THE PROBLEM IN TWENTIETH-CENTURY PHILOSOPHY*

The title refers to the notorious problem Ludwig Wittgenstein[1] raises very near the end of the *Tractatus*:

> It is clear that the logical product of two elementary propositions can neither be a tautology nor a contradiction. The statement that a point in the visual field has two different colours at the same time is a contradiction (*ibid.*, section 6.3751).

These two statements, each plausible by itself, seem none too plausible when taken together:

(1) The spot is red and blue.

(1) is "the logical product of two elementary propositions," and hence, according to the first statement, (1) cannot be a contradiction; but it asserts that "a point in the visual field has two different colours at the same time," and hence, according to the second, (1) is a contradiction.

(1) together with sentences like (2)-(6) seem to present us with a conflict between intuition and logic:

(2) The spot is red.
(3) The spot is not blue.
(4) The spot has a color.
(5) Red is a color.
(6) The spot is green.

Intuition tells us that (1) is a contradiction, that (2) and (6) are incompatible, that (2) entails (3) and (4), and that (5) is a necessary truth. But logic appears to contravene intuition. Not only do the sentential components of (1) express elementary propositions, (2), (4), (5), and (6) themselves express elementary propositions, and (3) expresses the negation of an elementary proposition. Since elementary propositions are logically independent of one another, logic tells us that sentences (1)-(6) do not have the logical properties and relations that intuition tells us they have.

Wittgenstein[2] imposed both a methodological and an epistemological constraint on a solution to this problem:

> It must be possible for the contradiction to show itself entirely in the symbolism, for if I say of a patch that it is red and green, it is certainly at most only one of these two, and the contradiction must be contained in the *sense* of the two propositions (*ibid.*, p. 107).

The methodological constraint is straightforwardly expressed in the first clause of this conjunction. The epistemological constraint, that knowledge of the contradiction is a priori semantic knowledge, is expressed in the second. Insofar as the symbolism shows the semantic properties and relations to be, as Wittgenstein says, "contained" in the senses of the sentences, it explains our knowledge of the contradiction, and of relations such as that (2) entails (3), as grounded on nothing more than an understanding of the sentences.

The problem (1) raises is widely known under names like the *color incompatibility problem*, but it is no more a problem specifically about color words than it is a problem specifically about the property of contradiction. It is a general problem about the extralogical vocabulary of the language and about all the semantic properties and relations of the language. The problem surfaces whenever we try to explain the logical powers of extralogical words with a symbolism on which the logical form of elementary propositions affords no basis for their explanation. But even though the color vocabulary is only a special case of this general problem, the conflict between our intuitions about color words (and other sensation terms) and the logic of sentences containing them is by far the hardest case, and for this reason, it serves as the test case for solutions to the general problem.

I. EXISTING SOLUTIONS TO THE PROBLEM

The definite article in the title is not intended to suggest that the work of twentieth-century philosophy is on the verge of completion. The uniqueness of Wittgenstein's problem lies rather in the special

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[2] *Philosophical Remarks* (Chicago: University Press, 1975).

role it has played in shaping twentieth-century philosophy. The emergence of the problem was one of those events which totally transforms an intellectual discipline. The three movements in which most analytic philosophy of this century has been done, Wittgenstein's late philosophy, Rudolf Carnap's neo-Humean empiricism, and W. V. Quine's neo-Millian empiricism, were each, in large measure, responses to the problem. When we appreciate the extent to which these movements were shaped by attempts to solve or dissolve the problem, we shall appreciate how long a shadow it casts over twentieth-century philosophy.

I.1. Wittgenstein. In the years following the completion of the *Tractatus*, the problem was the test case for its semantic system. Wittgenstein's failure to show a contradiction like (1) within that system and his subsequent diagnosis of the failure led to his radically different way of thinking about meaning, language, and logic in the late philosophy. To my knowledge, Edwin B. Allaire[3] was the first to recognize the central role of the problem in the development of Wittgenstein's late philosophy. Nowadays, it is widely recognized among Wittgenstein scholars. Referring to Wittgenstein's attempt in "Some Remarks on Logical Form"[4] to revise the truth-table notation to express "exclusion," Max Black[5] says: "Here, it may be said, Wittgenstein's system begins to crack" (*ibid.*, p. 368). P. M. S. Hacker and Anthony Kenny,[6] two other well-known Wittgenstein scholars, take essentially the same view of the centrality of the problem in the transition from the early to the late philosophy.

Wittgenstein's[7] opposition to synthetic a priori knowledge led him to equate 'being synthetic' with 'being contingent', and, as a consequence, this put him under great pressure to take sentences like (1) to be meaningless (*ibid.*, p. 68). But as he still held a calculus picture of language during this period, the option of representing sentences like (1) as meaningless, while at the same time representing their negations as meaningful truths, was not open to him.[8] Since the only kind of sentential well-formedness in calculi is syntactic well-formed-

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[3] "'Tractatus' 6.3751," *Analysis*, XIX, 5 (1959): 100-05; reprinted in Irving Copi and Robert W. Beard, eds., *Essays On Wittgenstein's* Tractatus (New York: Macmillan, 1966), pp. 189-94.

[4] *Aristotelian Society, Supplementary Volume IX* (1929): 162-71, here p. 168; reprinted in Copi and Beard, pp. 31-38.

[5] *A Companion to Wittgenstein's* 'Tractatus' (Ithaca: Cornell, 1964).

[6] Hacker, *Insight and Illusion* (New York: Oxford, 1972), pp. 86-94; Kenny, *Wittgenstein* (Cambridge: Harvard, 1973), pp. 103-19.

[7] *Ludwig Wittgenstein und der Wiener Kreis: Notes of F. Waisman and B. McGuinness* (Malden, MA: Blackwell, 1967).

[8] "Some Remarks on Logical Form," pp. 170-71.

ness, the meaningful/meaningless distinction coincides with the well-formed/ill-formed distinction. Hence (1) and its negation are either both meaningful or else both meaningless.

Allaire suggests that the need to separate meaningfulness from syntactic well-formedness led Wittgenstein to abandon the calculus picture of language and develop his new use-based conception of meaning:

> One possible way of making it palatable [that (1) but not its negation is meaningless] is to identify meaning with use. This, as we all know, is one of the key ideas of the final phase. If I am right, it follows that with respect to one very major issue, at least, the 1929 paper marks a transitional stage between the thought of the *Tractatus* and that of the final stage (*op. cit.*, pp. 192-93).

Since, on the new conception, the meaningfulness of signs is an aspect of their use in our linguistic practices, it is possible to reject the identification of the meaningful with the syntactically well-formed. Hence the negation of (1) can be treated as meaningful, in virtue of having the status of a "grammatical rule," while (1) itself is treated as meaningless, in virtue of being the denial of a grammatical rule.[9]

I.2. Carnap. Carnap's neo-Humean empiricism provides a less radical response to Wittgenstein's problem. On its formal side, Carnap's philosophy is an explication of Gottlob Frege's semantics. The principal innovation in connection with analyticity is to replace Frege's vague remarks about definition with a formal means for specifying logical relations among extralogical terms. This enables Carnap to treat sentences like the denial of (1) and (5) as analytic within a calculus.

Carnap's[10] reasoning can be reconstructed as follows. Wittgenstein had supposed that the source of the contradiction in a sentence like (1) lies in the nature of the color words themselves, but that supposition is not forced on us. The contradiction does not have to arise from structure internal to the color words in order for it to be shown in a symbolism. After all, the logical property 'being a tautology' exhibited in instances of 'P v~P' is not shown in a representation of the internal structure of the logical words in those sentences. Rather, the

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[9] At the outset of "the final stage," Wittgenstein diagnoses his earlier bewilderment as follows: "We make a picture like that of the two colors being in each other's way,...but on looking closer we find that we can't apply the picture we have made"—*The Blue and Brown Books* (Malden, MA: Blackwell, 1958), p. 56. Subsequently, the idea of "[a] picture [holding] us captive" becomes the general diagnosis of the metaphysical condition—*Philosophical Investigations* (Malden, MA: Blackwell, 1953), sections 115-32.

