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TRANSLATION FAILURE BETWEEN THEORIES

1. Introduction

ADVOCATES of the incommensurability thesis, notably Kuhn and Feyerabend, hold that the languages of some scientific theories are not fully intertranslatable and that the content of such theories cannot be directly compared.[1] One influential response to the incommensurability thesis has been to say that referential overlap suffices for content comparison, so that incomparability does not follow from untranslatability. Advocates of this referential response see comparison as the major issue raised by the incommensurability thesis and tend not to consider the issue of translation in any detail.

The referential response stems from Scheffler, who argued that even if terms occurring in different theories differ in sense they may have the same reference, so that statements from such theories may be compared for agreement and disagreement.[2] Putnam supported the approach, using a causal theory of reference to argue that reference can survive significant conceptual change in the transition between theories.[3] While this suggests that there is sufficient continuity of reference for comparison, the causal theory of reference faces difficulties which force it to grant a partial reference-determining role to descriptions and to allow reference-fixing apart from original term-introductions.

In this paper we will consider the issue of translation failure between theories from the perspective of a causal theory of reference modified to take these difficulties into account. In particular, it will be argued here that translation failure between theories is in fact a consequence of such a modified causal theory of reference. Thus the paper attempts to show what is right about the incommensurability thesis from the perspective of such an approach.

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Received 10 *April* 1990; *in revised form* 16 *July* 1990.

[1]See, for example, P. K. Feyerabend, 'Explanation, Reduction and Empiricism', in his *Realism, Rationalism and Scientific Method: Philosophical Papers Vol. 1* (Cambridge: Cambridge University Press, 1981), and T. S. Kuhn, *The Structure of Scientific Revolutions*, 2nd edition (Chicago: University of Chicago Press, 1970).

[2]I. Scheffler, *Science and Subjectivity* (Indianapolis: Bobbs–Merrill, 1967), pp. 55–61.

[3]H. Putnam, 'Explanation and Reference', in his *Mind, Language and Reality: Philosophical Papers, Vol. 2* (Cambridge: Cambridge University Press, 1975).

Stud. Hist. Phil. Sci., Vol. 22, No. 2, pp. 223–236, 1991.
Printed in Great Britain.

0039–3681/91 $3.00 + 0.00

Since relations of co-reference may nonetheless obtain in the absence of translation, incomparability of content does not follow from such failure of translation.

2. Translation and Reference Determination

The theory of reference provides an account of reference determination, hence it sheds light on translation. For the way an expression's reference is determined is a semantic property which must be preserved in translation. Since what semantically distinguishes between expressions which are non-synonymous but co-referential is the difference in the way their common referent is picked out, expressions which are translations of one another must have their reference determined in the same way.

This view of the relation between reference determination and translation is a natural one to take on the traditional description theory of meaning and reference. According to the description theory, meaning is comprised of sense and reference, and reference is determined by sense. On such an account, a term means the same as another just in case it has the same sense and reference. Hence, for a term to be a translation of another entails sameness of sense and reference. And since sameness of sense implies sameness of reference determination, sameness of reference determination is therefore a requirement of translation.

Though opposed to the description theory's account of reference determination, the causal theory of reference does not remove this requirement of translation. The objections to the description theory which motivate the causal theory are independent of the relationship between reference determination and translation. Briefly, it is argued against the description theory that satisfaction of the description which expresses the sense of a term is neither necessary nor sufficient for reference. A term may succeed in referring even if its associated descriptive content is in fact a misdescription of its referent. And it may fail to refer to items which do in fact satisfy the associated description. Since reference is therefore at least partially independent of description, this suggests that reference may be secured by means of the pragmatic relations of a causal nature into which speakers enter with their environment. The claim that non-conceptual factors are involved in reference does not bring into question the connection between reference determination and translation, but is specifically directed against the description theory of reference determination.

