Correspondence Truth and Indeterminacy of Reference: Field on 'partial denotation'

[draft paper]

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Abstract: the present paper is concerned with the import of indeterminacy thesis on a correspondence conception of truth. [I] First of all, two kinds of correspondence conceptions are distinguished: the first one appeals to a relation between sentences (or propositions) and facts to explain truth; the second, which appeals to a relation between terms (or concepts) and objects (or sets of objects), is called here 'referential semantics'. [II] Indeterminacy thesis is briefly illustrated, both in relation to scientific discourse and in relation to natural language (Quine); then is formulated the further thesis of ontological relativity and it is pointed out the threat it represents for referential semantics. Field's idea is that if we take seriously semantic indeterminacy, the ontological relativity thesis becomes incoherent; nonetheless it's still possible to argue for a correspondence theory of truth, by revising the basic semantic notions. [III] An argument is given for the inconsistency of ontological relativity thesis, trough a critique of the two claims on which such a thesis is grounded: (i) relativity of reference to a translation manual; (ii) relativity of reference to a background language. [IV] It's exposed Field's refusal of the 'arbitrary choice approach' to semantics; then it is sketched his revision of referential semantics, based on the new (more general) concepts of 'partial denotation' and 'partial signification'. The outcome is a correspondence truth definition capable of evaluating sentences containing referentially indeterminate terms. [V] The phenomenon of 'correlative indeterminacy' is illustrated and the previous truth definition is refined in order to handle more complex kinds of indeterminacy.

I

The so called 'correspondence theories of truth' can be divided in two kinds at least; the first kind - perhaps the most widespread in the philosophical literature - is roughly the view that truth consists in a relation (to be specified) between ***sentences*** - or propositions - on one side and ***facts*** on the other. Although this conception has undergone (very) different formulations, all its theorists agree that facts are what make sentences true, and that for this to be possible sentences and facts must share some sort of 'internal' or 'logical' structure. In the twentieth century this view has been advanced, among others, by Russell, Wittgenstein (in the *Tractatus*), and Schlick. If it has a certain grade of intuitiveness, it has yet a lot of problems: what kind of object are facts? How can we clarify the notion of 'logical structure'? In what does consist the relation of 'representation' between sentences and facts?[1] These

[1] It cannot consist in the relation of 'denotation', as we know from the so-called Frege-Church argument; such an argument shows that if we assume that facts are the ***denotations*** of sentences, there are only *two* facts, namely

problems are not shared by the second kind of correspondence conception, according to which the only relation you can establish between language and world is at the level of *terms* - or concepts -, not of whole sentences; in this view, to say that a sentence is true does it mean that it is built up from terms that denote *objects* (or set of objects) and that among those objects the same relations hold than among the terms of the sentence. This second conception of correspondence (very different from the first one, in that it doesn't mention facts) has received a formal shape in Tarski's theory of truth[2], in which the truth-predicate (for a fixed language L) is defined in terms of more basic semantic notions such as denotation, application, fulfillment[3]. Also in Frege's view[4] the central notion of semantics is that of denotation [*Bedeutung*], the relation that holds between terms of our language (names, predicates, functional symbols) and objects (where these objects may include functions from objects to truth-values); it's in term of this relation that truth and falsity are explained. I don't want to relate too strongly Tarski's and Frege's views (wich were very different *philosophical* views[5]); what I maintain here is that, notwithstanding their differences, both these authors have stressed the fact that the truth value of a whole sentence depends on the denotations of

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one corresponding to all the true sentences, and the other corresponding to all the false ones; but this amounts to say that all the true sentences denote the same thing (call it 'the true'), and that all the false ones denote the same thing (call it 'the false'): all you can say about these things is that they are different. In effect, this was the reason that induced Frege to say that truth-values are the denotations of sentences and to reject facts as useless entities from an explicative standpoint.

[2] Alfred Tarski, *Der Wahrheitsbegriff in den formalisierten Sprachen*, "Studia Philosophica" (1936) 1, pp. 261-405; trans. Eng. *The concept of truth in formalized languages*, in A. Tarski, "Logic, semantics, metamathematics: Papers from 1923 to 1938", Oxford U.P., Oxford 1958, pp. 152-278. For an informal and more philosophical presentation of Tarski's theory, see: Alfred Tarski, *The semantic conception of truth*, "Philosophy and phenomenological research" (1943) 4, pp. 341-375.