[10] "Meaning and Synonymy in Natural Language," *Philosophical Studies*, VII (1955): 33-47.

property is shown in a symbolism of logical postulates that represents the external structure of logical words. So, if we take the contradiction in the case of (1)—and other semantic properties in other cases—to be genuinely logical properties like 'being a tautology', then we ought to treat so-called extralogical words in the same way we treat logical words. Therefore, the apparatus for logical postulates ought to be used to formulate a parallel set of "meaning postulates" that represents the external semantic structure of so-called extralogical words.

Since meaning postulates are constraints on the assignment of extensions to sentences, Carnap[11] can explicate analytic truth as truth in all possible worlds (*ibid.*, pp. 7-13). This explication has an ontological and an epistemological payoff. Since analyticity is necessary truth, the explication delivers logicism effortlessly and without Frege's commitment to mathematical realism, and since necessary truths have no factual content, it delivers empiricism without a commitment to John Stuart Mill's inductivist view of logical and mathematical knowledge. Reflecting on the significance of this explication, Carnap[12] wrote:

> What is important...is that it became possible for the first time to combine the basic tenets of empiricism with a satisfactory explanation of the nature of logic and mathematics. Previously, philosophers had only seen two alternative positions: either a non-empiricist conception, according to which knowledge in mathematics is based on pure intuition or pure reason, or the view held, e.g., by John Stuart Mill, that the theorems of logic and mathematics are just as much of an empirical nature as knowledge about observed events, a view which, although it preserved empiricism, was certainly unsatisfactory (*ibid.*, p. 47).

I.3. Quine. Quine's response to Wittgenstein's problem is part of his case for an empiricism in the Millian spirit. Although Quine[13] found Mill's conception of the certainty of logic and mathematics unacceptable, he found the Millian view of their empirical status congenial, and, accordingly, Carnap's empiricism seemed a compromise of the empiricist principle that all our knowledge rests on experience. Quine's[14] response to Carnap was clean and simple: extralogical words have no logical powers; hence there is nothing for

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[11] *Meaning and Necessity* (Chicago: University Press, 1956, 2d ed.).
[12] "Intellectual Autobiography," in Paul A. Schilpp, ed., *The Philosophy of Rudolf Carnap* (La Salle, IL: Open Court, 1963).
[13] "Carnap and Logical Truth," in *The Ways of Paradox* (New York: Random House, 1965), pp. 100-01.
[14] *From a Logical Point of View* (Cambridge: Harvard, 1953).

Carnapian meaning postulates to explicate. Carnap's assumption, that extralogical words have logical powers, is "an unempirical dogma of empiricists" (*ibid.*, p. 37).

II. THE POSSIBILITY OF ANOTHER SOLUTION TO THE PROBLEM

The ways out of a problem divide into *solutions*, which typically reject an assumption which has been made about the problem but accept its presuppositions, and *dissolutions*, which reject one or another presupposition. Carnap's way out of Wittgenstein's problem is a solution. It rejects the assumption that logical properties and relations of sentences like (1)-(6) arise from the internal structure of their extralogical vocabulary. Wittgenstein's and Quine's ways out are dissolutions. They reject presuppositions. They both reject the idea that meanings are objects, that there is such a thing as necessity, that there can be a symbolism that shows that semantic properties are contained in the senses of sentences, and that our knowledge of the falsity of (1), the truth of (5), and the inconsistency of (2) and (6) is a priori. Here ends the similarity between their ways out. Quine's preserves the calculus approach of Frege/Russell style semantics and adopts a scientistic conception of philosophy; Wittgenstein rejects that approach and adopts a therapeutic conception of philosophy.

If these three ways out were exhaustive, the existence of a solution would depend on the adequacy of Carnap's way out. Hence the widespread belief that Carnap's way out is inadequate has led to the widespread belief that dissolution wins by default. But those three ways out are not exhaustive. The existence of another way out has been overlooked because philosophers equate intensionalism with Frege/Carnap intensionalism. I have argued elsewhere[15] that this equation is mistaken and that it limits our view of the options on a wide range of important philosophical issues. I shall argue here that the equation limits our view of the options on Wittgenstein's problem.

Quine was right about the inadequacy of meaning postulates: "We understand what expressions the rules attribute analyticity to, but we do not understand what the rules attribute to those expressions."[16] But the failure to provide such understanding is not, as Quine thought, due to there being *au fond* nothing for meaning postulates to explicate. It is due rather to the fact that meaning postulates are in their nature unsuited to explicating what is there. They deriva-

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[15] *The Metaphysics of Meaning* (Cambridge: MIT, 1990); "The New Intensionalism," *Mind*, CI, 4 (1992): 689-720; "Names without Bearers," *Philosophical Review*, CIII, 1 (1994): 1-39; "Analyticity, Necessity, and the Epistemology of Semantics," *Philosophy and Phenomenological Research*, LVII, 1 (1997): 1-28; and *Sense, Reference, and Philosophy* (in preparation).

[16] *From a Logical Point of View*, p. 33.

tionally enumerate sentences under the rubric *analytic*. The sentences are specified in the manner of theorems of logic, not as instances of the concept of analyticity. Thus, meaning postulates serve as constraints on the assignment of extensions to sentences, but they cannot explain the property common to the sentences they enumerate. Like Socrates's interlocutors, meaning postulates offer examples of the concept instead of the concept.

This failure is evident in cases of co-extensive concepts. What is the meaning of the word 'two'? One answer is the postulate '$(x)(x$ is the number two $\leftrightarrow x$ is the successor of the number one)'. Another answer is the postulate '$(x)(x$ is the number two $\leftrightarrow x$ is the even prime)'. Still another answer is the postulate '$(x)(x$ is the number two $\leftrightarrow x$ is the square root of the number four)'. Indeed, any postulate in which the predicate in the consequent is necessarily co-extensive with 'two' will do, since Carnap's referential semantics provides us with no adequate basis for deciding among extensionally equivalent answers. Meaning postulates are incapable of distinguishing synonymous expressions from necessarily co-extensive expressions because they cannot provide the fine-grained notion of meaning required to explicate meaning in natural language. They cannot do this because, as representations of the external (that is, logical) structure of the extralogical words, they do not have access to the internal (that is, sense) structure of those words.[17]

Thus, a new way out must reject Carnap's assumption that the external, logical structure of extralogical words is the source of analyticity, contradiction, and analytic entailment in connection with sentences like (1)-(6). It must assume instead that such properties and relations derive from the internal, sense structure of extralogical words. The bottom line is this: if there is to be a solution, the notion of sense must be something other than Frege's and Carnap's referential notion of sense.

But does not the very definition of sense automatically make it a referential notion? Frege defined sense as the determiner of reference, and the subsequent Carnapian doctrine on which sense is a function from possible worlds to extensions is only a slight modification that brings Frege's definition in line with the modal expansion of the universe. But if there is a definition of sense that explains it in

[17] Carnap's notion of intensional isomorphism (*Meaning and Necessity*, pp. 56-64) and its progeny do not overcome the difficulty because they assume an isomorphism between sense structure and syntactic structure. I shall discuss this assumption below; see also my "Semantics in Linguistics and Philosophy: An Intensionalist Perspective," in Shalom Lappin, ed., *Handbook of Contemporary Semantic Theory* (Malden, MA: Blackwell, 1996), pp. 612-13.

nonreferential terms, it might be possible to separate sense structure from logical structure, and this would open up the prospect of an alternative solution to Wittgenstein's problem.

