Saving Incommensurability: Semantic Theory of Meaning or Semantic Theory of Science?[1]

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Résumé : L'article de Carrier a pour but principal de reconstruire la notion d'incommensurabilité sur la base de la théorie contextuelle de la signification. C'est cette reconstruction dite sémantique que je discuterai ici. La stratégie de Carrier consiste à exhiber deux cas d'incommensurabilité sur la base d'une preuve symétrique d'intraductibilité, elle-même fondée sur la distinction entre deux éléments déterminant la signification d'un concept. Je montrerai principalement que la symétrie de l'argument est fautive et que la distinction sur laquelle il est fondée ne tient pas. J'argumenterai ensuite en faveur de la revalorisation d'une notion qui joue un rôle secondaire dans l'argument de Carrier, savoir « l'ensemble des situations dans lesquelles le concept est correctement appliqué », tant pour la détermination de la signification d'un concept que pour l'évaluation de la notion d'incommensurabilité. Je tenterai d'ouvrir enfin une autre voie pour la reconstruction de l'incommensurabilité, fondée, non pas sur la théorie sémantique de la signification, mais sur la théorie sémantique des sciences.

Abstract: Carrier's paper is mainly a defence of incommensurability as "a sensible notion", on the basis of the context theory of meaning. I shall here discuss

[1]Comment on Martin Carrier, "Semantic Incommensurability and Empirical Comparability: the Case of Lorentz and Einstein". I would like to thank Robert Nola, as well as Anouk Barberousse, who have both offered comments and advice, and forced me to present my ideas in a much clearer way, even if they are certainly not the ones to blame for the theses developped here, of which I take on the responsability.

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his semantic reconstruction of the notion. His argument consists in exhibiting cases where incommensurability is instantiated thanks to a symmetrical proof of untranslatability, based on a distinction between two determinants of the meaning of a concept. I shall mainly show that a logical asymmetry in the distinction hinders the argument from achieving its goal. I shall then defend that a notion that plays a secondary role in Carrier's argument, i.e. "the set of situation to which a concept is properly applied", should be placed at centre stage for the determination of the meaning of a concept and thence for the appraisal of the notion of incommensurability. I shall finally sketch an alternative reconstruction of the notion of incommensurability, based on the semantic view of science instead of the semantic theory of meaning.

The aim of Carrier's paper appears to be mainly a defence of incommensurability as, I quote, "a sensible notion". At the end of the paper, Carrier briefly sketches an answer to the usual misunderstanding of incommensurability as implying empirical incomparability. But it is unclear whether this is logically linked to the earlier parts. What is really at stake in the paper is the existence and the coherence of the very notion of incommensurability. The core of the paper is constituted by the attempt to prove that the context theory of meaning provides a good basis for a sound reconstruction of incommensurability.

I will not discuss whether the sound and clear reconstruction of the notion of incommensurability is possible, or even needed, for Kuhn's work. Nor will I cast doubt on the thesis that incommensurability does not imply empirical incomparability and relativism of theory choice. However, I am not completely convinced by Carrier's reconstruction of incommensurability on the basis of the context theory of meaning. More precisely, his argument hinges on a distinction between two determinants of the meaning of a concept. With this distinction in hand, he tries to construct a symmetrical argument, to prove that some cases of incommensurability, understood as untranslatability, are instantiated in the history of science. I shall mainly show that there is a logical asymmetry in the distinction that hinders the argument from achieving its goal. I shall then defend that the notion of "the set of situations to which a concept is properly applied" is, and appears to be in Carrier's case studies, more central for the determination of the meaning of a concept than the two determinants he gives us.

I shall then try to give an alternative basis for a reconstruction of the notion of incommensurability. The idea is that using a context view on meaning is going the right way, but is still not enough. It is going the right way, because it takes scientific theories as wholes, in which concepts are integrated. It is not enough, because it still takes the translatability of concepts, and not the congruence of structures, as a primary basis for theory comparison. My proposal is that the semantic view of science may be a better basis. It could offer a simple way to understand incommensurability.