The causal theory of reference is confronted by problems which necessitate revision of its account of reference determination. According to the causal theory, the reference of a term for an observable natural kind may be established at an original baptism in which a sample of the kind to be named is identified ostensively. On such an account, the extension of a kind term consists of the set of objects (or stuff) which belong to the same kind as the original sample.[4] A purely causal analysis of ostension is problematic, however, since the causal relation of perception does not, by itself, determine which kind a particular sample is a sample of. The object with which an observer interacts causally is a member of numerous categories (e.g. sub-species, species, genus) between which the causal relation does not discriminate. Hence, to render reference determinate, ostensive introduction of a term must involve a specification of the category exemplified by the sample.[5]

The need for descriptions is even greater in the case of reference to unobservable entities for which ostension is unavailable. According to Putnam and Kripke, reference to theoretical entities may be secured by specifying the observable effects for which they are causally responsible.[6] They suggest that the reference of a theoretical term may be fixed without detailed description of its referent by means of the causal relation between observed effect and the unobserved entity responsible for the effect. However, this suggestion overlooks the need for more precise information concerning the nature of an unobservable referent. Theoretical terms do not, as a rule, refer simply to whatever happens to be the cause of a given effect. Rather, they are usually introduced specifically to refer to entities which are purported to bring about the effect in a particular way. This is apparent from the fact that theoretical terms are frequently deemed not to refer. For if such terms did refer in an unrestricted way to whatever causes a particular phenomenon, then—short of the phenomenon being bogus or uncaused—such failure of reference would be impossible. Thus, in addition to the effects produced by an unobservable

[4]Reference can also be fixed by means of a description which contingently identifies the referent. For example, the reference of 'water' may be fixed by the description 'the stuff that flows in rivers here on Earth', though 'water' is not defined as whatever flows in rivers. Such descriptions have a function similar to ostension since they serve merely to pick out the referent. For the distinction between fixing a term's reference and defining it, see S. Kripke, *Naming and Necessity* (Oxford: Blackwell, 1980), pp. 53–56.

[5]The problem of the causal indeterminacy of ostensive reference has become known as the 'qua' problem, since it concerns picking out a particular sample *qua* member of a given kind. See F. W. Kroon, 'Theoretical Terms and the Causal View of Reference', *Australasian Journal of Philosophy* **63** (1985), 146–147, and K. Sterelny, 'Natural Kind Terms', *Pacific Philosophical Quarterly* **64** (1983), 120–121. While the problem described in the text applies to kind terms, a similar problem arises for singular reference: namely, mere ostension does not settle which of the objects jointly instantiated by an entity is the referent.

[6]Putnam, 'Explanation and Reference', p. 200, and Kripke, *Naming and Necessity*, pp. 129–131.

entity, it is necessary in order to fix it as referent to specify the causal mechanism whereby the entity produces the effects.[7]

To meet these problems, the causal theory must incorporate a role for descriptions into its account of reference determination. The indeterminacy of ostension may be resolved by descriptions employed at term-introductions to supplement ostension. Such descriptions contain categorial expressions (sortals, mass terms) whose role it is to specify the kind exemplified by the ostended sample. With theoretical terms, on the other hand, the role played by descriptions in identifying the referent is not just supplementary. The reference of such terms is determined by a description of the causal role by means of which the entity to which reference is purportedly made produces certain phenomena.

Given the relation between reference determination and translation, such descriptive components of reference determination must be preserved in translation. In the case of observational kind terms it is not sufficient to translate by means of a term whose reference is fixed by ostension of samples of the same kind. Since ostension requires descriptive backing, the reference of such terms is determined by the condition of being the same kind as the ostended sample, where the relevant kind is specified by a category term. Translation of such terms must preserve not only extension, but the categorial specification of the exemplified kind as well.[8] As for theoretical terms, reference is determined by a description specifying the putative causal mechanism whereby the entities referred to produce certain effects. In translating such terms, it is necessary that the causal role described be preserved.

Because of the role descriptions play in determining reference, conceptual content enters into the way reference is determined. This means that the conditions which determine reference depend on an epistemic and theoretical background, so that different means of determining reference are indicative of difference in theoretical or epistemic content. To describe an object by means of a term which has its reference determined in a particular manner may therefore be to say something which differs in meaning from what is said by using a term whose reference is determined in another way. Thus, for the purposes of translation, in which the aim is to employ semantically equivalent expressions, it is necessary to use expressions whose reference is determined in

[7]For discussion, see B. Enc, 'Reference of Theoretical Terms', *Nous* **10** (1976), 261–282, and R. Nola 'Fixing the Reference of Theoretical Terms', *Philosophy of Science* **47** (1980) 503–531. Enc and Nola are divided on what is needed to fix reference. Nola holds causal mechanism to be what is needed, while Enc holds that in addition kind-constitutive properties must be specified as well.