In the early seventies, I presented such a definition, namely, (D):

(D) The sense of an expression is that aspect of its grammatical structure which is responsible for its sense properties and relations, that is, having a sense (meaningfulness), sameness of sense (synonymy), multiplicity of sense (ambiguity), repetition of sense (redundancy), opposition of sense (antonymy), and so on.[18]

(D) explicates sense not as the determiner of referential properties and relations like denotation and truth, but as the determiner of sense properties and relations like meaningfulness, synonymy, ambiguity, and redundancy. On (D), the theory of sense concerns the relations of senses with one another and sentences of a language, rather than, as in the Frege/Carnap tradition, with relations of the language to the world.

(D) enables us to make two important dichotomies. It enables us to separate sense structure sharply from both logical structure and syntactic structure. Sense is not only *not* something that determines reference, it is also *not* something that is determined by syntax. The former dichotomy frees us from interpreting sense (hence the notions of analyticity, contradiction, and analytic entailment) in logical terms. The latter frees us from the view of sense structure as isomorphic to syntactic structure. That view commits us to saying that syntactically simple words have simple senses, that their only semantic structure is external structure, and that meaning postulates are the best description of semantic structure. But if syntactically simple words can have complex senses, there may be a better description available to us.

I shall call the complex sense structure of syntactically simple words *decompositional sense structure*.[19] This level of grammatical structure introduces a different surface structure/deep structure distinction. Since compositional senses of expressions are a function of the senses of their constituents, the componential structure of such senses reflects the constituent structure of the expression. Since expressions with decompositional senses have

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[18] *Semantic Theory* (New York: Harper and Row, 1972), pp. xvi-xxvii, 1-12.

[19] For a response to Wittgenstein's criticism of analysis, see my *The Metaphysics of Meaning*, pp. 52-66 and 101-07. For a response to the argument against decompositional semantics in Jerry A. Fodor, "Concepts: A Potboiler," *Cognition*, 1 (1994): 95-113, see my "Analyticity, Necessity, and the Epistemology of Semantics," pp. 13-16.

no constituent structure, their componential structure is an intrinsic property of the expressions. Hence, as with cases where underlying syntactic structure cannot be read off surface structure (for example, 'Simpletons are easy to fool'), decompositional sense structure must be inferred from linguistic intuitions about underlying sense structure. We posit decompositional sense structure because only in this way can we explain sense properties and relations of expressions that cannot be explained otherwise. For example, only if we assume that the sense of 'bachelor' is complex can we explain the synonymy of 'bachelor' and 'single man'. The sense of 'single man' is complex, being a compositional function of the senses of 'single' and 'man'. Since 'single man' and 'bachelor' have the same sense, the sense of 'bachelor' is complex.

I shall argue shortly that the level of decompositional sense structure makes it possible to explain the semantic powers of logically elementary sentences on the basis of the nonlogical, internal structure in morphemes. Wittgenstein once took a step in this direction:

> ...from the given I can construct what is not given.... That makes it look as if a construction might be possible within the elementary proposition. That is to say, as if there were a construction in logic which didn't work by means of truth tables.
>   What's more, it also seems that these constructions have an effect on one proposition's following logically from another.[20]

He went no further. The reason seems clear. A construction that explains the semantic powers of logically elementary sentences must be, as it were, both inside and outside of logic. The construction must be inside of logic to "have an effect on one proposition's following from another." It must be outside of logic to be "possible within the elementary proposition" and not to "work by means of truth tables." But with only Fregean definitions of sense and analyticity, the construction cannot be outside of logic.

We have just seen how, on (D), sense structure can be outside of logic: sense structure is a referentially independent linguistic structure that is internal to syntactically simple words in elementary sentences. In the next section, I shall spell this idea out more precisely. In section VII.2, I shall explain how it can also be inside logic in precisely Wittgenstein's sense.

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[20] *Philosophical Remarks*, pp. 105-06.

III. TWO NOTIONS OF CONTAINMENT

Two conditions must be met for sense structure to be outside of logic. First, sense structure must be strictly mereological (part-whole) structure, and, second, the sense properties and relations must be defined in terms of sense structure (together with aspects of syntax). Logical operations can have no role in sense containment and hence in the definitions of analyticity, analytic entailment, and other sense properties and relations. The containment relation must be expressible solely in terms of the parts of senses and identity. For example, the redundancy of 'single bachelor' and 'male bachelor' must be definable as an identity of the sense of the modifier with a part of the sense of the head. Similarly, the analyticity of (10) and (11) and the analytic entailment of (8) and (9) by (7) must be definable in strict mereological terms:

(7) John is a bachelor.
(8) John is single.
(9) John is male.
(10) Bachelors are single.
(11) Bachelors are male.

The importance of this point is not the only reason for stressing it. Frege[21] muddied the waters when he introduced another sense of 'containment' in his definition of analyticity as provability from laws of logic and definitions (*ibid.*, p. 4). He was quite clear about the difference between the literal, mereological sense of 'containment' and his figurative sense. He likened the former, as it appears in Immanuel Kant's definition of analyticity, to the containment of beams in a house, and he likened the latter, logical notion, as it appears in his own definition, to the containment of a plant in the seed (*ibid.*, pp. 99-101). Just as a plant is not something there in the seed from which it grew, so, generally speaking, conclusions of logical inferences are not something literally there in the premises from which they are logically derived. This was a point on which Frege himself insisted (*ibid.*, p. 101).

The autonomy of the theory of sense depends not only on having a definition of sense like (D) but also, and as much, on having definitions of analyticity and analytic entailment based exclusively on literal containment. To be sure, Frege presented arguments against such definitions, but they are nowhere near as convincing as he took them to be. His principal argument was that they are not "fruitful" enough to do justice to definition in logic and mathematics (*ibid.*, pp.

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[21] *The Foundations of Arithmetic* (Malden, MA: Blackwell, 1953).

99-101).²² Kant's definition of analyticity does not, for example, even cover as simple a case as (12):

   (12)   If *A* is larger than *B* and *B* is larger than *C*, *A* is larger than *C*.

The sense of the antecedent in (12) does not literally contain the sense of the consequent, since the terms '*A*' and '*C*' do not appear as arguments of the predicate 'larger than' in either conjunct of the antecedent. But so what if Frege is right that (12) and indefinitely many other more sophisticated sentences of logic and mathematics are not analytic in the Kantian sense? Since Kant did not think everything that is a priori and necessary is analytic, Frege begs the question.²³ Moreover, not everyone shares Frege's commitment to logicism or holds another doctrine that requires analyticity to cover mathematical and logical truth. And, of course, Frege does not address the question of whether the notions of definition and analyticity appropriate to natural language are fruitful in his sense.

   Further, the fact that Frege was also right that Kant's subject-predicate definition of analyticity does not cover relational sentences is equally inconsequential because the failure is not due, as Frege would have it, to its failure to capture relational sentences like (12). The definition is incomplete because it fails to capture relational sentences like (13)-(16):

   (13) Henry buys books from those who sell them to him.
   (14) Jill walks with those with whom she strolls.
   (15) Jack kills those he murders.
   (16) Police follow those they chase.

The latter but not the former exhibit the same redundant predication found in sentences like (10) and (11). The only difference between analytic sentences like (13)-(16) and analytic sentences like

²² Frege also says: "How can we [ask whether the predicate concept is contained in the subject concept] if the subject is an individual concept? Or if the judgment is an existential one" (*ibid.*, p. 100)? The first question is answered if Kant is allowed the same opportunity to invoke a descriptive view of names that Frege allows himself—see *Translations from the Philosophical Writings of Gottlob Frege*, Max Black and Peter Geach, eds. (Malden, MA: Blackwell, 1952), p. 58. If such a view is false, as Millians think, Frege's question does not arise. The second question might be trouble for Kant, who argued against Descartes's ontological proof on the grounds that existential propositions are always synthetic. But this question is no trouble for a Kantian style account of analyticity per se, as argued in my account of Descartes's *Cogito*—see my *Cogitations* (New York: Oxford, 1986), pp. 98-177.
²³ See Paul Benacerraf, "The Last Logicist," in P. A. French et alia, eds., *Midwest Studies in Philosophy, VI* (Minneapolis: Minnesota UP, 1981), p. 34, fn. 6.

