COMPOSITIONAL IDIOMS

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In this article we argue that there is a large class of expressions, typified by *plastic flower*, *stuffed animal* and *kosher bacon*, that have a unique semantics combining compositional, idiomatic and decompositional interpretation. These expressions are compositional because their constituents contribute their meanings to the meanings of the wholes; they are idiomatic because their interpretation involves assigning dictionary entries to nonterminal elements in their syntactic structure; and they are decompositional because their meanings have proper parts that are not the meanings of any of their syntactic constituents. We argue that extensionalist semantics, on which the meaning of an expression is a function from domains to extensions in those domains, cannot provide an adequate account of the semantics of these expressions, and that supplementation with a theory of pragmatic interpretation does not improve the situation. We show how our account explains the intensionality and the productivity of these expressions.*

1. INTRODUCTION. The title of this article seems to be an oxymoron. Compositional expressions are ones whose meaning is a function of the meanings of their subconstituents and their syntactic relations. Idioms, in contrast, are expressions whose meaning does not depend on the meanings of their subconstituents. Although it appears at first that the present article could no more have a subject than one bearing the title *Round Squares*, appearances are deceiving. The expressions in 1 have a meaning that is both compositional and idiomatic.

(1) a. plastic flower
b. stuffed animal
c. kosher bacon
d. rubber chicken

More specifically, these expressions all have readings involving the concept of an IMITATION, which is not derivable from either the head noun or the modifier directly. *Plastic flower* means (on one sense) something like 'imitation flower made of plastic', *stuffed animal* something like 'imitation animal made with (or by) stuffing', *kosher bacon* something like 'imitation bacon made in accordance with kosher dietary restrictions', and so on. As in the case of standard idioms (*kick the bucket*, *spill the beans*), this underived interpretation is directly assigned to the expression as a whole. Yet, unlike idioms, the expressions in 1 have meanings partly determined by the meanings of their constituents: *plastic flower* means 'imitation flower made of plastic', *rubber chicken* means 'imitation chicken made of rubber', and so forth. Moreover, also unlike idioms, but like compositional expressions, these expressions are PRODUCTIVE. Thus, we have *plastic tulip*, *silk flower*, *stuffed elephant*, *kosher Canadian bacon*—all with related and predictable meanings.[1]

The discovery of a phenomenon combining compositionality and idiomaticity neces-

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[1] An additional interesting feature of these expressions, to be discussed below, is that on their imitation readings they are semantically NONCONJUNCTIVE: plastic flowers are not things that are plastic and flowers, stuffed animals are not things that are stuffed and animals, and so on.

sitates a revision in the way we understand those concepts in descriptive semantics.[2] In this article we describe the implications of the phenomenon for the nature of compositionality and idiomaticity and for our understanding of the mechanisms of compositional combination and idiom interpretation.

Our study of compositional idioms has implications for both descriptive and theoretical semantics. The principal implication for theoretical semantics is to strengthen the case for an intensional theory of meaning in linguistic semantics. In the seventies, extensional theories of linguistic meaning gained ascendency over intensional theories. This, as we see it, resulted from two factors. One was the growing influence in linguistics of Quine's skepticism about theories of meaning (1960, ch. 2, 1953, 20–64). The other was the increasingly broad application of model-theoretic logic in linguistic semantics, as an attempt to solve all the problems of a troubled area in one field by importing a newly developed apparatus from another field. Given the collapse of Quine's skeptical arguments against intensional theories of meaning, something which he himself (Quine 1990; also Clark 1993) now seems to acknowledge, and the fact that it is becoming increasingly clear that fundamental problems of linguistic semantics have not yielded to the application of model-theoretic apparatus, it is time to reexamine the wisdom of continuing to rely exclusively upon purely extensional approaches to meaning.

Today, the Davidsonian and Carnapian theories of meaning are the two most popular extensional approaches. Both conceive of linguistic meaning as functions from a domain to a set of objects belonging to the domain. Davidsonian and Carnapian theories differ in whether the domain for the interpretation of a language is restricted to the actual world or includes other possible worlds as well. Philosophers and linguists working within these approaches are confident that the apparatus of extensional functions can be extended to cover any semantic phenomena in natural language, and, hence, they think that a purely referential semantics is all that is needed for natural language. They thus think that theories that postulate senses—nonextensionally individuated intensions—are unmotivated, and, hence, eliminable on grounds of simplicity.