[8]Similar remarks apply for observational natural kind terms whose reference is fixed by a description which contingently identifies the referent. What determines extension is the condition of being the same kind (as specified by a categorial term) as the kind which is identified by virtue of certain contingent properties which it possesses.

the same way. Thus one way of showing that an expression is untranslatable into a given theoretical or conceptual framework is to show that reference cannot be determined in the required manner within that framework.

3. Untranslatability Between Theories

Apart from the need to embrace a role for descriptions in the determination of reference, the causal theory of reference in its original form faces an added difficulty. In their development of the theory, Kripke and Putnam place undue emphasis on original term-introductions. Their emphasis on baptisms at which a term's reference is first established disallows any effect of subsequent use on reference, hence it precludes change of reference.[9] To accommodate reference change within the framework of the causal theory, applications subsequent to initial term-introductions must be granted the ability to affect reference. Allowing subsequent applications of a term a reference-fixing role makes the variant conditions of later uses of a term relevant to reference.

In this connection, Kitcher has argued that different tokens of the same scientific term type may have their reference fixed in different ways.

> When we look at the language in use among scientists at a particular time, we may find that for some important expression types there is a variety of ways in which the reference of tokens of those types can be fixed, and that the varied employment of tokens of these types presupposes connections that later scientists will reject. So, from the perspective of the scientific language in use at later times, the former usage of the key terms will be mistaken, and there will be no term in the later language which is used in the same variety of ways as the old expressions.[10]

The basic point is that a term's reference may be fixed in a number of ways because it may be applied in different contexts. Members of the same kind may be present in a variety of situations and they may be described in different ways. So there may be alternative ways in which the reference of tokens of a term for a given kind may be fixed.

The point emerges clearly with terms whose use includes both an ostensive and a descriptive component. Within the context of a theory a term may be applied directly to observed samples as well as being defined by a description of the kind to which the samples belong. Such diversity of use appears unified because it is assumed that the kind to which the ostended samples belong is identical with the kind specified by the description. But the assumption of

[9]As argued by A. Fine, 'How to Compare Theories: Reference and Change', *Nous* **9** (1975), 17–32.

[10]P. Kitcher, 'Implications of Incommensurability', in *PSA 1982, Vol 2* (East Lansing, Michigan: Philosophy of Science Association, 1983), p. 694.

unity may be false, in which case the term's extension will contain members of distinct kinds.[11]

Kitcher's point complicates the issue, but need not lead to a fragmentary picture of translation. It is not as if terms whose reference is multiply determined may be analysed into their tokens and translated severally. To translate token for token would result in loss of semantic content, since it would remove the presupposition that uniform reference underlies the diversity of determinants of reference. The reason for using a single term even though its reference is determined in different ways is that the set variously so picked out is presumed to constitute a single natural kind. To remove the implication that the set constitutes a single kind by breaking down the connection between tokens alters the information conveyed by use of the term and is therefore a failure of translation. I will develop this point in more detail later (Section 6).

Before turning explicitly to translation failure between theories, it is necessary to introduce an assumption about the languages between which translation fails. In what follows, the language of a theory will be taken to be the special vocabulary employed in the context of a theory, not the natural language in which it is couched. Such theoretical vocabulary constitutes a sub-language or local idiom embedded within an encompassing natural language. Translation failure between theories results from the inability of one theoretical sub-language, taken in isolation from the background natural language, to translate expressions of another theoretical sub-language. Such translation failure is therefore localized translation failure between parts of a natural language.[12]

We are now in a position to formulate a criterion of untranslatability between theories. To accommodate Kitcher's point, it must be taken into account that scientific expression types can be associated with more than one way of determining reference.

> *Criterion of untranslatability*: A term type is unable to be translated into the language of a theory if the reference of no expression of the theory is able to be determined in the same set of ways as the term type.

This allows the reference of a term type to be determined in a number of different ways. Since the criterion applies to term types, it does not permit terms whose reference is multiply determined to be translated token by token.

[11]Cf. *ibid.*, pp. 695–696.