(10) and (11) is that, in the relational sentences, some term other than the subject is the containing term. Thus nothing requires us to follow Frege in abandoning literal containment. All that is required is to abandon Kant's limitation of the containment condition to subject terms and to replace it with a generalization, something like (A):

> (A) If the sense of a simple sentence consists of an n-place predicate with a term occupying each place, then the sense is analytic if one of the terms contains the full predicate with each of the terms.[24]

IV. REPRESENTING SENSE STRUCTURE

The principal task in this and the next two sections is to provide a symbolism that exhibits "the contradiction...contained in the *sense* of the two propositions." In earlier work, I developed a symbolism for sense structure (*ibid.*). The symbols representing sense structure, called *semantic markers,* can be written as tree structures. But unlike the domination relations in the familiar tree' notation for phrase markers, which represent constituent/subconstituent relations in sentences, the domination relations in semantic markers represent sense/subsense relations in senses.

Let us suppose the tree structures (17) and (18) are semantic markers that represent, respectively, the senses of the verbs 'chase' and 'follow':

(17)

(18)

$$(\text{Activity}) \;\; [\text{NP}, \text{S}]$$
$$X$$
$$<\text{R}>$$

(Physical)

(Movement)

(Fast)   (Direction)

$$(\text{Toward}) \;\; [\text{NP}, \text{VP}, \text{S}]$$
$$X$$
$$<\text{R}>$$
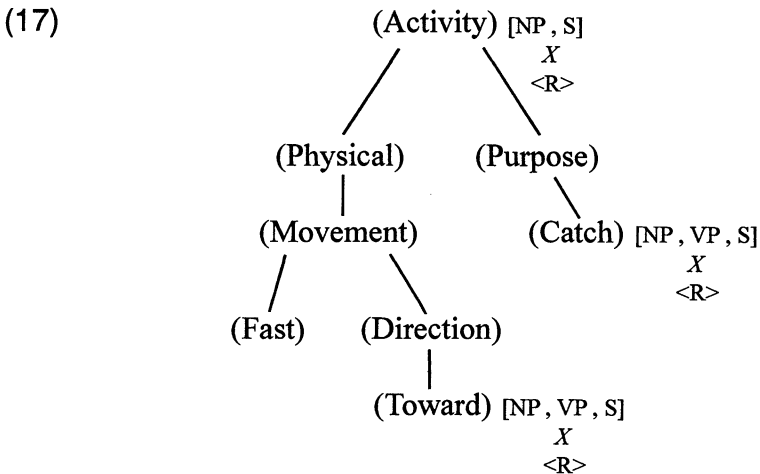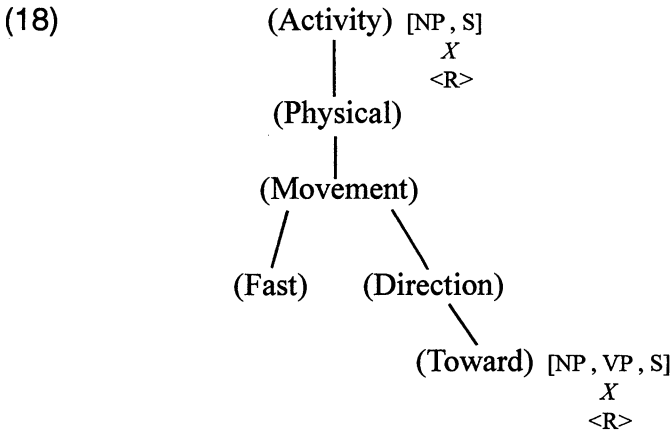
In terms of such a symbolism, we can define one sense to be the su-
perordinate of another, its subordinate, just in case the latter is a
same-rooted subtree of the former. Since (18) is a same-rooted sub-
tree of (17), the semantic markers (17) and (18) represent the sense
of 'follow' as a superordinate of the sense of 'chase'.

   In explaining the compositional meaning of sentences, semantic
markers combine in a way that represents the way in which the
senses of the parts of syntactically complex constituents combine.
One mode of marker combination is attachment of a semantic
marker representing the sense of a modifier as a branch under the
semantic marker representing the sense of its head. The composi-
tional meaning of the expression 'follow with the purpose of catch-
ing the followee' could be obtained in this way, starting with (18) as
the representation of the head and attaching a representation of the
modifier to form (17).

   Another way of obtaining semantic representations of composi-
tional meanings is the embedding of one semantic marker within
another. This form of marker combination takes place in the as-
pect of semantic markers that represents the argument structure
of predicates. Occurrences of 'X' with syntactic information in
brackets above the variable, such as in (17) and (18), are called
categorized variables. They mark argument places. Note that the
same categorized variable can occur more than once in a seman-
tic marker, as in the case of (17). In this way, we can represent,
inter alia, the fact that the sense of 'chase' identifies the object of
the chaser's purpose with what directs the course of the chaser's
activity. The placedness of a relation is, accordingly, specified by

the number of distinct categorized variables that occur in its representation.

The syntactic information in the brackets specifies the semantic representations that can be values of the variable. It specifies the representations in terms of the syntactic constituents to which they are assigned.[25] For convenience, we may represent such information in the form of Noam Chomsky's[26] grammatical functions. They pick out a constituent on the basis of its syntactic role in the sentence: for example, the functions [NP, S] and [NP, VP, S] pick out, respectively, the subject of a sentence (the noun phrase that is a constituent of the whole sentence but of no other constituent in it) and the direct object of the sentence (the noun phrase that is a constituent of the verb phrase).

The angles under an occurrence of a variable state a condition that tells us what structure a semantic representation must have to be the value of the variable. These *selection restrictions* ensure that the results of attachment and embedding operations are bona fide semantic representations of senses. They are formal means to block what philosophers have called *category mistakes*. For example, the senses of the subject and direct object in (19) are of the appropriate category to combine with the sense of the verb 'chase', but the senses of the subject and direct object in (20) are not, as shown by the deviance of (20):

   (19) The police chased the fugitive.
   (20) The polygon chased the number seventeen.

Thus we want the selection restriction in (17) to require that the semantic marker '(Concrete)' appear as the label of the root in the representations for subjects and direct objects of 'chase'. Such a requirement blocks the semantic representations of the subject and direct object of (20) from being values of the variables in (17), and, consequently, (20) receives no semantic representation. In this way, selection restrictions enable us to mark the degree of ambiguity of expressions and sentences, that is, to assign n semantic representations to sentences with n senses.

A theory of decompositional and compositional meaning in the above sense consists of a dictionary in which each lexical item is asso-

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[25] The syntactic information in categorized variables thus ensures that the semantic representations of terms go in their proper argument place in a predicate (for example, so that 'John loves Mary' is not represented as synonymous with 'Mary loves John').

[26] *Aspects of the Theory of Syntax* (Cambridge: MIT, 1965).

ciated with semantic markers representing its senses, a principle for assigning semantic markers from dictionary entries to occurrences of lexical items in sentences, rules for the compositional operations such as attachment and embedding, and a set of definitions of sense properties and relations stated in terms of formal features of semantic markers. With such a theory, the informal generalization (A) can be restated as (A*):

(A*) A semantic representation represents an analytic sense if it is of the form $P\{T_1,...,T_n\}$, where $P\{x_1,...,x_n\}$ is the predicate and $T_1,...,T_n$ are the terms occupying its argument places, and one of those terms, T_i, is of the form $P'\{T'_1,...,T'_n\}$, and $P\{x_1,...,x_n\}$ is a same-rooted subtree of $P'\{x_1,...,x_n\}$ and each term in $T_1,...,T_{i-1},T_{i+1},...,T_n$ is a same-rooted subtree of the corresponding term in $T'_1,...,T'_n$n.