We will argue that the semantics of compositional idioms shows that extensional functions are inappropriate for the description of sentence meaning within grammar, and, further, that the proper form for such description is representations of senses. This is not to claim that extensional functions have no significant role in linguistic semantics, but to claim that their role is confined to relating the expressions whose senses are represented in the grammar to their referents in the domain of the language. The two meanings of the term SEMANTICS—'theory of sense' and 'theory of reference'—must be kept separate.

To be sure, this line of criticism is not new. Previous studies have criticized extensional approaches on the basis of other semantic phenomena, such as the selective way in which an evaluative adjective like *good* operates compositionally (a point to which we will return), the fine-grainedness of the synonymy relation, opacity, and the compositional meaning of certain types of action sentences (see Katz 1986, Katz et al. 1985 and Ravin 1990). But a new phenomenon can often make old points more forcefully,

[2] Some recent work on idioms (e.g. Nunberg et al. 1994, Jackendoff 1995) has challenged the orthodox construal of idioms as semantically noncompositional, claiming that the combination of compositionality and idiomaticity is in fact quite common. The expressions we study here are quite different from those studied by Nunberg et al.: they are NOT idioms, but, as suggested in the text, a distinct kind of expression with a unique semantics (which is in certain respects LIKE the semantics of idioms as classically construed).

both because the freshness of the phenomenon can provide a clearer view of the issues and because the new phenomenon extends a pattern encountered elsewhere.

The family of expressions typified by the compositional idioms in 1 has a unique semantics combining elements of compositional and idiomatic interpretation that resists a fully adequate analysis in purely referential terms—including those of such sophisticated extensionalist theories as Montague semantics and the thematic role theories of generative grammarians. We will also argue that Gricean and more recent pragmatic theories, which are often invoked to take up interpretive slack left by an extensionalist semantics, do not apply in cases like 1.

2. EXTENSIONALIST EXPLANATION. The theory of a language must explicate the ways in which the meaning of a syntactically complex expression of the language depends upon the meanings of its constituents and their syntactic relations. The construction of a compositional semantics for a natural language involves the identification of semantically relevant syntactic operations and the provision of semantic operations corresponding to them. One prominent example of such a syntactic operation is modification. In modification, a noun, adjective, adverb or preposition (or phrase headed by such item) is attached to another noun, adjective, adverb or preposition (or phrase headed by such item) to yield a complex expression of the same syntactic category as the head.

On the Davidsonian and Carnapian approaches, the semantic operation corresponding to modification is an extensional function. We will consider such functions in the Carnapian approach because it is the more general form of the two in making use of the apparatus of possible worlds. INTENSIONS in the Carnapian approach are not intensions in the sense of traditional intensionalism, but functions from indices (ordered n-tuples consisting of a possible world plus further entities such as a time or context), to extensions (sets, sets of sets, ordered n-tuples, truth values, etc.). We shall refer to them as CARNAPIAN INTENSIONS or more simply EXTENSIONAL FUNCTIONS to avoid confusion.

In the most basic cases, the compositional meaning of a modifier-head construction is a simple set-theoretic function of the extension of the modifier and the extension of the head. In such a semantics, the function is conjunctive: the extensions of the head and the modifier are the sets of objects to which they apply, and the extension of the phrase is the intersection of those sets. Thus, for example, the extension of the phrase *female senator* is the set of objects that are both female and senators. Cases involving intensional modifiers, such as *former senator* (whose extension is not a function of the extensions of its parts),[3] can be accommodated in a referential semantics by treating the Carnapian intension of the modifier as a higher-order function that operates on the Carnapian intension of the noun it modifies.

The extension of *former senator* in a world w at a time t is the intersection of the

[3] Substitutivity and existential generalization fail within the scope of *former*, as the following examples show.

(i) Brown was the first mayor of Normaltown, and Smith was its first chief of police. Now, however, Jones holds both offices.