[3] Let's put aside, in this context, the debated question of whether Tarski's theory has to be viewed as a formal characterization of the correspondence conception of truth or if such a theory is neutral towards all issues about the nature of truth. For the first of these positions, we can cite Tarski himself (1943), and also Hartry Field, *Tarski's Theory of Truth*, "Journal of philosophy" (1972) 69, 347-375; this last reprinted in the recent book: Hartry Field, *Truth and the Absence of Fact*, Clarendon Press, Oxford, 2001, Chap. I. This author has stressed in that paper that the theory of truth elaborated by Tarski constitutes only a *part* of a real correspondence theory, for missing is a physicalistic explication of the primitive semantic notions, such as denotation. For the neutrality of Tarski's theory, see: Scott Soames, *What is a Theory of Truth?*, "Journal of Philosophy" (1984) 81, 411-429; in this paper Soames shows the advantages of Tarski's theory as a deflationary theory, distinguishing between correct definitions of (the extension of) the truth-predicate and theories about the nature of truth.
As far as our present issue is concerned, I think that at the bottom of Tarski's theory there was the idea of explaining (in the sense of reducing) truth to more basic *correspondence* relations holding between names, predicates, etc., on one side and objects (or set of objects) on the other side; and so in my opinion Tarski's theory *is* committed with *some* form of correspondence.

[4] Gottlob Frege, *Uber Sinn und Bedeutung*, "Zeitschrift fur Philosophie und Philosophische Kritik" (1892) 100, 25-50; trans. Eng. 'On Sense and Reference', in *Translations from the Philosophical Writings of G. Frege*, ed. and trans. M. Black and P. Geach, Oxford, Blackwell, 1960.

[5] For example, Tarski, as a reductionist, was interested in showing how to *eliminate* semantic notions such as truth and reference in favor of purely mathematical and logical notions; Frege, which was in no way a reductionist, allowed for the *existence* of ideal semantical entities such as senses, truth-values, and so on, just to explain how our language works.

its names and on the extensions of its predicates; in particular, its truth value depends on the names and predicates having *determinate* denotations and extensions. This idea, which constitutes the core of our second kind of correspondence conception of truth, has been called, in the literature on the topic, 'referential semantics'[6]. It's with this kind of correspondence conception that I'll be concerned in the rest of the paper. What will be at issue in the present work is the relation between referential semantics and the phenomenon of 'semantic indeterminacy'; in particular, the problem is: *does the phenomenon of semantic indeterminacy by itself preclude the possibility of a correspondence theory of truth?* The negative answer that I'm going to expose, is based on some writings due to Hartry Field[7].

II

The so-called 'indeterminacy thesis' is - roughly speaking - the thesis that the semantics of our language (both in the intensional and in the extensional dimension) is radically indeterminate; that is to say that there is no fact of the matter, no inter-subjective criterion as to what a certain word has a determinate meaning or a determinate reference. This general thesis has been established in different areas of the philosophical research; in philosophy of science, for example, authors like Thomas Kuhn[8] or Paul Feyerabend[9] have argued that many theoretical terms employed in past and present scientific theories (for example 'phlogiston', or 'mass') are radically indeterminate, so that it makes no sense to talk about the truth and falsity of the sentences of such theories, absolutely speaking. In fact, according to referential semantics, it makes sense to talk of the truth and falsity of a sentence only if you can settle the semantic features of the words that compound the sentence. The outcome of this is that the best you can do is to talk of 'truth-relative-to-the-theory-T', without being able to compare *objectively* (with reference to the world) terms from one theory with terms from another. If the authors just mentioned have been mainly concerned with

[6] For example by Hartry Field, *Theory Change and Indeterminacy of Reference*, "Journal of Philosophy" (1973) 70, 462-481.
[7] In particular, the works by Field on the matter to which I will refer are: *Theory Change and Indeterminacy of Reference* (op. cit.); *Quine and Correspondence Theory*, "Philosophical Review" (1974) 83, 200-228; *Some Thoughts on Radical Indeterminacy,* "The Monist" (1998) 81 n.2, 253-273. All these papers have been reprinted with added postscripts in the volume: Hartry Field, *Truth and the Absence of Fact* (op. cit.), respectively as Chapters 6, 7, and 9. From now on, all page references to Field works will be based on this book.
[8] Thomas Kuhn, *The Structure of Scientific Revolutions,* University of Chicago Press, Chicago, 1962.
[9] Paul Feyerabend, *Against Method,* New Left Books, London, 1975.

scientific discourse, it's only with Quine's work[10] that the indeterminacy thesis has been established in all generality, investing the very natural language in its everyday use. Quine has argued that even when we are dealing with the expressions of our ordinary language, there's no a fact of the matter as to what these expressions denote or mean. To put the question very roughly, the point is that the process of *translation* always under-determines the semantic features of a word, so that there are many equally plausible (that is, compatible with the overall speaker behavior) and mutually incompatible candidates to the role of the meaning and the reference of that word; and, in Quine's view, the notion of translation is the central notion of semantics, the notion from which you have to start when you're developing a semantic theory. Even if you're dealing with your own language, things don't change: the process of translation from your 'home language' (as Quine calls it) to your 'idiolect' leaves room for a wide range of alternatives; any appeal to your intentions of 'referring to' or 'meaning something' is methodologically incorrect from a naturalistic standpoint (such as Quine's and also Field's).