Given (A*) and the representations (17) and (18), we can say that (16) has an analytic sense.

Such a theory enables us to state Wittgenstein's methodological constraint formally, as (B):

(B) A sentence's having a sense property or relation K is shown in a symbolism just in case a semantic representation of the sentence meets the definition of K.

Since a representation of (16) falls under (A*), (B) enables us to say that (16)'s analyticity is shown in our symbolism.

V. THE FULL DIMENSIONS OF THE PROBLEM

The good news is that a symbolism of the kind just sketched solves one aspect of the problem. The bad news is that it seems to put a complete solution beyond our reach.

First, the good news. W. E. Johnson[27] observed that "the understanding of the subject-term [in a "structural proposition" such as (5) expresses]...demands a reference of it to the general category there predicated of it," and that

...structural statements contain as their predicate some wide logical category, and their fundamental characteristic is that it is impossible to realize the meaning of the subject term without implicitly conceiving it under that category (*ibid.*, Volume II, p. 14).

Further, Johnson distinguished this relation from that of class membership, arguing that the relation of a determinate like 'red' to its determinable 'color' obtains in virtue of "a unique and peculiar kind of difference that subsists between the several determinates under

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[27] *Logic* (New York: Cambridge, 1921).

the same determinable" (*ibid.*, Volume I, p. 176).[28] The special mode of difference that unites the determinates under a determinable is that no two of them can simultaneously characterize the same thing. Something can be simultaneously both red and square, but not simultaneously both red and blue.

Further, a difference between the members of a pair of determinates under a determinable can be compared to a difference between the members of another pair under the same determinable, but such a comparison cannot be made across determinables. We can say that the difference between red and orange is less than the difference between red and blue, but we cannot sensibly say that the difference between red and orange is less than the difference between red and square. Finally, the determinates 'red', 'blue', and so on under the determinable 'color' are in themselves indefinable, since they have no internal structure in virtue of which they are color concepts.

Our formalism for semantic markers incorporates Johnson's insights. In particular, it incorporates his insight about the indefinability of color concepts.[29] We distinguish between primitive senses and simple senses. Primitive senses are not definable in the system of senses: the semantic markers representing primitives are not definable in terms of other markers. But primitive senses may be simple or complex: the semantic marker representing primitive senses may or may not have domination relations representing superordinate/subordinate structure.

This enables us to represent the senses of basic color terms as complex primitive senses.[30] Representing the senses of 'red' and

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[28] See also Arthur N. Prior, "Determinables, Determinates, and Determinants," *Mind*, LVIII (1949): 1-20 and 178-94; and John R. Searle, "Determinables and Determinates," in Paul Edwards, ed., *The Encyclopedia of Philosophy*, Volumes 5 and 6 (New York: Macmillan, 1969), pp. 357-59.

[29] We may take G. E. Moore to be right about the indefinability of color terms—see *Principia Ethica* (New York: Cambridge, 1903), pp. 5-21. Hence the notion that for something to be yellow is for it to appear so to normal observers in normal circumstances is not to be construed as a definition of the term 'yellow', but as a condition for something to have the property. For an account of how a condition can be a condition for something to have a property without its being part of the definition of the term, see "Analyticity, Necessity, and the Epistemology of Semantics."

[30] We characterize basic color terms as those whose decompositional sense structure involves nothing more than the determinable 'color' with a single hue designation as its determinate. If the determinate is qualified in terms of degree of saturation or brilliance, or if more than one hue determinate occurs, the term is not a basic color term. Thus the lexical items 'red' and 'blue' (as represented in (27) and (28)) are basic color terms, while 'mauve', being the concept of a color of a bluish blue-red of high saturation and of medium to low brilliance, is not a basic color term.

'blue' with the markers (21) and (22) says that those senses are
primitive but complex concepts:

(21)   (Color)
                              |
                            (Red)

(22)   (Color)
                              |
                            (Blue)

Since the terminal components in these representations of the
senses of 'red' and 'blue' have no status in the symbolism indepen-
dent of their status in (21) and (22), (21) and (22) represent the in-
trinsic connection that the determinates 'red' and 'blue' have to
their determinable 'color'.

We can now state some modest results. With the semantic marker
'(Color)' as the semantic representation of the word 'color', (5) and
similar sentences with other color words as their subject are analytic
on the basis of (A*). The analytic entailment of (4) by (2) and simi-
lar analytic entailments can also be marked on the basis of a defini-
tion for analytic entailment parallel to (A*). In effect, the
containment relation that (A*) requires $P\{T_1,...,T_n\}$ to bear to a term
T_i is the relation that the representation of an entailed sense must
bear to the representation of the entailing sense.[31] This solves one as-
pect of the problem. Given (B), the analyticity of the sentence (5)
and the analytic entailment of the sentence (4) by the sentence (2)
are shown as "contained in the *sense* of the...propositions."

Now for the bad news. The first sign of trouble comes when we try
to use the symbolism thus far set out to account for the analyticity of
a sentence like (23):

(23) Red is not blue.

Since the function of the English words appearing in semantic mark-
ers are purely mnemonic, semantic markers like (21) and (22) are
simply distinct symbols for distinct senses. Thus they do not distin-
guish antonymous terms like 'red' and 'blue' from merely nonsyn-
onymous terms like 'spouse' and 'parent'. (21) and (22) must be
appropriately modified not only to make this distinction, but also to

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[31] *Semantic Theory*, pp. 171-97.

enable us to represent (23) as analytic in the sense of (A*). But this means that the sense of the subject 'red' in (23) must literally contain the sense of the predicate 'not blue'. This is hard to imagine, but, to make matters worse, the sentences in (24) have to be represented as analytic as well, and this means that the senses of 'not green', 'not yellow', 'not brown', and so on must likewise be packed into the sense of the subject 'red':

(24) Red is not green, Red is not yellow, Red is not brown,....

Hence it appears as if the sense of every basic color term must somehow have the senses of all the other basic color terms as parts. Here it looks very much like our system, too, "begins to crack."

Once, not so long ago, only a tiny minority of philosophers, notably Arthur Pap and William and Martha Kneale,[32] held the view that sentences like (23) are synthetic. Now it is the majority view. Not surprisingly, the arguments for this view are variants on the theme that the sense of a basic color word cannot contain the sense of another basic color word. For example, C. L. Hardin[33] says:

There need be no occasion for a reflective green-seer to have had contact with red,...[hence] there is no reason to suppose that the concept of not being red is thereby part of her concept of being green; after all, not being a mastodon isn't part of the concept of being a lampshade, even though reflective people would be readily able to distinguish mastodons from lampshades (*ibid.*, p. 122).

At this point, the full dimensions of the problem are visible. Since literal containment provides the only alternative to Carnap's unacceptable way out of Wittgenstein's problem, it is essential for a solution. But literal containment appears to rule out a solution in the test case.

VI. HOW TO DO THE SEEMINGLY IMPOSSIBLE

I shall now show that, appearances to the contrary, (23) is analytic. To do this, we have to provide a compositional derivation of (23) which begins with representations of the senses of the lexical items in the sentence and ends with a representation of its sense on which the sense of its subject 'red' contains the sense of its predicate 'not blue'. The account of the derivation must indicate how, *mutatis mutandis*, we can give similar derivations for the other color sentences in question.

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[32] Pap, *Elements of Analytic Philosophy* (New York: Macmillan, 1949), p. 422; and Kneale and Kneale, *The Development of Logic* (New York: Oxford, 1962), p. 637.
[33] *Color for Philosophers: Unweaving the Rainbow* (Indianapolis: Hackett, 1986).