[12]This assumption enables one to meet Davidson's objection that the idea of an untranslatable language is incoherent (see D. Davidson, 'On the Very Idea of a Conceptual Scheme', in his *Inquiries into Truth and Interpretation*, Oxford: Oxford University Press, 1984). For details, see my paper 'In Defence of Untranslatability', *Australasian Journal of Philosophy* **68** (1990), 1–21.

The criterion raises the question of the source of limits on reference determination in the language of a theory. Such limits are due to the ontological and causal-explanatory commitments of a given theory. For in order to introduce a term into the language of a theory, the way its reference is determined must be compatible with the theory. In particular, the descriptions which play a reference-determining role must be such that asserting the existence of entities which satisfy the descriptions does not run counter to the theory. Limits on reference determination arise from inability to introduce terms into the language of a theory which refer to entities whose causal roles fail to conform with the causal mechanisms of the theory, or which belong to kinds not countenanced within the ontology of the theory. Given its commitment to particular causal mechanisms and kinds, a theory may be unable to assert the existence of entities satisfying the descriptions needed to determine reference. Terms whose reference determination involves descriptive content incompatible with a theory are therefore unable to be introduced into the language of the theory.

Further limits on the determinants of reference arise from the rejection by a theory of conjoint use of two or more ways of determining reference. In the context of a theory, the reference of a term type may be determined in a number of ways which are taken to be merely alternative means of securing reference to the same kind or object. However, the identification of the entities picked out by such disparate means of determining reference may be rejected by a rival theory which denies that uniform reference to a single kind or object is so determined.[13] In such a case the latter theory would be unable to introduce a term with reference determined in the same variety of ways as the term of the other theory.

In light of the criterion of untranslatability, there are accordingly two basic ways in which translation from one theory into another may fail. Either a particular means of determining reference employed in one theory is precluded by another, or the conjoint use of a particular set of reference determinants within a theory is unacceptable in the context of another theory.

4. Phlogistic versus Oxygen Chemistry

Having sketched in general terms the conditions under which translation between theories may fail, I will now discuss a pair of theories with conflicting ontological and causal-explanatory commitments. In the late eighteenth century, the phlogiston and oxygen theories came into contention regarding

[13]Cf. Kitcher, *op. cit.* note 10, p. 694.

the nature of combustion and calcination.[14] Controversy centered on the existence of phlogiston, which was thought to have the main causal role in combustion and the production of calxes. Proponents of the oxygen theory sought to explain those same chemical processes by means of an opposed causal mechanism, based on an ontology which dispensed with phlogiston.

In the background of this debate was the rise of pneumatic chemistry, which ultimately undermined the phlogiston theory. During the third quarter of the eighteenth century, the number of gases known to chemists increased greatly. But pneumatic chemists did not think of them as such, for the concept of a gas as a distinct chemical substance in a particular physical state emerged later. 'Common' or atmospheric air was not at that time thought to be made up of different chemical elements in a gaseous state. Air was considered to be a distinct substance, an element in its own natural state, rather than a mixture of other elements. Since they conceived of air as elemental, phlogistic chemists took the new gases to be 'airs' rather than gases. They regarded them as different varieties of air, each air a modification of the air, with distinctive properties due to the presence of phlogiston and various impurities.

Phlogistic chemists held that combustion is the release of phlogiston. When a flammable substance such as wood burns it emits phlogiston into the atmosphere. Phlogiston is a chemical principle. A principle is a basic constituent of a body, whose presence in a body gives it certain properties, e.g. combustibility or fluidity. The presence of phlogiston gives a substance the property of inflammability, and its emission causes the loss of that property. Air has a limited capacity to absorb phlogiston, so combustion in an enclosed space stops when phlogiston saturates the air.

Calcination is analogous to combustion. When heat is applied to a metal it decomposes into its calx and releases its contained phlogiston. Thus a metal is more complex than its calx, since it contains phlogiston and calxes do not. Since loss of phlogiston causes a metal to lose its characteristic metallic properties, it is the presence of phlogiston that gives metals such properties. Calxes re-convert to metal when heated together with a source of phlogiston, such as charcoal. The phlogiston combines with the calx to produce the metal.