1. Carrier's symmetrical argument

Carrier's argument is based on the context theory of meaning, from which he deduces a context theory of translation. He gives a sketch of it in section 2. If one looks at Carrier's summary of this section (p.77), everything seems quite clear:

> On the whole, then, the theoretical context account recognizes two chief determinants of the meaning of concepts. First, the inferential integration of a concept which is specified by its relations to other concepts. The integration of scientific concepts, in particular, is furnished, among other things, by the relevant laws or theories. Second, the conditions of application which are determined by the set of situations to which a concept is thought to apply (or not to apply respectively). To these two sources of meaning correspond two constraints on adequate translations. Rendering a concept appropriately demands, first, the preservation of the relevant inferential relations, and, second, the retention of the conditions of application.

In this paragraph, Carrier precisely defines two determinants of the meaning of concepts: the inferential integration (call these (*ii*)) and the conditions of application (call these (*ca*)). To these correspond two criteria for a good translation, that is, the preservation of each determinant.

This distinction is of high importance for Carrier's argument. It serves as a basis for his comparison between concepts of Lorentzian and Einsteinian theories. Indeed, he wants to prove that there are concepts from the two theories that are not translatable from one to the other, and hence that semantic incommensurability holds between them. Case 1 deals with velocity, case 2 with mass. In both cases, Carrier's argument proceeds in two symmetric stages, each of which shows that satisfaction of one of the requirement implies dissatisfaction of the other one.

> The first one is to translate according to the relevant conditions of application. That is, the two terms are applied under the same circumstances. (...) The catch is that the corresponding predicates do not exhibit the same inferential relations. (...) The second option is to translate such that the inferential relations are retained. But, (...) the conditions of application fail to be preserved.

Let me call the criteria $P(ii)$ and $P(ca)$ respectively, the preservation of the inferential integration and the conditions of application, then the form of Carrier's argument is as follows.

First, translation based on $P(ca)$ implies a translation failure under $P(ii)$ requirement:

$$P(ca) \rightarrow \neg P(ii) \tag{1}$$

Second, translation based on $P(ii)$ implies a translation failure under $P(ca)$ requirement:

$$P(ii) \rightarrow \neg P(ca) \tag{2}$$

Hence, translation is hindered, while semantic incommensurability holds and is finally proved to be "real" or "instantiated". Thus, the distinction given above is the very basis of the argument's structure.

2. The symmetry defeated

Now, consideration of the details of section 2 will show that the situation is more confused than it appears at first. In particular, the role given to the notion of "set of situations to which a concept is thought to apply", in regard to the determination of meaning, is far from clear. Let us call (ss) this "set of situation (...)". More precisely, I shall show how the argument fails because of the relation of (ss) respectively to (ca) and (ii), that makes the neat distinction fall apart.

In the passage quoted just above, we read that the second chief determinant of the meaning of a concept is "(...) the conditions of application which are determined by the set of situations to which a concept is thought to apply (or not to apply respectively)". According to this, (ss) is linked with (ca) in the following way: (ss) determines (ca). (ss) then has logical priority over (ca), so that we can now write, as Carrier suggests:

$$(ss) \rightarrow (ca) \tag{3}$$

Now in the first paragraph of the same section, we were given that (ss) is linked with (ii); but this link is not very clear:

> (...), the meaning of a concept is <u>*determined*</u> by its relations to other concepts and the meaning of a statement results from its integration in a network of other statements. *Another way of putting this is to say that*

> *the use of a concept determines its meaning. What a concept means is represented by the way in which it is applied to different situations. The use of scientific concepts is specified by the laws of nature in which these concepts figure.* The meaning of a concept like "electric field" is given by its lawful connections to related concepts such as electric current, charge or magnetic field. The concept "electric field" is understood if it is known, for instance, that such fields are produced by electric currents or variable magnetic fields and generate changes in the motion of charges, and so forth. Laws and theories supply a concept with a network of relations to other concepts, and this network determines to which situations the concept is properly applied. Such generalizations add to the meaning of the relevant concepts *(my italics and underlining).*

The second sentence seems to hold that (*ii*) and the "use" of a concept are strictly equivalent as to the *determination* of the meaning of a concept. The third sentence obviously aims at defining the term "use", giving (*ss*) as its definition. As a consequence, one can say that (*ii*) and (*ss*) are equivalent as to the determination of the meaning of a concept.