VI.1. Taking stock. Before turning to this derivation, we need to take stock of what we already know about the senses of the items 'red', 'be', 'not', and 'blue'. In an earlier work,[34] I developed an account of the sense concept of negation. This account takes off from the distinction between external and internal negation drawn by Arthur Prior[35] and others. Their distinction is based on scope. The scope of external nega- tion is the whole sentence, while the scope of internal negation is a phrase or smaller constituent. External negation is, of course, defined extensionally, in terms of truth and falsehood. But internal negation is defined extensionally, too, in terms of set-theoretic relations among ex- tensions of terms. Looking at internal negation through the lens of Fregean sense, intensionalists see another form of logical negation.

(D) allows us to carry the sharp sense/reference distinction we have drawn for the rest of the vocabulary through to the negative forms of the language. We are thus committed to defining internal negation *intensionally*. We can define it as an operator that converts senses in its scope into other senses. We may illustrate this with the antonyms in (25):

(25) perfect, flawed

'Not perfect' or 'imperfect' means 'flawed', and 'not flawed' or 'un- flawed' means 'perfect'. In this case, internal negation functions as an operation taking us from one sense to another, from one member of an antonymous *n*-tuple to the other. Here, the difference between the external negation of standard logic and the internal negation of language stands out clearly. The former is a toggle, a toggle between truth values. The latter is a toggle, too, but a toggle between senses.

Given that internal negation is a sense toggle, the internal nega- tion of a sense is some other sense which—as internal negation in connection with (25) illustrates—belongs to the same antonymous *n*-tuple. Since each of the members of an antonymous *n*-tuple have a common superordinate but stand in an exclusion relation to each other member, the internal negation of a sense is some one of its co- members. The sense of an internal negation is thus an operator, which we symbolize as "A/...," whose application to a sense yields an exclusive disjunction of the other senses in its antonymous *n*-tuple.

We already know some things about the senses of 'red' and 'blue'. One is that the hue concepts in those senses are determinates of the determinable 'color'. This means that (21) is part of the semantic

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[34] *Semantic Theory*, pp. 157-71.
[35] "Negation," in Edwards, Volumes 5 and 6, pp. 458-63.

representation of 'red' and (22) part of the semantic representation of 'blue'. We also know that those semantic markers are not full representations of 'red' and 'blue', since we know that (21) and (22) do not represent the antonymy of 'red' and 'blue'. The markers are all right as far as they go, but they do not go far enough.

Interestingly, we know something about the further parts of the markers that represent the antonymy of 'red' and 'blue'. Since (26) raises the same question for us as (23), the parts of the semantic markers for the senses of 'red' and 'blue' that represent their antonymy relations must be the same modulo the difference between (21) and (22):

(26) Blue is not red.

Moreover, since there is a set of sentences for (26) corresponding to (24), that is, 'Blue is not green', and so on, the semantic representation of a basic color term must somehow show its incompatibility with all other basic color terms. Hence the decompositional sense of a basic color term has to embody the antonymy structure of the entire system of basic color terms.

Here we come to the key point. A basic color term must express its incompatibility with all the other basic color terms without the senses of the latter themselves occurring in the sense of the former. The element of truth in the claim of Hardin and others is that one color concept is not part of another. Their mistake was to conclude from this that sentences like (23) are not analytic on the basis of the same containment relation found in (10) and (11). They overlook the possibility that the antonymy structure of the color words is embodied in their senses in a sufficiently abstract form for both this element of truth to be preserved and such sentences to be analytic.

VI.2. The derivation. To represent the antonymy structure of color words as abstractly embodied in their senses, the semantic markers (21) and (22) have to contain a further branch, Br, that expresses the antonymy of the color concept they represent with the other color concepts, but does so without semantic markers for them appearing in Br. Since Br is the same for the representation of every color word, we need only figure out what it is in the case of (21). To do this, let us think ahead to the critical step in the derivation at which Br is transformed into a branch Br* that represents the antonymy of the sense 'red' with the particular color concept 'blue'.[36] The semantic marker for the sense of 'blue' that enters Br at this step can only come from the representation of the

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[36] There must be such a step if the derivation is to provide a representation of (23) on which it is analytic.

sense of the word 'blue' in the verb phrase of (23). Since, as (24) shows, any color word could appear in place of 'blue' in this verb phrase, Br must contain a categorized variable at which to embed a representation of the sense of whatever color term we find in the verb phrase. This means that Br is a branch whose topmost marker '(Color)' dominates a complex symbol consisting of an occurrence of 'A/...' associated with a categorized variable whose value is a semantic representation of the constituent of the verb phrase containing the color term. Hence (27) replaces (21) as the semantic representation of the lexical item 'red':

(27)   (Color)
                       /   \
              (Red)   [F]
                      A/ X
                        /   < (Color) >

The syntactic information in [F] and the selection restriction together tell us that values of that variable are semantic representations of the predicate in the verb phrase just in case the superordinate marker in the semantic representation of the adjective is '(Color)'. Adding the Br to (22) provides (28) as the lexical representation of 'blue':

(28)   (Color)
                       /   \
              (Blue)   [F]
                      A/ X
                        /   < (Color) >

The copula 'be' is the one lexical item in (23) still requiring a representation. We introduce the schematic marker (29):

(29)   [Predicate , S]
                      X [NP , S]
                      < > X
                                   < >

It is modeled on the familiar notion of the application of the predicate concept in a subject-predicate sentence to the subject concept. The grammatical function '[Predicate, S]', which is read as "the constituent dominated by 'Predicate', dominated by 'S'," picks out the

predicate 'not blue' in (23). The function '[NP, S]', as indicated ear-
lier, picks out the subject of the sentence. (29) becomes the repre-
sentation of (23) when the variable categorized '[Predicate, S]' and
the one categorized '[NP, S]', respectively, are replaced with the rep-
resentations of the predicate and the subject of (23).

  Since the derivation of a representation of (23) describes its com-
positional meaning, the representation is a function of the afore-
mentioned representations of 'red', 'be', 'not', and 'blue', and the
syntactic relations among the constituents of (23). Those relations
can be depicted in the phrase marker (30) for (23):[37]

(30)
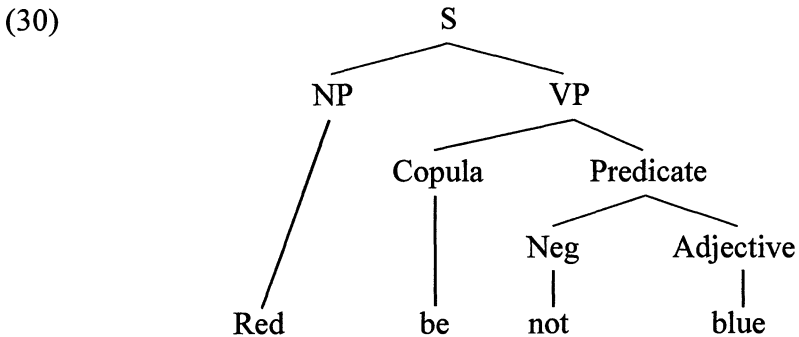
Since compositional principles work up from the most deeply em-
bedded constituents—the lexical items of the sentence—to the least
deeply embedded constituent—the entire sentence—the first step in
our derivation assigns semantic markers from the dictionary to the
terminal symbols of (30). At this step, (27) is assigned to 'red', (28)
to 'blue', 'A/...' to 'not', and (29) to the copula 'be'.