The contrasting picture yielded by the oxygen theory wholly inverts these processes. Instead of being in the burned or calcined substance beforehand, oxygen is in the air. So combustion and calcination are processes of combination rather than decomposition. Moreover, the oxygen theory rejects the idea that the various 'airs' are modifications of elemental air. They are instead conceived as distinct chemical elements and compounds which combine in a gaseous state to form atmospheric air.

[14]This case has been the subject of a debate between Kitcher and Kuhn. See Kitcher, *op. cit.* note 10, and Kuhn, 'Commensurability, Comparability, Communicability', in *PSA 1982, Vol. 2.*

In combustion, oxygen from the atmosphere is taken on by the burning substance, with which it combines. When heated, a metal oxidizes by combining with oxygen. And an oxide re-converts to the metallic state by releasing the oxygen it has taken on in oxidation. Thus metals are elemental while their oxides are compound.

The oxygen and phlogiston theories, therefore, give opposing accounts of the processes of combustion and calcination. On the latter, a substance breaks down, emitting a contained principle into the atmosphere. On the former, a gas is removed from the atmosphere and combines with the substance.

But even though the structures of these processes are in opposition, the causal function of phlogiston is not entirely absent from the oxygen system. For the theory of oxidation was combined with a theory of the gaseous state. Lavoisier held that chemical substances become gaseous by combining with the 'matter of heat', which he called 'caloric'. Thus oxygen gas consists of oxygen combined with caloric. When oxygen is consumed by a burning substance or in calcination, the caloric disengages from the oxygen and escapes into the atmosphere while the oxygen combines with the substance. So according to the oxygen theory something does escape into the atmosphere in combustion and calcination. But the analogy between phlogiston and caloric extends no further. The released caloric is not contained beforehand in the oxidized substance, and phlogiston does not combine with chemical substances to put them into a gaseous state.

At the level of ontology, oxygen and phlogiston theory are incompatible. They are committed to different entities: phlogiston and various airs versus oxygen and other gases. They conceive common entities differently: elemental air and its varieties versus air as a combination of elemental gases; compound metals and simple calxes versus elemental metals and compound oxides. And they conceive the processes of combustion and calcination in opposite terms: decomposition versus combination; emission of phlogiston versus consumption of oxygen.

5. Untranslatability of Phlogistic Terms

Can 'phlogiston' be translated into the language of the oxygen theory? If we ignore the complication of caloric for the moment, it is tempting to answer as follows. The reference of 'phlogiston' is fixed in the phlogiston theory by a description of a causal role, namely, phlogiston is the stuff emitted by calcined metal or burning matter. On the oxygen theory, something is taken on, nothing is emitted. So nothing fulfils that causal role, and no process satisfies that description. The necessary reference-fixing description cannot be employed by

the oxygen theory to secure reference, and as a result 'phlogiston' cannot be translated into it.

The problem with this argument is that something is given off in oxidation according to the oxygen theory, namely, caloric. So it is not counter to the oxygen theory to describe something let off in combustion. 'Phlogiston' cannot on that account be considered untranslatable.

There is, however, more to phlogiston than emission in the process of combustion. The emission of phlogiston is the very process of combustion, and its prior presence in the burned substance is necessary for combustion to occur. But on the oxygen theory there is no such causal role to be filled. For combustion is a process of consumption rather than elimination. It is the combination with something taken on from the air, not the release of something previously contained in the body. And what is required for combustion is the presence of oxygen in the atmosphere, not the presence in the body of something waiting to be released.

'Phlogiston' cannot be translated into the oxygen theory. It is not that nothing is given off in combustion. The point, rather, is that nothing contained in a substance beforehand disengages and escapes from the substance as the very process of combustion itself. It is precisely a causal role description of the latter sort which cannot be employed within the oxygen theory as a description which determines reference to the entity responsible for combustion. For even if something is let off in combustion according to the oxygen theory, combustion is not itself the process of emission, but the process of combination with something taken on.

It might appear that a phlogistic term with direct empirical application is more readily translated. In this connection Kitcher has discussed Priestley's discovery of oxygen.[15] Priestley called oxygen 'dephlogisticated air'. Lavoisier, who learned from him how to produce it, later introduced the term 'oxygen' for it.