$$(ss) \leftrightarrow (ii) \tag{4}$$

However, when Carrier turns to scientific concepts in the last italicised sentence, the relation seems to lose its simplicity: now (*ii*), that is, the laws and theories for a scientific concept, "specify" (*ss*). Thus, (*ii*) is given logical priority over (*ss*), and this can be now expressed:

$$(ii) \rightarrow (ss) \tag{5}$$

But now it follows from (3) and (5) that the inferential integration of a concept determines its conditions of application, at least in the case of the scientific concepts with which we are dealing here:

$$(ii) \rightarrow (ss) \rightarrow (ca) \tag{6}$$

Two morals can be drawn from this. First, these considerations certainly point to the ambivalent role given to (*ss*) in the determination of the meaning of a concept in Carrier's paper, although he never seems to notice it. We proved in (3) that, following Carrier, (*ss*) determines (*ca*). Moreover, independently of Carrier's consideration of scientific concepts, we had indeed obtained an equivalence of (*ii*) and (*ss*) as to the determination of the meaning of a concept. Nevertheless, in his paper he gives (*ss*) a secondary role and not the central role it may deserve. But let us deal with this point in the last section. And before that, let us see how many doubts these logical considerations raise about the validity of the argument we set out in the first section.

The argument was based on the independence of, and the symmetrical roles, of (*ii*) and (*ca*). But since an asymmetrical relation holds between these, the argument seems not to be valid anymore. In particular, the second wing is not even logically possible, for one cannot have, at the same time, sameness, or preservation of, the inferential integration and difference in the conditions of application if the latter is determined by the former:

Coming from (6): $(ii) \rightarrow (ca)$

Thus: $P(ii) \rightarrow P(ca)$

Which implies the impossibility of the reasoning:

$$P(ii) \rightarrow \neg P(ca) \tag{2}$$

that is, the second wing of the argument. Thus, the nice symmetrical structure of Carrier's argument falls apart.

A closer look at the details of these alleged symmetrical wings in the sections concerning the case studies will show that both have really the same form: whether the preservation of (*ii*) or (*ca*) holds or not, the chief determinant of meaning and translation criterion is (*ss*). In the next section, (*ss*) will be shown to play this central role. I shall then defend the idea that the semantic view on science provides a better basis for incommensurability than the context theory of meaning does.

3. Modelling incommensurability?

Reading Carrier's case studies section, one becomes aware of the fact that the chief determinant of the meaning of a concept is not the inferential integration and/or the conditions of application, as defined in the previous sections, but rather the "set of situations to which it is properly applied". Let us focus on the respective first stages of the translation attempt to see how this notion is central even in Carrier's argument[1]. The structure of the argument here appears far less clear than Carrier wants us to believe. Let Carrier be our guide:

> The first try is to focus on conditions of application and to translate according to equality of measuring procedures: quantities that are determined empirically in the same way can be translated into one another.

[1]We already dealt with the second stages (or wings) in section 2, showing that Carrier seems to contradict himself.

In this first paragraph of the translation attempt, Carrier poses the measuring process to be the conditions of application, as determining the meaning and serving as a basis for the translation of a scientific concept. The beginning of the following paragraph stays with what was announced:

> However, the inferential relations fail to be retained.

However, the justification of this statement is rather surprising, for it concludes indirectly to the difference in theoretical integration, on the essential basis of the study of "relevant types of situations":

> The disparate conceptual integration of the seemingly identical concepts of length and velocity becomes conspicuous once the *relevant types of situation*, as they emerge in the Lorentzian framework, are reconsidered in Einsteinian terms. (My italics)

A list of those situations then follows, and Carrier's argument hinges on the accurate study of them. Finally, Carrier concludes:

> Such differences in judgment *indicate* a change in the theoretical integration of the concept of length. (My italics)

In this passage, (*ca*) and (*ii*) only play a secondary role: what really serves as a criterion for a good translation is here called the "relevant types of situations", that is (*ss*). We find ourselves with three determinants of the meaning of a scientific concept: the theoretical integration (*ii*), the types of situations to which it applies (*ss*), and the processes by which it is measured (*ca*). No doubt that the last sentence quoted suggests that there holds a priority relation from the highest (theory) to the lowest level (measurement) of the determinants of meaning such as in (6): the sentence says namely that a difference in (*ss*) has served as the *sign* ("indicates") of the difference in (*ii*). This can be interpreted as follows: the non-preservation of (*ss*) implies the non-preservation in (*ii*), which is consistent with (6).