  The second step combines the representation of 'not' with the
representation of the adjective 'blue' to get (31) and assigns (31) as
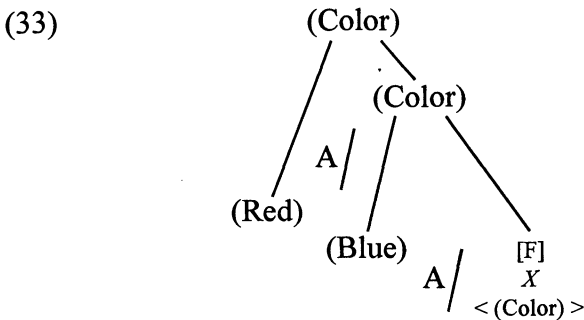the representation of the predicate 'not blue' in (30):
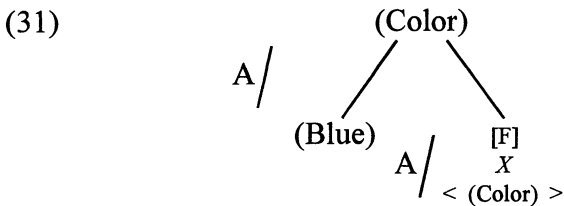
(31)

The third step makes (31), just assigned as the semantic representation of the predicate, the value of the variable in the semantic marker (29) that is categorized for representations of predicates. The result is (32), which is assigned as the semantic representation of the VP constituent in (30):

(32)

$$A \diagup \qquad (Color) \; [NP,S]$$

(with tree) (Color) [NP, S]
X
$< >$

A/

(Blue)
A/ [F]
X
< (Color) >
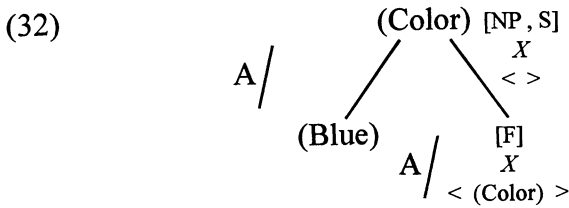
The fourth step provides a value for the categorized variable in the representation of the subject in (30). Since the semantic representation of the predicate, (31), has the marker '(Color)' as its topmost marker, it satisfies the selection restriction of the variable in (27), and becomes its value. The result, (33), is assigned to the subject in (30):

(33)

(Color)
(Color)
A/
(Red)
(Blue)
A/ [F]
X
< (Color) >

In the final step of the derivation, (33), which was just assigned as the representation of the subject in (30), is made the value of the variable categorized for the subject in (32), and the result, (34), is assigned to the sentence constituent in (30), and hence is the semantic representation of (23):[38]

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[38] The occurrences of the categorized variables do not remain in (34). When there is no semantic representation to provide the value of a variable, its value is the semantic marker in its own selection restriction. This principle is independently required to handle analytic entailments, such as that from 'The dog drank' to 'The dog drank a liquid'—see *Semantic Theory*, p. 107.

(34)
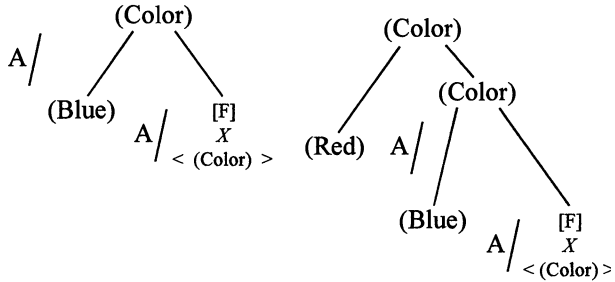
    VI.3. Analyticity and contradictoriness. (34) is of the form $P\{T_1,...,T_n\}$, $n \geq 1$. The semantic marker on the left of (34) which represents the predicate $P\{x_1,...,x_n\}$ is a same-rooted subtree of the semantic marker on the right which represents the term T_i, and hence (A*) marks the sense represented by (34) as analytic.

    Similarly, sentences like (1) and (35) can be marked as contradictory on the basis of representations like (27) and (28):

    (35) Red is not red.

On the definition of contradictoriness, a sense of a sentence is contradictory if either there is an antonymy among its predicates or there is an antonymy between its predicates and its terms (*ibid.*, pp. 180-81). (1) is an example of the former type of contradictoriness, and (35) is an example of the latter. In the case of (1), (27) and (28) are each values of the occurrence of the variable in the other. When these saturated semantic markers become the value of the variable categorized '[Predicate, S]' in the occurrence of (29) assigned to the copula of (1), the sentence will be represented as having an antonymy relation between its component predicates, and so be marked contradictory. In the case of (35), each occurrence of (27) will be the value of the variable in the other occurrence. When these saturated semantic markers replace the variables categorized '[Predicate, S]' and '[NP, S]' in the occurrence of (29) assigned to the copula of (35), the result is a semantic marker that represents (35) as having an antonymy between its predicate and term. Thus (35) will be marked contradictory.

VII. THE REMAINDER OF THE SOLUTION

Since, for us, analyticity and contradictoriness are relations internal to the senses of sentences of a language, not relations between sentences and the world, section VI is not yet a complete solution to Wittgenstein's problem. We have still to explain why and in what

sense analytic sentences like (23) are necessary truths and contradictory sentences like (1) are necessary falsehoods.

VII.1. The explanation. I shall not argue that analytic sentences are straightforward necessary truths. The topic of whether they are is better left for another time.[39] In any case, such a construal of them is not open to us, since it would treat the senses of the sentences in question as logical forms and analyticity as a species of logical truth. Fortunately, Saul Kripke's[40] notion of weakly necessary truth does just as well for present purposes as necessary truth: "We can count statements as necessary if whenever the objects mentioned therein exist, the statement would be true" (*ibid.*, p. 137). In this spirit, let us adopt the definitions (WNT) and (WNF):

> (WNT) A proposition p is a *weakly necessary truth* if and only if p contains no inconsistency among its terms and p is true in all possible worlds where each of the terms in p occurring in a referential position has a nonempty extension.[41]
>
> (WNF) A proposition p is a *weakly necessary falsehood* if and only if p contains no inconsistency among its terms and p is false in all possible worlds where each of the terms in p occurring in a referential position has a nonempty extension.

If a sense of a sentence is analytic, it is a weakly necessary truth. The reasoning behind this is as follows.[42] Given p is analytic in the sense of (A*), p has a term t that contains the entire sense p. If there is no inconsistency among the terms in p, there are worlds in which there are things of which p is true or false. Since the truth conditions

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[39] To show this requires construing simple sentences like (10) and (11) as material conditionals to deal with worlds in which there are no bachelors or colors for such sentences to be true of. Construing simple subject-predicate sentences as compound sentences was Frege's device for, inter alia, bringing subject-predicate sentences under his definition of analyticity. Such construals, as I argue in *Sense, Reference, and Philosophy*, are dubious linguistics, because they distort the grammar of simple sentences. As David Wiggins and others have pointed out, universal sentences like (10) are not complex sentences formed with the sentential connective 'if, then', and particular sentences like 'Some bachelors are single' are not complex sentences formed with the sentential connective 'and'— "'Most' and 'All': Some Comments on a Familiar Programme, and on the Logical Form of Quantified Sentences," in Mark Platts, ed., *Reference, Truth, and Reality* (New York: Routledge, 1980), pp. 318-46.

[40] "Identity and Necessity," in Milton Munitz, ed., *Identity and Individuation*, (New York: University Press, 1971).

[41] For an explanation of the notion of a referential position that appears in the definitions (WNT) and (WNF), see my "A Solution to the Projection Problem for Presupposition," in Choon-Kyu Oh and D. A. Dinneen, eds., *Syntax and Semantics, Volume 11: Presupposition* (New York: Academic, 1979), pp. 91-126.

[42] "Analyticity, Necessity, and the Epistemology of Semantics," pp. 24-25.

for p are included in the conditions for the extension of t, p is true in all those worlds. Hence p is a weakly necessary truth. Since (23) is analytic in the sense of (A*) and has no inconsistency among its terms, it is a weakly necessary truth. Thus, being red is necessarily connected with not being blue.