The extensions of *mayor of Normaltown* and *police chief of Normaltown* are the same (viz., Jones), while the extensions of *former mayor of Normaltown* (viz., Brown) and *former police chief of Normaltown* (viz., Smith) are different.

(ii) a. Ringo Starr is the former drummer of the Beatles.
b. (∃x)(Ringo Starr is the former drummer of x).

The inference (iia–b) is invalid. There needn't be, at time t, a thing x such that Ringo Starr is the former drummer of x at t in order for Ringo Starr to be the former drummer of x at t.

complement of the set of senators in *w* at *t* with the union of all sets of senators in *w* at times earlier than *t*.[4] The Carnapian intension of *senator* picks out sets of senators across all worlds and times, and the Carnapian intension of *former* selects from among them and effects set-theoretic operations appropriate to yield the desired extension for the phrase. Thus, though the semantics of such expressions is not conjunctive (the extension of *former senator* is not the set of objects that are former and senators), it is compositional: the Carnapian intension of *former senator* is determined on the basis of the Carnapian intensions of *former* and *senator* and their syntactic combination. Moreover, given that Carnapian intensions are individuated extensionally, that is, two intensions are identical if and only if they determine the same extensions in all possible worlds, the semantics of *former* phrases is also extensional. The core idea of extensionalist semantics—that interpretation is a matter of directly relating expressions to the world—is thus preserved, in spite of what at first looked like a counterexample.

Examples like those in 1 also present a challenge to the core idea of extensionalist semantics. It is intuitively clear that their meanings are not conjunctive in the manner of *female senator*: female senators are senators, but plastic flowers are not flowers, stuffed animals are not animals, kosher bacon is not bacon, and vegetarian chicken is not chicken. Contrast the expressions in 1 with other expressions containing the same modifiers, such as *plastic bag*, *stuffed mushroom*, *kosher chicken*, and *vegetarian pizza*, or the same head nouns, such as *edible flower*, *feline animal*, *Canadian bacon* and *free-range chicken*, all of which have straightforwardly conjunctive senses. Moreover, the expressions in 1 appear to be intensional as well, exhibiting failure of both substitutivity and existential generalization at the head-noun position (for example, *unicorn* and *minotaur* are coextensive at the actual world, but *plastic unicorn* and *plastic minotaur* are not, likewise *stuffed unicorn* and *stuffed minotaur*; the inference from *Elvis has a plastic son of God on his dashboard* to *(∃x)(Elvis has a plastic son of x on his dashboard)* is invalid). (We shall return to this point below.)

These facts suggest that the core idea of extensionalist semantics might be preserved by an application of the apparatus of higher-order extensional functions, as in the case of *former* compounds. There is an initial doubt that such a move will work for all of our cases, since the modifier in the case of *former senator* is syncategorematic, while the modifiers of compositional idioms refer (plastic flowers are plastic, stuffed animals are stuffed, kosher bacon is kosher, etc.). Moreover, if the Carnapian intension of modifier *M* in a compositional idiom is a function picking out sets of things that are *M* at all indices, and the intension of a head *H* is a function picking out sets of *H*s at all indices, then the values of these functions will always be, respectively, sets of *M*s and sets of *H*s (e.g. sets of plastic things and sets of flowers). We will argue, however, that there are no distinctions among the extensions of either the modifiers or the heads of compositional idioms across different indices that could be exploited to construct for them correct extension-determining intensions as a function of the intensions of their parts.

The analysis of *former* succeeds because the property of being a former F involves the property of being an F in an extensional way: an object can only be in the extension

[4] Generally:

$$[\![\text{former F}]\!]^{M,wn,tm} = \overline{[\![F]\!]^{M,wn,tm}} \cap \cup [[\![F]\!]^{M,wn,tm}, \text{ for all } m < n]$$

(This analysis corrects an error in the example used to introduce Carnapian intensions in Dowty et al. 1981 and Chierchia & McConnell-Ginet 1990. On the analysis found in these texts (and others that follow them), the extension of *former F* includes present Fs.)