Now, starting from the indeterminacy thesis, Quine has argued for the further thesis of 'ontological relativity', that is, the thesis that:

> (1) What makes sense is to say not what the objects of a theory are, absolutely speaking, but how one theory of objects is interpretable or reinterpretable in another[11].

Field observes that in this context the expression 'objects of a theory' obviously refers to the objects denoted by the singular terms (or mass terms) of the theory and to the sets of objects that constitutes the extensions of the predicates of the theory; so he gives the following reformulation:

[10] The *locus classicus* in which Quine's indeterminacy thesis has been presented is: W.V.O. Quine, *Word and Object*, MIT Press, Cambridge, Mass., 1960, Chap. II, where the thesis is argued on behaviorist grounds; but in: W.V.O. Quine, *Ontological Relativity and Other Essays*, Columbia U.P., New York, 1969, Chap. II, the same thesis is established on the basis of different arguments and points of view (from linguistics, to psychology, to philosophy of mathematics), reaching an higher degree of generality; in this last context Quine has also maintained the (distinct) thesis of 'ontological relativity', presenting it as a mere consequence of the indeterminacy thesis. As we'll see in the rest of the paper, this jump is neither straightforward at all nor beyond any suspect.

[11] *Ontological Relativity and Other Essays* (op. cit.), p. 50.

> (2) What makes sense is to say not what the terms of a theory denote or signify, absolutely speaking, but how one theory of object is interpretable or reinterpretable in another[12].

Thesis (2) is very strong, because it seems to preclude in principle the possibility of a correspondence theory of truth; in fact, it is saying that the only interesting correspondence you can establish is that between words of one theory and words of another, loosing any possibility of an objective comparison between words of a theory (or a language[13]) and the world. Field's idea, as we'll see in detail in what follows, is that Quine's passage from indeterminacy thesis to ontological relativity is not so obvious; in other words, ***even if semantics is so indeterminate as Quine maintains, we can continue to accept a correspondence theory of truth and reject ontological relativity.*** In particular Field argues that we can accept correspondence theory even if we give a ***stronger*** reading of the indeterminacy thesis than that given by Quine himself; in Quine's view, in fact, the indeterminacy thesis does not force us to completely get rid of the semantic notions; it merely forces us to ***relativize*** them: this is the significance of Quine's remark 'absolutely speaking' in (1). If indeterminacy is valid, we can talk of 'relative denotation' (and hence of 'relative truth') with respect to (i) a given 'translation manual' and (ii) a given 'background language'; and it's on this notion of relative denotation that Quine's thesis of ontological relativity is established. But Field argues that if we take seriously the indeterminacy thesis, «it forces us to give up not only the absolute notions of denotation and signification, but even the relativized notions that Quine has proposed as surrogates of them»[14]; thus, the ontological relativity thesis also, which is based on these relativized notions, becomes unsustainable.

Field's general strategy is that of showing that what we need to save a correspondence theory of truth while accepting a strong reading of the indeterminacy thesis (which rejects ontological relativity) is a ***revision*** of our classical semantic notions, such as 'denotation' and 'signification'[15]: ***if indeterminacy thesis is sound, what goes wrong is not our correspondence conception of truth, but the basic notions from which it is built up; so these notions are what***

[12] *Quine and Correspondence Theory,* p. 199.
[13] In Quine's view, to possess a linguistic competence is something like having a theory of the world; so, speaking of the semantics of a scientific theory is very close to speaking of the semantics of a natural language.
[14] *Ibid.* p. 205.

we have to revise, trying to preserve as much of referential semantics as possible in the face of indeterminacy. In the next section I will illustrate Field's arguments for the refusal of ontological relativity thesis and then I will sketch his proposal for a referential semantics capable of handling sentences containing indeterminate terms.

III

In several passages of *Ontological Relativity* Quine contends that ontology is 'doubly relative': it's relative to the choice of one of the possible - and mutually incompatible - translation manuals, and relative to a background language, that is the language in which we give the semantics for the language we are studying; Field argues that both these notions of relativity of the ontology are, at careful analysis, inconsistent. Let's give a sketch of his arguments.

