of the contradiction between each two statements is only possible in the case of both statements belonging to the same language (or to mutually translatable languages) and their presupposing the same conceptual

scheme (as otherwise they would be referring to different things). That is to say, the determination of consistency or inconsistency between two propositions presupposes commensurability as a necessary, although not sufficient, condition for their establishment. Thus, analysing the consistency between two statements presupposes the selection of a shared language in which these statements are expressed. In other words, the selection of a language is a prior requirement for the establishment of contradiction or non-contradiction of any pair of sentences.

It is interesting to distinguish, in this sense, between mere change of belief and conceptual change (or, what is discussed here, change of conceptual scheme). The latter always implies the former, but the former only occasionally gives rise to the latter. Incommensurability supposes a change in beliefs linked to a conceptual change; nevertheless, contradiction relates two propositions that, in the case of being accompanied by a declarative propositional attitude on the part of the users of the languages, transmits different beliefs that are not linked to a conceptual change<sup>10</sup>.

The empirical character or not of the conceptual framework that is presupposed in a contradiction highlights another discrepancy between this and incommensurability: every scientific theory, regarding the attempted explanation of the world, is accompanied by an ontology that is based on empirical conceptual frameworks. Nevertheless, it is not the case that every proposition that makes up a contradiction is presented as reporting on a real phenomenon. Proof of this is that inconsistent statements may have no ontological intention, as can be seen in the following example: "Pegasus is blue" and "Pegasus is not blue". The type of (non-referential) propositions making up this example are usually considered to be false (in accordance with Russell) or lacking in truth value (according to Frege). The philosophical debate that has been generated by these types of expressions is beyond the scope of the present work; I would simply like to point out that perhaps the choice between one of the two options given above could be made depending on the type of propositional attitude that underlies the formulation of the statements. As we shall see in the second sub-section, statements in which the conceptual frameworks of incommensurable theories are expressed are formulated, however, with the aim of establishing a series of truths about the world. Let us consider the utterance: "Phlogiston takes part in combustion" and "phlogiston does not take part in combustion."

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<sup>10</sup> The distinction referred to appears in: Thagard, P., "Concepts and Conceptual Change", *Epistemology and Cognition*, ed. J.H. Fetzer, Kluwer Academic Publishers, Netherlands, 1991, 101-120.

This contradictory and (discovered to be) non-referential statement is made up of sentences to which it seems reasonable to attribute truth values, given that their formulation is accompanied by a propositional attitude that is characteristic of science: that of attempting to establish truth values for the world. The new example would then be found to comprise of a pair of empirically false sentences. This gives rise to a paradox, since no pair of statements that are contradictory between themselves can be made up of two false sentences. This is a well-known paradox that Russell resolves by distinguishing between primary and secondary occurrences of descriptions<sup>11</sup>. *Phlogiston* would have a secondary occurrence in the proposition “Phlogiston does not take part in combustion”, as the sentence does not simply arise from using this term as an argument of the propositional function “it does not take part in combustion” (as occurs in primary occurrences), rather it stems from using such a term as the argument of the propositional function “takes part in combustion” and, furthermore, from negating the result. The truth value that corresponds to the statement “Phlogiston does not take part in combustion” will therefore be true, due to it having *phlogiston* as a secondary occurrence. It is denied that the entire phenomenon be true, i.e., the very fact that phlogiston exists, and, thus, that it may take part in combustion.

The above comments on presuppositions highlight the difference relating to conceptual levels in which incommensurability and inconsistency relations respectively appear. There is a great degree of divergence with regard to the conceptual complexity that is characteristic of the class of entities that are linked by both relations. Connected in the former are scientific theories in which conceptual frameworks of different orders are included, and to which truth values are applied. Linked in the latter are sentences that do not have conceptual schemes, and to which truth values are not necessarily applied. It should be stressed that as incommensurability relates discrepant scientific theories which aim to deal with the same phenomena, it necessarily has to be established between different conceptual frameworks, which, in turn, share some previous conceptual framework at a more basic or elemental ontological level. Thus not only contradictory sentences, but also incommensurable theories share some sort of conceptual framework. Nevertheless, the differences in conceptual complexity between both relations is highlighted once again, since the conceptual framework that is shared by