Priestley heated red calx of mercury with a burning lens, obtaining mercury and a new air with striking properties. Most notably, the air was good to breathe and supported combustion better than common air. Since calx contains no phlogiston and metal does, the mercury calx must have taken on phlogiston in converting to mercury. Because the new air was obtained during a reaction in which phlogiston was consumed, Priestley reasoned that it must be air from which phlogiston had been removed. That would explain why the air supported combustion so readily, since air unsaturated by phlogiston would have room to take on emitted phlogiston. Because he supposed phlogiston had been removed from it, Priestley named the new air 'dephlogisticated air'.

[15]See P. Kitcher, 'Theories, Theorists, and Theoretical Change', *The Philosophical Review* **87** (1978), 519–547, (especially pp. 529–535).

Lavoisier interpreted the reaction differently. For him the new air was oxygen gas. It was released from the mercury oxide when the oxide was heated. And it supported combustion so well because it was itself the gas whose presence is needed for combustion to take place.

In some sense perhaps 'oxygen' and 'dephlogisticated air' are equivalent. For once Priestley's use of the expression was established, it became common use among phlogistic chemists to refer to the new air as 'dephlogisticated air'. Oxygen chemists could simply take 'dephlogisticated air' as the phlogistic name for oxygen. But the fact that two expressions co-refer is not sufficient for translation, for their reference must be determined in the same way. I will now argue that 'dephlogisticated air' cannot be translated into the oxygen theory, from which it follows *a fortiori* that it cannot be translated as 'oxygen'.

The reference of 'dephlogisticated air' can be fixed in two ways.[16] The first is by theoretical description. According to the phlogiston theory, dephlogisticated air is air from which phlogiston has been removed, which soaks up phlogiston emitted in combustion. But from the standpoint of the oxygen theory there is no such thing as phlogiston which could be removed from the air. So 'dephlogisticated air' cannot even be defined in terms of the oxygen theory, which is to say that such a reference-fixing description cannot be formulated within it.

Secondly, the referent of the expression can be fixed by ostension. In the course of his experiments with mercury calx, Priestley obtained samples of the new air which he collected in vessels such as test tubes. Thus it was possible for him to refer deictically to samples of the air in the presence of vessels containing it. He had the ability, therefore, to apply tokens of the expression 'dephlogisticated air' directly to samples of the substance in an ostensive manner.

Since Lavoisier had an analogous ability, 'oxygen' and 'dephlogisticated air' were both ostensively linked to the same substance. But even though both expressions are linked to oxygen, the ostensions are not equivalent. The categorial specification required to narrow down which sort of substance is ostended must vary between the ostensions. For Priestley, the ostended substance was an air, a modification of elemental air. Whereas, for Lavoisier, the oxygen was a gas, a chemical element in a state of expansion, not a modification of elemental air. Not only are the ostensions non-equivalent, but owing to the use of the category term 'air' Priestley's has content which is incompatible with the oxygen theory.

Even if it were allowed that the ostensions were the same, the term would still not be translatable into the oxygen theory. Our criterion requires that all of the ways in which the reference of a term type is determined must be preserved if it is to be translated. The reference of 'dephlogisticated air' is

[16] *Ibid.*, p. 537.

determined by theoretical description and by ostension. According to the oxygen theory, the substance ostended by Priestley is not the substance left over when phlogiston is removed from the air. That is, the oxygen theory denies the connection purported to obtain by the phlogiston theory between the ostended substance and the theoretically described stuff. So, even if the ostensions were the same, no expression having its reference jointly determined by both these means could be introduced into the language of the oxygen theory.

6. Against Contextual Translation

The overlapping application of 'oxygen' and 'dephlogisticated air' raises the possibility of contextual translation. Perhaps occurrences in which 'dephlogisticated air' is directly applied to oxygen may be equated with 'oxygen'.

At one stage Kitcher held that 'dephlogisticated air' was translatable on a token-by-token basis. He proposed that the term could be translated in a context-sensitive manner by specifying the referents of its various tokens.[17] Thus tokens whose reference is fixed by ostension translate one way, tokens with reference fixed by theoretical description translate in another.

But the idea that such expressions may fragment in translation must be rejected. Translation replaces expressions with semantic equivalents in another language. But to translate 'dephlogisticated air' as 'oxygen' at one point and as 'the air from which phlogiston has been removed' at another is not to replace it with an equivalent.[18] Rather, it is to replace it with two distinct expressions which are not themselves semantically equivalent. And since they are themselves non-equivalents, both expressions cannot be equivalent to the original expression they replace. Thus, such contextual translation is not translation.