If we try to translate a foreign term, for example 'gavagai', according to Quine we can say that relative to an obvious translation manual that word signifies the set of rabbits, and that relative to an unobvious but nonetheless acceptable manual it signifies the set of undetached rabbit parts[16]. This fact reflects the thesis of ontological relativity as exposed in (2), according to which it doesn't make sense to ask - absolutely speaking - what is the denotation or the extension of a term of a given theory (language), but it only makes sense to ask how a term from one theory (language) is interpretable in another. Yet, if we look at the matter more carefully, we see that something doesn't work; if we try to explicate the notion of 'signification relative to a translation manual' in the manner suggested by (2) we have, as a first attempt:

> (3) To say that a term T used in one language signifies the set of rabbits relative to a translation manual M, is in effect just to say that M translates T as 'rabbit'.

But (3) is not a satisfactory explanation of the notion in question, being not an explicit and general definition; if we try to formulate such a definition we have:

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[15] In what follows, we'll say that a singular term 'denotes' an object, and that a predicate 'signifies' its extension; thus the 'signification' here will have an extensional character, for in this context we're concerned with theory of truth, not with theory of meaning.

[16] Here, for simplicity, we consider only two possible candidates as translation of 'gavagai'.

(4) For every predicate T, set {*x* | F*x*}, and manual M, T signifies {*x* | F*x*} relative to M if and only if M maps T into 'F'.

But this last formulation, Field observes, involves a use-mention confusion, since we are trying to quantify over a variable, 'F', that appears both inside and outside the quotation marks; the only hope to avoid this defect is that of reformulating (4) as:

(5) For every predicate T, set {*x* | F*x*}, and manual M, T signifies {*x* | F*x*} relative to M if and only if M maps T into some term which signifies {*x* | F*x*}.

But clearly (5) defines the relativized notion of signification in terms of an ***absolute*** notion of signification as this is employed in the language in which we give the definition (or it is trivially circular); so it seems that we have to understand the unrelativized notions of denotation and signification ***before*** if we want to grasp the relativized ones. Employing the relativized notion of signification - Field concludes - «Quine himself has become a victim of 'the myth of the museum'»[17]. Thus the notion of a term signifying relative to a translation manual appears unfounded.

As far as relativity of the ontology to a background language is concerned, Quine illustrates this thesis through an analogy between ontological relativity and the relational doctrine of space elaborated by Leibniz[18]. Leibniz maintained that it doesn't make sense to speak of the relation between physical objects on one side and absolute space on the other; what it does make sense is to speak of the spatial relations between physical objects. Thus, we have to reinterpret all sentences that appear to state relations between physical objects and absolute space (such as: «object *a* has position *p* and velocity *v*»), relativizing them to a coordinate system composed by physical objects. Similarly, Quine suggests that we can adhere to (2) without getting rid of the notions of denotation and signification, simply by relativizing them to a coordinate system composed by the words of the background

[17] *Ibid.* p. 204.
[18] *Ontological Relativity and Other Essays* (op. cit.), pp. 48-49.

language[19]. But Field sees on this point a crucial disanalogy: «on Leibniz' theory, we can understand relativized claims about the relations of physical objects to places *only because places are understood as constituted by the relations of physical objects;* whereas no one holds that physical objects are constituted by the relations of words»[20]. In the case of the relational doctrine of space, relativized assertions about position and velocity results intelligible because we arrive - in last analysis – to something fixed, permanent: the physical objects; thus the predicate '*x* has velocity *v* relative to *y*' is definable in terms of the spatial relations between *x* and *y*. But on the contrary, the predicate 'T_1 signifies $\{x \mid Fx\}$ relative to T_2' (where the term T_2 belongs to the background language) is not definable in terms of the linguistic relations between T_1 and T_2 , because the only way for specifying such relations would consist in pointing out the connection between one of the two terms and $\{x \mid Fx\}$, but this is just what indeterminacy prevents us from doing.