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<sup>11</sup> Cf. Russell, B., “Descripciones”, 1919, in *La búsqueda del significado. Lecturas de Filosofía del Lenguaje*, ed. Luis ML. Valdés Villanueva, Tecnos, Madrid, 1991, 46-56.

incommensurable theories explicitly appears as part of the entities that are connected, which does not occur in the case of inconsistency. In this case, the shared conceptual framework is directly employed and it only implicitly forms part of the entities that are connected.

The matter of propositions also has consequences regarding the *a priori* and *a posteriori* aspects of the entities that are related by incommensurability and inconsistency. The previously-mentioned *a priori* nature of conceptual frameworks determines the *a priori* nature of a section of scientific theories, as the former are included in the latter. Contradictions do not share this sort of aprioristic feature with incommensurable theories, since, as has already been mentioned, they do not necessarily make explicit any conceptual framework. Consequently, the falsification of one of the sentences forming part of a contradiction does not lead to the elimination of the conceptual framework on which it depends, whilst the rejection of a theory results in the abandonment of one of the conceptual frameworks on which it depends.

***b) Propositional attitude***

As has already been touched upon, in the case of incommensurable theories, its users attempt to formulate a series of true sentences about the world, whilst in the case of inconsistency there is not necessarily this aim. This was stressed when dealing with non-referential contradictory sentences. Also emphasised therein is the ontological dimension that is opened by the scientist's characteristically propositional attitude.

Mentioning the intention, on the part of a certain scientific community, of establishing and accepting a series of propositions as being true is a too generic form of referring to the propositional attitudes of its members. Structuralist theory analysis enables us to perfect this aspect somewhat more, by recognising three propositional attitudes of scientific communities that are aimed respectively at three different aspects of scientific theories<sup>12</sup>. The first type involves both the theoretical and pragmatic parts of the theory, and indicated the aim — by those individuals pertaining to the scientific community — to apply the theory-element core in order to explain or predict certain phenomena. Inversely, the applications of a theory will thus always be desired or intended applications of that theory. The second type of propositional attitude relates principally to the plane of intended applications and consists of recognising a given set of applications as being paradigmatic. There is no doubt that this class of intended applications will be more ontologically relevant than the rest, as it verifies the set of characteris-

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<sup>12</sup> See Balzer, W., Moulines, C.U., Sneed, J.D., *op. cit.*, p. 215.

tic applications of a theory. Lastly, the third type affects propositions, and is defined by the admission of a proposition as being well-corroborated by means of proof procedures that are typically used by a given scientific community.

### 3.3. Epistemological differences between incommensurability and inconsistency

The following epistemological differences can be emphasised regarding: a) *a priori* and *a posteriori* aspects; b) role of truth.

#### a) Differences in a priori and a posteriori aspects

The type of exclusion between incommensurable theories, as well as between contradictory sentences, is determinable *a priori* on the basis of its logical form. Nevertheless, the specific manner in which exclusion is produced is only decidable *a priori* in the case of incommensurable theories, and not for contradictory sentences. That is to say, each scientific community only accepts one of the rival theories as being true, even before undertaking its empirical confirmation. This is due to the ontological nature of exclusion between rival theories, determined by drastic differences between the proposed conceptual frameworks. The choice between the two theories cannot be postponed until the empirical confirmation as it is something that has already been presupposed in this confirmation: i.e., part of the theory is presupposed in the confirmation of the theory itself. Thus the possibility of postponing the decision on which theory to accept and which to reject is eliminated.

Conversely, between contradictory empirical statements the specific manner in which exclusion comes about is only decidable *a posteriori*. Contradictory statements are already drawn up from some presupposed common conceptual framework, instead of being adapted. Therefore, the decision on the truth or falsity of these sentences, as for any non-presupposed empirical question, requires empirical confirmation, and thus resolution *a posteriori*. *A priori*, it is considered that any, albeit only one, of the two contradictory statements can be experimentally confirmed. The conceptual framework that is employed does not exclude either of the two possibilities. In spite of this, only the empirical confirmation of both statements will reveal which of them should be accepted and which excluded.