of *former F* if it at one time was in the extension of *F*.[5] The extension of *former F* may thus be constructed out of the complement of the present set of Fs and sets of past Fs using the intensions of *former* and ⌜F⌝ in the way shown above. The past-F/present-F/future-F distinction yielded by including temporal coordinates in indices can be exploited to construct a function that gets the extension of *former F* right. But plastic flowers never were or will be flowers. Indeed, on the reading concerned here, plastic flowers COULDN'T BE flowers; mutatis mutandis for the other expressions in 1.[6]

How should these intuitive facts be explained? Note, to focus on our representative case, that the necessary incompatibility of being a plastic flower and being a flower can't be either logical or semantic. Though such incompatibility might explain why plastic flowers are not flowers, if it were due to the meanings of *plastic* and *flower*, *plastic flower* would have to be either contradictory or semantically anomalous. But *plastic flower* is neither; indeed, if it were, it would necessarily be referentially vacuous.

But if it is logically and semantically (though perhaps not biologically) possible for flowers to be made of plastic, what of the intuition that the referents of *plastic flower*, *wooden Indian*, and *rubber chicken* are necessarily not flowers, Indians, and chickens?

The answer we propose is that *plastic flower* and the other expressions in 1 are AMBIGUOUS between a conjunctive sense, on which, for example, a plastic F is both plastic and an F, and a nonconjunctive sense, on which a plastic F is plastic and an imitation F. The senses of *plastic flower* et al. on their nonconjunctive readings include a component that is not derived from either of their syntactic constituents. Though this ambiguity is not obvious in the case of *plastic flower*, notice that it is for other expressions of the kind illustrated in 1. A plastic heart, for example, can be either a heart in someone's chest pumping blood through her body or a biology class model of a heart that is incapable of functioning as a pump. We live in a world in which *plastic heart* has a nonempty extension on both senses of the ambiguity. Even clearer is the case of *stuffed animal*. A stuffed animal can be a toy (made by some process involving stuffing), and, hence, not an animal, or a taxidermied animal—an animal that is stuffed. Here again we have nonempty actual-world extensions on both readings.

Plastic flower is only contingently different. In the actual world there are no real flowers made of plastic, only fake ones. But there are possible worlds in which there are real flowers made of plastic. The biological, chemical or physical laws in those worlds may or may not be substantially different from those of the actual world. For all we know now, science may one day revolutionize the artificial flower industry by discovering how to grow such botanoids. In any case, the worlds in which real flowers made of plastic grow naturally are to some degree remote from ours. The nonobviousness of the ambiguity in the case of *plastic flower* is due to the relative remoteness of the possible worlds in which its conjunctive reading has a nonempty extension. *Kosher bacon* is a complimentary case, since we have to travel to other possible worlds (in which kosher laws are different) for kosher bacon in the conjunctive sense.

Now, the property of being a plastic flower does not involve the property of being

[5] We assume here an identification of the senses of predicates and properties. This is a fairly common assumption in philosophy of language and philosophy of mind. (Montague, for example, thought of his notion of an intension as a reconstruction of the notion of a property (see Montague 1974).)

[6] We will take cases like *plastic flower*, *rubber chicken*, *glass eye*, etc., to be representative of the class of compositional idioms (and *plastic flower* to be representative of this subclass). The differences of detail among the examples in 1 will not affect the applicability of the points we make with respect to *plastic flower* et al. Where appropriate, we note what some of the differences are, and how they might be accommodated. (See for example §5.)

a flower in the way that being a former senator involves the property of being a senator. Thus, the Carnapian intension of *plastic* cannot be construed as an operator on the Carnapian intension of *flower*; and the same is true for all of the other modifiers in this class. Nor is it feasible to treat the Carnapian intensions of the heads as operators on the Carnapian intensions of the modifiers. Note that a Montague grammar will already assign to the heads as their Carnapian intensions functions on indices, not other intensions. Moreover, even if the heads were reassigned a higher-order function, it is difficult to see how the assignment could be exploited to yield the correct extension. The intension of *plastic*, for example, is a function picking out sets of plastic things, at all indices. Which among these sets, or the sets constructible from them, is the correct extension of *plastic flower*? And how is it determined by the Carnapian intension of *flower*?