IV

The outcome of the preceding paragraphs is that the ontological relativity thesis is not well founded, due to the inconsistency of the notions on which it is based, namely 'relative denotation' and 'relative signification'; Field proposal, as hinted above, is that of getting rid both of the old notions of denotation and signification, and of the 'surrogates' Quine has proposed for them, introducing *more general* semantic concepts capable of handling semantic indeterminacy in the framework of correspondence truth. Field's main idea is that of introducing - as the basic notions of semantics - the new concepts of 'partial denotation' (for singular terms and mass terms) and 'partial signification' (for predicates); this new terminology will allow us to remain as far as it's possible inside the referential semantics tradition while assuming a naturalistic approach towards truth. The new feature of partial denotation is that a singular term (or mass term) can *partially denote* more than one object (or physical quantity); analogously, a predicate can *partially signify* more than one set of objects (every one of this sets will be said 'partial extension' of that predicate). With this points in mind, we can give the following characterizations of reference for singular and general terms:

[19] It is possible that the very words of the background language are to be themselves relativized to a further background language; but this is not a problem in Quine's view, because this situation is similar to what happens in the case of the relational doctrine of space, in which every coordinate system is itself relative to a further one.
[20] *Ibid.* p. 205.

- a term is said to be *referentially indeterminate* if and only if it partially denotes (signifies) more than one object or quantity (set);
- a term is said to be *referentially determinate* if and only if it partially denotes (signifies) exactly one object or quantity (set);
- a term is said to be *denotationless* if and only if it partially denotes (signifies) nothing.

It's now clear in what sense the new concepts are generalizations of the oldest; the classical notion of denotation becomes a special case of partial denotation, namely the case in which the term in question partially denotes exactly one object (or set of objects); yet, Field observes, this last characterization has the unpalatable consequence that a referentially indeterminate term will result lacking denotation (in the old sense) without being denotationless. So Field proposes rejecting the classical notion of denotation, unless we're dealing with languages containing only perfectly determinate terms[21]. Just to make some examples of how these new concepts work, let's take two terms under the assumption they're referentially indeterminate: Newton's term 'mass'[22], and the foreign word 'gavagai'; according to our terminology, we can say that Newton's word 'mass' partially denoted relativistic mass ***and*** partially denoted proper mass; since it partially denoted both these physical quantities, it didn't fully (or determinately) denote none. In a similar way, the foreign word 'gavagai' is said to partially signify the set of rabbits, the set of undetached rabbit parts, and the set of rabbit temporal stages[23]: each of these sets of objects is said to be a partial extension of the general term. The main motivation that underlies Field's proposal of 'partial denotation' terminology consists in his refusal of the 'arbitrary choice' approach to semantics as it is suggested by Quine. According to Quine, you can give a semantic theory for a certain object language only after you have accomplished an arbitrary choice among all the equally possible (and mutually incompatible) translation manuals from that language to yours; this is due to the fact that, if we put ourselves from a naturalistic standpoint, there's no a coherent way of applying the concepts of denotation and signification to the words of the language we're studying. Thus the choice of a particular translation manual forces us to build a

[21] In *Some Thoughts on Radical Indeterminacy* (op. cit.), pp. 259-260, Field observes that there could be cases of 'higher order indeterminacy': the same term 'denotes' is itself indeterminate, since it partially signifies both partial denotation and total denotation.

[22] In *Theory Change and Indeterminacy of Reference* (op. cit.) Field sharply argues that the word 'mass' as used by Newton was referentially indeterminate between two possible candidates: 'relativistic mass' and 'proper mass', that is, between the two physical quantities that - according to relativity theory - are the most plausible referents of the word.

[23] Assuming for simplicity that these three sets are the only candidates to the role of referents of the word 'gavagai'.

semantic theory for the language studied that is totally different from the semantic theory that would be built if another translation manual would have been (arbitrarily) chosen; but in Field's view this approach is totally unreasonable: «…what we should do in this situation is to transcend the individual manuals: if many translation manuals are acceptable […], then any semantic theory for the language that looks at only one of them is ***inadequate,*** and an ***adequate*** theory has to look at ***all*** of them»[24]. The arbitrary choice approach, he maintains, compels us to give an incomplete account of the ***actual*** semantics of the analyzed language, since every possible translation manual picks up an aspect of such a semantics. At the bottom of the introduction of the concepts of partial denotation / signification there's the purpose to avoid such an arbitrary choice between alternative translations and the aim of taking into consideration all of them (or, at least, all the relevant ones)[25].

Now let's see how these newly introduced notions can be employed in the elaboration of a referential semantics capable of giving an account of the truth and falsity of sentences containing referentially indeterminate terms. Some definitions, at this stage, will be necessary; we first characterize the notion of 'structure':

> [s] a ***structure*** for a language L is a function that maps all the names of L into extralinguistic objects, and all the predicates of L into sets of extralinguistic objects.

This notion is similar to that of reference scheme, and also to the quinean notion of translation manual[26]; because of the phenomenon of indeterminacy, there will not be a unique structure that totally accords with the (actual) semantics of the language under consideration, but there will be several structures, each of which 'partially accords' with the semantics of that

[24] *Quine and Correspondence Theory* (op. cit.), p. 215.