This is not to rule out the idea of a context-sensitive translation in principle. Genuine ambiguity demands such sensitivity. Different tokens of an ambiguous term type are semantically distinct.[19] They can be translated in a context-sensitive manner by semantically distinct terms.

But if Kitcher's point is that 'dephlogisticated air' is ambiguous, then its semantic content must divide into distinct components. For compare it with a

[17] *Ibid.*, p. 535. In his discussion of such contextual translation, Kitcher never clearly states whether mere co-reference is all that is required to specify the reference of a term token using some other. But he takes 'oxygen' as the translation of some tokens of 'dephlogisticated air' which suggests that it is. Yet if co-reference is all that is required, then his contextual translations are based on the fallacy that co-reference suffices for translation.

[18] Of course, if a 'blank' as Kuhn calls it ('Commensurability, Comparability, Communicability', p. 674) appears in the place of the token of 'dephlogisticated air' to be translated, then contextual translation is no translation at all.

[19] Strictly speaking, an ambiguous term type is not a semantical term type but an inscription type. The ambiguity is because a single inscription type symbolizes distinct semantic types.

term like 'bank'. Translated into French, it splits in two, coming out as 'rive' and 'banque'. Different tokens of English 'bank' translate differently into French. But such tokens of 'bank' have distinct contents in English, which are not semantically linked in any way. On some occasions, 'bank' means 'financial institution'; on others, 'side of a river'. The only thing the two uses have in common is the inscription 'bank'.

Nothing of the sort holds with 'dephlogisticated air'. Priestley applies the term to the newly discovered air because he thinks he has isolated dephlogisticated air. So far as he can tell, the air is a sample of a substance which it is possible to describe on the basis of the phlogiston theory. That is, he believes that the stuff let off by the mercury calx is the very stuff that is described in the phlogiston theory as air from which the phlogiston has been removed.

The fact that the reference of tokens of the term varies does not affect the issue. Priestley was under the impression that the reference of his tokens of the term was uniform. He did not knowingly use it to refer differently. Nor does difference in the way reference is determined imply ambiguity. We noted in our earlier discussion of Kitcher that tokens of the same term type which are applied in different situations may well have their reference fixed in different ways.

What determines that the term is unambiguous is that all of its occurrences were meant to apply to a single kind of substance, namely air with phlogiston removed. In each of its separate uses it was thought to refer to the substance in general or to particular samples of the substance. Its diverse applications are unified by intended denotation of a single substance, since throughout those applications the concept of dephlogisticated air as defined in the phlogiston theory remains constant.

Contextual translation loses sight of such semantic connections between tokens. It treats tokens as semantically independent and obscures their intended uniformity. In so doing it alters the content of the tokens because it obliterates their semantic relation to the conceptual system that defines them. The whole point of using terms like 'dephlogisticated air' on different occasions is that the term type is presumed to refer to a single kind throughout the various applications of its tokens. What is picked out in different ways and situations is meant to belong to a kind which is quantified over within the ontology of the theory which defines the term.

Thus contextual translation loses content necessary to translation. The way to preserve it is to translate such terms as types and to insure that their translation refers to the relevant theoretically described kind. To refer to the same kind it is not sufficient that an expression merely have the same extension, for the same set can belong to more than one kind. Rather, their common extension must be specified with the aid of equivalent categorial expressions which indicate what sort of kind the set belongs to. Thus the

constraint that the kind a term represents must be preserved in translation accords well with our criterion of untranslatability. The criterion guarantees that no term will be translated by an expression which fails to represent the same kind.[20]

Acknowledgements—I am indebted to Henry Krips, Homer Legrand, Oscar Manhal and Jack Smart for comments.

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[20]The criticism of contextual translation given here appears to accord with Kuhn's objections to Kitcher's 'context-dependent strategy' (see Kuhn, 'Commensurability, Comparability, Communicability', pp. 674–676). However, Kuhn's positive proposal (pp. 681–683) about what translation must preserve suggests that reference need not be determined in the same way to translate a kind-term. In brief: the problem with this is that either reference is determined in an equivalent manner and semantic content is preserved or it is determined in a non-equivalent manner and semantic content is not preserved.