#### b) The role of truth

As has already been highlighted when analysing the truth tables, incommensurability does not necessarily imply the truth of any of the theories. Inconsistency, however, except in case of non-referentiality,

implies the truth of one of the sentences or of one of the groups of sentences making up the contradiction.

#### 4. Conclusion

- Non-trivially incommensurable theories are incompatible, but they do not merely have a relation of inconsistency between them, rather of non-contradictory opposition from which it is possible to infer inconsistent statements.

- It is possible to carry out a conceptual comparison between non-trivially incommensurable scientific theories on the basis of some metalanguage in which the relation between the most basic conceptual frameworks that are presupposed in each theory and the majority of which is shared by both is analysed.

- The notions of incommensurability/commensurability are more radical or basic than those of inconsistency/consistency. Commensurability is a necessary, but not sufficient, condition for establishing both consistency and inconsistency between statements. Trivial incommensurability makes the logical analysis of the relation between theories affected by it impossible. Non-trivial incommensurability enables the logical analysis between the commensurable parts of incommensurable theories (in an interesting sense). The presence of a high degree of commensurability together with the inclusion of some inconsistency, on the other hand, are necessary, but not sufficient, conditions for there to be non-trivial incommensurability.

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#### REFERENCES

- [1] Balzer, W., Moulines, C.U., Sneed, J.D., *An Architectonic for Science. The Structuralist Program*, Reidel, Dordrecht, 1987.
- [2] Cohen, M. R., Nagel, E., *An Introduction to Logic*, ed. John Corcoran, Hackett, Indianapolis, 1993.
- [3] Davidson, D., "On the Very Idea of a Conceptual Scheme", *Inquires Into Truth and Interpretation*, Clarendon Press, Oxford, 1984, 183-198.
- [4] Feyerabend, P.K., "Explanation, Reduction and Empiricism", *Scientific Explanation, Space, and Time*, eds. H. Feigl and G. Maxwell,

- Minnesota Studies in the Philosophy of Science*, III, University of Minnesota Press, Minneapolis, 28-97.
- [5] Gaifman, H., "Ontology and Conceptual Frameworks. Part I", *Erkenntnis* 9, Reidel, 1975, 329-353.
- [6] Hintikka, J., "On the Incommensurability of Theories", *Philosophy of Science*, 55, 1988, 25-38.
- [7] Kitcher, P., "Theories, Theorists, and Theoretical Change", *The Philosophical Review*, 87, 4, 1978, 519-547.
- [8] Kitcher, P., "Implications of Incommensurability", *Philosophy of Science Association*, 2, 1982, 689-703.
- [9] Kitcher, P., *The Advancement of Science. Science without Legend, Objectivity without Illusions*, Oxford University Press, New York, 1993.
- [10] Kuhn, T.S., *The Structure of Scientific Revolutions*, University of Chicago Press, Chicago, 1970.
- [11] Kuhn, T. S., "Commensurability, Comparability, Communicability", *Philosophy of Science Association*, II, 1983, 669-688.
- [12] Putnam, H., *Reason, Truth and History*, Cambridge University Press, Cambridge, 1981.
- [13] Russell, B., "Descripciones", 1919, in *La búsqueda del significado. Lecturas de Filosofía del Lenguaje*, ed. Luis ML. Valdés Villanueva, Tecnos, Madrid, 1991, 46-56.
- [14] Scheffler, I., *Science and Subjectivity*, The Bobbs-Merrill Company, Indianapolis, 1967.
- [15] Shapere, D., "Meaning and Scientific Change", *Scientific Revolutions*, ed. Ian Hacking, Oxford University Press, New York, 1981, 28-59.
- [16] Thagard, P., "Concepts and Conceptual Change", *Epistemology and Cognition*, ed. J.H. Fetzer, Kluwer Academic Publishers, Netherlands, 1991, 101-120.