[25] Field's naturalistic attitude towards semantics, and also his motivation for the notion of 'partial denotation', is evident in the following passage from *Some Thoughts on Radical Indeterminacy* (op. cit.), p. 259: «A natural question to raise about words - or about their mental analog, concepts - is: in virtue of what facts do they refer to whatever it is that they refer to? […] It would seem that this question about words or concepts needs an answer. And the only kind of answer we can take seriously is a naturalistic answer: the Brentanian answer that words or concepts refer by virtue of irreducibly mental connections between the mind and the world is not a serious contender. […] Even if there are no naturalistic facts that fully determine the referents of these words or concepts, surely there are naturalistic facts that *partially* determine the referents. […] If there are no facts that fully determine the reference of 'entropy' or 'insanity', then from an objective point of view the best we can say is that such a word 'partially refers' or 'indeterminately refers' to each of a range of things…».

[26] Even if the notion of translation manual seems to be a wider one, since a manual for L will presumably include also denotationless expressions like adverbs, articles, logical connectives, and so on, whereas a structure or a reference scheme will include only denoting ones.

language, in the sense that it correctly describes an aspect of such a semantics. We can illustrate more precisely this idea with the following definition:

> [pa] a structure ***m partially accords*** with the semantics of L if and only if each term of L partially denotes or partially signifies the entity which ***m*** assigns to it.

Partial accordance is in effect just a generalization of accordance ***tout-court***: when all the terms of L are referentially determinate, there's exactly one structure that partially accords with the semantics of L, namely that structure that totally accords with such a semantics. The next step will be to define the notion of 'truth-in-a-structure':

> [ts] a sentence S is ***true in the structure m*** if and only if it ***would*** be true if all the terms in S were determinate and if they denoted or signified just those entities which ***m*** assigns to them.

Field observes that the definition [ts] just given is only a vague and intuitive one; but it can easily be made perfectly clear and precise in the way of a tarskian definition of truth for a fixed language L (trough the notion of satisfaction of a formula by a sequence of objects to be assigned to the variables of the language). Clearly, if we are interested in the question of the truth and falsity of sentences we really use, the notion of 'truth-in-a-structure' is not of much interest for ***every*** structure; since we can always pick up structures according to which a sentence that is determinately true turns out false[27]; this means that we have somehow to restrict our attention to those structures that are in close accordance with the semantics of the language under consideration. To this end, we can combine our characterization [ts] with the previous definition of 'partial accordance' [pa], getting the following truth definition:

> [T] A sentence of L is ***true*** if and only if it is true-in-the-structure-***m*** for every structure ***m*** that partially accords with the semantics of L.

[27] For example, if we choose a structure that assigns Napoleon to the word 'Venus' and the set of rabbits to 'is a planet', then the sentence 'Venus is a planet' turns out false in that structure, since Napoleon is not a rabbit. But this only means that the structure just considered has nothing to do with the actual semantics of 'Venus' and 'is a planet', so that such a structure is insignificant for the truth and falsity of the sentence in question.

This definition tells us that a sentence is true when it turns out true relative to ***all*** the possible translation manuals which are in close accordance with the semantics of the language to which the sentence belongs. Let's make some examples just to see how this definition works. Take the term 'mass' as used by Newton; we've seen (see footnote 22) that this word was[28] indeterminate: according to our terminology, it partially denoted relativistic mass and partially denoted proper mass. Thus there will be two different structures, call them m_r and m_p , each of which assigning a different referent to Newton's term 'mass' (all the other terms maintaining the same referents). Consider now the following sentences uttered by Newton:

(6) Momentum equals mass times velocity.

(7) For any two frames of reference, mass with respect to frame 2 equals mass with respect to frame 1.

(8) The mass of object A is between 1.21 and 1.22 kilograms [said after putting object A onto a pan balance and accurately weighting it].

(9) To accelerate a body uniformly between any pair of different velocities, more force is required if the mass of the body is greater.