If the sense of a sentence is contradictory, then it is a weakly necessary falsehood. Since (1) and (35) are contradictory and evaluated only on worlds where there is something for them to be true or false of, they are weakly necessary falsehoods. Thus, 'red' and 'blue' are necessarily exclusive and 'red' and 'not red' are necessarily exclusive.[43]

VII.2. The notion 'inside logic'. As we saw at the end of section II, a solution to Wittgenstein's problem requires that senses be both outside and inside logic. I explained above how senses can be outside logic. I shall now explain how they can also be inside logic. Sense is inside of logic in that senses play an essential role in the connection between sentences and logical properties like weakly necessary truth and weakly necessary falsehood. As we just saw, the sense structures underlying analyticity, contradictoriness, and analytic entailment are, inter alia, part of the explanation of why (5) and (23) are weakly necessary truths and why (1) and (35) are weakly necessary falsehoods. It is easy to see that sense structure plays the same role in explaining why inferences like those from (2) to (3) and (2) to (4) are valid. Since senses provide the fine-grained linguistic structure necessary for a model-theoretic explanation of why such sentences have such logical properties and relations, senses are inside logic in precisely Wittgenstein's sense of "hav[ing] an effect on one proposition's following from another."

VIII. WHY THE SEEMINGLY IMPOSSIBLE SEEMED IMPOSSIBLE

Why did it seem impossible for the sense of 'red' in (23) to contain the sense of 'not blue'? The answer that emerges from our discussion is that no distinction was made between the meaning of a word *in isolation* and the meaning of a word *in a sentence*. To be sure, it is impossible for the sense of the lexical item 'red' to contain the sense 'not blue', but the case of a word in a sentence is different. It is different because the sense of a word in a sentence can have sense components which are not part of its sense as a lexical item but come

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[43] Weakly necessary truth is not only the referential correlate for analytic sentences, it is also the correlate for denials of contradictory sentences. Hence the sentence 'It is not the case that the spot is red and blue' is a weakly necessary truth. Correspondingly, weakly necessary falsehood is not only the referential correlate of contradictory sentences, it is also the referential correlate for sentences that are denials of analytic sentences. Hence the sentence 'It is not the case that red is not blue' is a weakly necessary falsehood.

into the latter from the senses of other constituents in the sentence. Compositionality makes the difference. Failing to note this, philosophers assimilate the case of words in a sentence to the case of words in isolation, thereby taking a genuine impossibility intuition about the latter to apply to the former, where it does not apply at all.

Restricted to lexical concepts, Hardin's claim that "the concept of not being red is...[not] part of [the] concept of being green" expresses an uncontroversial truth. But such claims are intended to apply generally, and they must do so in order for them to support the view that Wittgenstein's problem has no solution. But if the claims do apply generally, they apply to senses of words in sentences, and then, as we have seen, they are false.[44]

IX. WHY THERE IS NOT A CONFLICT BETWEEN INTUITION AND LOGIC

Philosophers saw Wittgenstein's problem as posing a conflict between intuition and logic. It is true that sentences like (1)-(6) have the semantic properties and relations that intuition tells us they have. It is also true that the components of (1) are elementary propositions, that (2), (4), (5), and (6) are themselves elementary propositions, and that (3) is the negation of an elementary proposition, and hence it is true that those sentences cannot have their semantic properties and relations on the basis of their logical structure. But there is no inconsistency between intuition and logic because the semantic structure on the basis of which the sentences have those properties and relations is not logical structure. The alleged conflict between intuition and logic disappears once we stop thinking that semantics, in both senses of this ambiguous term, is logic.[45]

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[44] Hardin is correct to claim "not being a mastodon isn't part of the concept of being a lampshade." But Hardin's example 'A lampshade is not a mastodon' is hardly a parallel case to (23). Hardin's example is not analytic, while, as we have seen, (23) is. The difference lies in the fact that the sense of 'red' and the sense of 'blue' are members of the same antonymous n-tuple, whereas the sense of 'lampshade' and the sense of 'mastodon' are not members of the same antonymous n-tuple, but only contain senses (that is, the senses 'artifactual' and 'natural') that are. This difference allows the sense of 'mastodon', the predicate in Hardin's example, to contain senses that do not appear in the sense of 'lampshade', the subject in that example. Thus Hardin's example is not analytic. But, although it is not, it is a weakly necessary truth because it is the denial of the contradictory sentence 'A lampshade is a mastodon', and being a weakly necessary truth is also the referential correlate of being the denial of a contradictory sentence.

[45] This is not an isolated case. The same thinking underlies a number of other alleged conflicts: for example, the conflict between Millian and descriptivist views of names and the conflict between internalist and externalist views of meaning. See my "Names without Bearers," *Philosophical Review*, CIII, 1 (1994): 1-39; and B. Armour-Garb and my "What's in a Name" (to appear) regarding the former, and "Analyticity, Necessity, and the Epistemology of Semantics" regarding the latter.

X. A METAPHYSICAL CODA

The failure of Frege/Carnap's semantics was presumed to show that dissolution is the only way out of the problem. Since dissolution, of both the Wittgensteinian and Quinean type, would leave the rationalist with no basis for claiming that knowledge of color incompatibility is a priori, it is seen as removing a major obstacle to naturalized epistemology and hence as a success for naturalism and empiricism.[46] This perception has led to a shift in the focus of contemporary philosophy from efforts to explain modal facts about color incompatibility to efforts to explain why intuition misled us and why it is so difficult to find a plausible example of something simultaneously red and blue.[47] Naturalists and empiricists are now pursuing approaches to such explanations, which, at one extreme, represent a return to something like Husserlian phenomenology, and, at the other, represent a return to something like Spencerian biologism.[48] The present paper opposes this claim of a success for naturalism and empiricism.

Initially, the paper might seem to support empiricism. That is because a central theme of logical empiricism was that the statements

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[46] See, for example, Arthur C. Danto's remarks in Hardin's *Color for Philosophers: Unweaving the Rainbow*, pp. x-xii, and Hardin's remarks, pp. 121-27.

[47] Danto (*ibid.*, p. xii) engages in a bit of rationalist bashing on the basis of Hewitt Crane and Thomas P. Plantanida's interpretation—"On Seeing Reddish Green and Yellowish Blue," *Science*, CCXXI (1983): 1078-80—of the reports of some of their subjects as to what they see when looking at the point where a field of red and a field of green merge. The reports are supposed to demonstrate that sentences like (2) and (6) can both be true in application to the same spot. Quite apart from the conflation of the cases Hardin calls "conjoining" and "compounding," this jumps the gun. As Hardin himself observes, there was no replication of the experiment as of the time of his writing and, as he also observes, the experiment has been "greeted with widespread skepticism in the visual-scientific community" (*ibid.*, p. 125). Moreover, why take the interpretation of the reports of the subjects in question at face value? It is not as if the responses of the subjects in the experiment were uniform, or as if one could not come up with other explanations of the responses of the subjects in question. Taking their responses, or similar responses of people in various homespun experiments, as veridical reports of a homogeneously red and green surface is as misguided as taking comparable reports about figures in the area where a series of polygons merge into a circle as establishing that there are figures which are simultaneously a polygon and a circle.

[48] On the phenomenological side, there is Colin McGinn's claim that sentences like the negation of (1) express "necessities of how the world can seem in perceptual experience"—*The Subjective View* (New York: Oxford, 1983), pp. 21-28. McGinn's phenomenology does not solve Wittgenstein's problem because a solution to that problem is under the modal constraint of showing that the negation of (1) is necessarily false in the Leibnizian sense of holding in no possible world. On the Spencerian side, there is Quine's approval of evolutionary explanations of certain "structural traits of color perception"—Quine, *Ontological Relativity and Other Essays* (New York: Columbia, 1969), p. 90.

about color that we have been considering are analytic a priori truths. By exhibiting "the contradiction [as] contained in the *sense* of the two propositions," our symbolism provides a solution on which knowledge of color incompatibility is indeed analytic a priori knowledge. But the notion of analyticity that our argument justifies is not the Frege/Carnap notion that expands the class of analytic truths to encompass the necessary truths. Instead, it is the mereological notion which contracts that class so that virtually all logical and mathematical truths are synthetic. Thus, acceptance of our solution to the color incompatibility problem entails, for the empiricist, the undesirable consequence that the problem of synthetic a priori knowledge reemerges for logical and mathematical truths generally.

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