Nevertheless, it seems to me that only the second level, that is the "relevant types of situations", has been useful in the practical determination of the meaning of the Lorenztian and Einsteinian term 'velocity'. So that (*ss*) could be the main determinant of the meaning of a concept after all. In that case there would be no need of any shaky symmetrical argument to save the notion of incommensurability, especially if this argument hinges on the distinction between the inferential integration (*ii*) and the conditions of application (*ca*), finally identified, in the case studies, with the old, "orthodox" and controversial distinction between the theoretical integration and the measuring processes of a concept. The study of the *relevant types of situations to which a concept applies* would then be the key to prove that incommensurability is a sound notion.

An analogous (short) analysis can be conducted on the second case study about mass. Here again, Carrier narrows the scope of the conditions of applications to the measuring processes. Then he uses the ways in which the two theories "capture [a] *situation*" (p.10) (my italics) as sufficient determinants of the meaning of the concept they include. Finally the difference in these ways is considered as a sufficient reason to draw the conclusion that there must be a difference in its theoretical integration. In the end, Carrier's first distinction between two determinants of meaning does not play the role it was supposed to play in the case studies. On the whole, the meaning of a concept appears to be sufficiently determined by the "set of situations", or maybe better to say "the relevant types of situations" to which the concept applies.

Probably the late Kuhn's theory of kinds would appear as the natural development of my argument here. And in fact, section 5 of Carrier's paper does refer to it, and appraises his view on incommensurability in contrast with it. Here Carrier applies the same bottom-up type of argument to give a secondary role to the change of taxonomies of natural kinds between theories as when he dealt with the ways in which theories capture relevant types of situations to which the concept applies.

> Incommensurable concepts emerge if, owing to nomological change, natural kinds are restructured. If a new system of laws is adopted that conflict with a previous one, the former equivalence classes split up into heterogeneous components and realign to form new taxonomic structures. This change of the class of properties to which a concept is rightly applied goes back to a change in the nomological integration of this concept. The use of electrodynamic and relativistic concepts is governed by contrasting sets of laws. It is this nomological contrast that constitutes the ultimate reason for the translation failure. *The dissolution and the new formation of natural kinds which is placed at center stage by Kuhn is a proximate reason that follows from the divergence of the relevant inferential relations.* (My italics)

I will not go further in the discussion and appraisal of the late Kuhn's theory. So let me, as an end to this already too long comment, run the risk of giving an alternative proposal. It seems to me that Carrier's notion of "theoretical", "nomological", or "inferential integration" is not clear enough. At first (see (4)), it was equivalent with the set of situations to which a concept properly applies. At a second stage Carrier tried (see (5)) to give it a logical priority. But then the risk is, as in the first stage of the first case study, to go back to the orthodox distinction that I am sure Carrier does not want to defend. That may be the reason why he distinguishes in parenthesis (see p.85) his notion from the simple mathematical formulas in the second case study, maybe feeling the old orthodox theory lurking behind his words. More seriously, the notion is either too broad or too narrow, and I claim that the chief determinant of meaning appears to be "the relevant types of situations to which a concept is properly applied", throughout the paper. And I doubt that the bottom-up movement from these, or from Kuhn's taxonomies, sheds clearer light on the notion of incommensurability.

I now risk the proposal that the notion of "the relevant types of situations to which a concept is properly applied" is the linguistic formulation of what an advocate of the semantic theory of science would call a model. Shifting then from semantic theory of meaning to semantic theory of science, we could hope to find an alternative, sound reconstruction of the notion of incommensurability. Since two theories can be represented by the set of their models, semantic incommensurability could find a natural definition as the lack of congruence of some of these models, that is, the lack of a relation of equivalence between these models that would be incompatible as regards to internal structure. Looking back to Lorentz electrodynamics and Einsteinian special relativity, it is interesting to consider that noting, as Carrier does p.80, that

> Lorentz-contraction proper is asymmetric whereas Einstein-contraction is reciprocal

would be then sufficient to conclude to semantic incommensurability: the two theories are at least partly incompatible as regard to internal structure. Carrier's case studies could be then interpreted as providing two examples of this incompatibility, concerning velocity and mass. But this is going far too fast. However, this may deserve further investigation.

The only claims I would defend are the following. First, Carrier's argument does not have the nice symmetric form he wants to give to it. Secondly, the distinction on which the argument hinges is neither clear enough, nor sheds a brand new light on the notion of incommensurability. And thirdly, the relationships between the inferential integration and the set of situations to which a concept is properly applied could be certainly fruitfully clarified.