Sentence (6) turns out true in the structure m_r (since momentum equals relativistic mass times velocity), but it turns out false in the structure m_p , (since momentum does not equal proper mass times velocity); thus (6) turns out ***false*** according to our truth definition [T], since it doesn't turn out true for all the relevant structures. The same holds in the case of (7), with the only difference that the truth values assigned to that sentence in the two structures are now inverted (since relativistic mass is not independent on the frame of reference). The outcome of this is that sentences (6) and (7) are ***objectively*** false, according to [T]; and the ***conjunction*** of them is therefore false. But it's worth noting that the ***disjunction*** of (6) and (7) is objectively ***true***: if fact such a disjunction turns out true in each one of the relevant structures (always

[28] At the present time this word is simply ***ambiguous***; in fact, contemporary physicists can mean by this word both relativistic mass (that satisfies some properties) and proper mass (that satisfies other properties), that is, two different physical quantities. In ***Theory Change and Indeterminacy of Reference*** (op. cit.), p. 188, n.12, Field distinguishes indeterminacy from ambiguity; a term is ambiguous if different tokens of it have different semantic features, each token having yet a determinate denotation: thus 'mass' tokens as used today have different referents (relativistic mass or proper mass) depending on the context of utterance, but nonetheless the referent of ***each*** token is determined (for example by the laws in which the word 'mass' is employed – a similar case is showed by the word 'bank', whose tokens can apply both to things along rivers and to the Chase Manhattan). On the contrary, a term is indeterminate if each token of it ***lacks*** determinate denotation; thus Newton's word 'mass' was referentially indeterminate (not merely ambiguous), since each token of it partially denoted proper mass and partially denoted relativistic mass. In a few words, we can say that a term is ambiguous if and only if its ***type***

being one of its members true in one of the relevant structures). So we have assigned determinate truth values to such fundamental laws of Newtonian mechanics, notwithstanding referential indeterminacy of the term 'mass' employed in them. Sentences (8) and (9) are examples of, respectively, an empirical statement and a theoretical statement; they both turns out objectively ***true*** according to our truth definition [T], being true in each of the two relevant structures. The moral to be drawn till here, can be summed up in at least two points: (i) the existence of referential indeterminacy doesn't preclude us the possibility of comparing sentences from earlier theories with sentences of contemporary ones, so that we can objectively attribute truth values to such sentences; thus, the 'incommensurability' between theories[29] is not a well founded concept; (ii) induction from the indeterminacy of terms in earlier theories may suggest that many of ***our*** current scientific terms are referentially indeterminate, so that science will never reach the stage where all of its terms are perfectly determinate; but perhaps this conclusion, as Field argues, doesn't conflict «with anything that is reasonably called 'scientific realism'»[30]: if science (in progress) is our 'Neurath's boat', then a truth characterization like [T] will always enable us to objectively evaluate sentences of past and present theories.

Till now examples have been made from scientific discourse; but is [T] capable of handling sentences of ordinary discourse as well? Is it capable of evaluating sentences involving more complex cases of indeterminacy? Some problems might be raised in conjunction with the phenomenon of the so called ***correlative indeterminacy***; let's illustrate this phenomenon by a classical example due to Quine. Suppose someone utters the sentence:

(10) $\forall x \forall y$ (x and y are nearby rabbits $\rightarrow$ x is identical to y),

which we imagine to be uttered in an environment containing exactly one rabbit; obviously, (10) ought to turn out true in that context, but if we try to evaluate it by [T] we'll not get this result. Suppose, for simplicity, that the only indeterminate words of the sentence are the predicates 'rabbit' and 'is identical to', being all the other words (quantifiers, connectives, adverbs, …) semantically determinate; and suppose that each one of the indeterminate words has only two sets as possible extensions, that is: 'rabbit' partially signify both the set of

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lacks determinate denotation, while it's indeterminate if and only if ***each one*** of its ***tokens*** lacks determinate denotation.

[29] See Kuhn, ***The Structure of Scientific Revolutions*** (op. cit.).

[30] ***Theory Change and Indeterminacy of Reference*** (op. cit.), p. 192.

rabbits and the set of undetached rabbit parts, whereas 'is identical to' partially signify both the relation of identity and the relation of 'paridentity', which is the relation of being undetached parts of the same object. But this implies that, according to our characterization of 'partial accordance' [pa] given above, we have the following *four* relevant structures for evaluating the sentence (10):

(a) 'rabbit' $\rightarrow \{x \mid x \text{ is a rabbit}\}$
'is identical to' $\rightarrow \{x \mid x \text{ is identical } x\}$

(b) 'rabbit' $\rightarrow \{x \mid x \text{ is an undetached rabbit part}\}$
'is identical to' $\rightarrow \{\langle x,y\rangle \mid x \text{ and } y \text{ are undetached parts of the same object}\}$

(c) 'rabbit' $\rightarrow \{x \mid x \text{ is a rabbit}\}$
'is identical to' $\rightarrow \{\langle x,y\rangle \mid x \text{ and } y \text{ are undetached parts of the same object}\}$

(d) 'rabbit' $\rightarrow \{x \mid x \text{ is an undetached rabbit part}\}$
'is identical to' $\rightarrow \{x \mid x \text{ is identical } x\}$

And in order that sentence (10) turning out true, it has to be true relative to all structures (a)-(d), according to our truth definition [T]; but unfortunately this is not the case. In fact, this sentence turns out true relative to structures (a) and (b), but relative to structure (c) it seems a nonsense, and relative to (d) it turns out false (since not all the undetached rabbit parts are identical to each other). It seems that [T] compels us to declare false a sentence that is clearly true in the circumstances in which it is uttered; must we reject our truth definition? What there's wrong with it? Field suggests that what has to be revised is not [T], but the characterization of 'partial accordance' [pa]; we have to refine it in order to toss out those structures which, like (d), lead us to deny sentences that are plain true. But how to work out such a selection among the relevant structures? From the context of utterance of the sentence (10) and from the fact that everyone is disposed to *assent* to it in that context, clearly results that: ***if*** 'is identical to' is a word for identity, ***then*** 'rabbit' signifies the set of rabbits, whereas ***if*** 'is identical to' is a word for paridentity, ***then*** 'rabbit' signifies the set of undetached rabbit parts; but due to indeterminacy, 'is identical to' partially signifies both the relation of identity and the relation of paridentity. Thus we can argue that relative to a correlation of identity with 'is identical to', 'rabbit' signifies the set of rabbits, whereas relative to a correlation of paridentity with 'is identical to', 'rabbit' signifies the set of undetached rabbit parts: here's the

phenomenon of correlative indeterminacy. Field's idea, then, is that «if we take Quine's radical indeterminacy thesis seriously, we should take 'rabbit', 'dinosaur', and so forth as being ***dependent*** predicates, predicates whose extension is a function of the extension of another predicate, 'identical' (which I call the ***basis*** of the dependent predicates)»[31]. Thus, the functional dependence of (the extension of) some predicates on (the extension of) other predicates that act as their basis, will allow us to correlate the partial extension of a predicate with the partial extension of another, in order to reject those structures that assign not correlated partial extensions to our predicates[32]. In giving a reformulation of the concept of 'partial accordance' we'll have to employ the term 'basis'; writing '$t_1 = b(t_2)$' we mean that the term t_1 acts as the basis of the term t_2. In general, it's not necessary to require that the basis of a term be always independent; it can be dependent on another term that acts as its basis, and this last term can in turn be dependent on another basis, and so on; but we must require that at the end of this chain we reach an independent term (otherwise it would be impossible to evaluate the sentence in question): call this the *grounding requirement.* With this points in mind, let's give the following definition:

[pa*] A structure ***m partially accords*** with the semantics of L if and only if
(i) each independent term *t* of L partially denotes or partially signifies ***m(t)***;
(ii) each dependent term *t* of L denotes or signifies ***m(t)*** relative to the correlation of ***m(b(t))*** with ***b(t).***

Now, if the grounding requirement is met, [pa*], combined with [s] and [ts] gives us the truth definition [T*]: a characterization capable of handling more complex cases of indeterminacy, like correlative indeterminacy. According to [T*], sentence (10) turns out ***true***, since the last two structures considered don't partially accord with the semantics of L (in fact they fail to satisfy condition (ii) of [pa*], as they assign to the predicates 'rabbit' and 'is identical to' non correlated partial extensions).

[31] *Quine and Correspondence Theory* (op. cit.), p. 211.
[32] The idea of a functional dependence between a term and its basis provides us a way of explaining how 'rabbit' can partially signify both the set of rabbits, and the set of undetached rabbit parts, and so on; in fact, causal links taken by themselves are not sufficient in explaining that: at most they can explain how 'rabbit' partially signify the *conjunction* (of one or more sets) consisting in {rabbits}∪{undetached rabbit parts}∪{…}, but it's difficult to see how the causal link could ***divide*** this conjunction into the various considered sets. This problem can be overcame if we look at 'rabbit' as a dependent term whose extension depends on the extension of its basis-term, 'identical'.

The sort of semantic theory just sketched shows that the acceptance of indeterminacy thesis does not preclude in principle the possibility of a correspondence theory of truth, where by this last expression we mean a theory that pretends to explain truth appealing to some correspondence relations that hold between words and the extra-linguistic objects they are about; it shows that such a 'correspondence' has to be more complicated than we had expected, and that this complication is due to a vigorous revision of our basic semantic concepts, such as denotation and signification. The phenomenon of semantic indeterminacy, in Field's view, does not show (as Quine seems to maintain) that *every* structure that correctly describes one aspect of the semantics of a certain language L is an adequate basis for a definition of 'true-in-L', but it shows that *none* of those structures – singly chosen – is sound for such a purpose.

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