If, as just suggested, the correct extension for *plastic flower* in a domain is a set of imitation flowers made of plastic, then the Carnapian intension of *flower* would have to be an extensional function that picks out the subset of things in the extension of *plastic* that are imitation flowers. But how plausible is this as a gloss on the meaning of *flower*? The Carnapian intension assigned to *former* is a principled reconstruction of the intuitive sense of that word within an extensionalist approach. But the present proposal is entirely ad hoc. It amounts to glossing the sense of *flower* as *imitation flower*. What's more, it assigns implausible interpretations to expressions like *real flower* (?'real imitation flower'), *fake flower* (?'fake imitation flower'), and *edible flower* (?'edible imitation flower').

If neither the extensions nor the Carnapian intensions of the expressions in 1 are functions of the extensions/Carnapian intensions of their parts, then, an extensionalist semantics (e.g. Montague-style semantics) will have to treat them as semantically primitive. Carnapian intensions of primitive expressions are simple extension-determining functions with no internal structure; they are simply correlations of expressions with extensions at all indices. The loss of generality in taking such expressions to be primitive is excessive: each expression in 1 would have to be treated as a separate case. Intuitively, however, these expressions are PRODUCTIVE. Treating them as primitive would sacrifice productivity to ideology.

We conclude that an extensional semantics cannot do justice to the intuitive meanings of modifier-head compounds like those in 1. We further claim that this failure is due to the fact that extensional functions are individuated only by aspects of the syntactic structure to which they apply, and by aspects of the domain. In the final section of this article, we will explain why this restriction prevents us from capturing the nonextensional contributions of the meanings of the modifier and head in the expressions in 1 to the meaning of the whole construction.

3. THEMATIC EXPLANATION. We claim that *plastic flower* is semantically ambiguous, meaning either 'flower made of plastic' or 'imitation flower made of plastic'.[7] We note the existence of a certain parallel with the ambiguous expressions 2 and 4.

(2) old friend
(3) friend who is old
(4) poor man
(5) man who is poor

Old friend has the sense 'aged friend' and the sense 'friend of long standing'. The fact

[7] We will have more to say by way of defending this claim in subsequent sections.

that 3 has only the sense 'aged friend' suggests that the ambiguity of 2 is not due to the ambiguity of *old*. Likewise, 4 may mean either 'impoverished man' or 'pitiable man'. Similarly, the fact that 5 can mean only 'impoverished man' suggests that *poor* is not itself ambiguous. The same facts obtain for *plastic flower* and the other expressions in 1. *Plastic flower* may mean either 'flower made of plastic' or 'imitation flower made of plastic', while 6

(6) flower that is plastic

can mean only 'flower made of plastic', suggesting that *plastic* is not ambiguous between 'made of plastic' and 'plastic-imitation'.

These parallels suggest both that the sort of extensional semantics considered above will not adequately account for the ambiguity of 2 and 4, and that an explanation in one case will work in the other.

Some linguists have attempted to explain the facts about 2 and 4 in terms of thematic roles. Given the similarities between these facts and the facts about the expressions in 1 on their nonconjunctive senses, it would be natural to try to apply the thematic-role apparatus to explain the nonconjunctive senses of the expressions in 1.

Thematic roles enter the linguistic literature with Fillmore 1968 and Gruber 1965. Fillmore introduced his conception of CASE, and Gruber his conception of THEMATIC RELATION, to explain certain conceptual relations that they claimed hold between a verb and its arguments, and that they felt were not captured by the traditional grammatical relations and cases. Cases and thematic relations are meant to characterize the arguments of a verb in terms of the roles their referents play in the state of affairs or event denoted by the sentence—such roles as *agent*, *source*, *goal*, and *instrument*.

For our purposes, the important difference between these two theories is that Fillmore stipulates a one-one correspondence between Cases and syntactic arguments, while for Gruber the correspondence between thematic relations and arguments is, typically, many-one. Thus, the Case structure of a predicate is isomorphic to its first-order logical form, whereas thematic relations may introduce additional CONCEPTUAL argument structure, either overlaid on or in addition to syntactic argument structure.

This contrast is preserved among contemporary semantic theories that employ the construct of a thematic role. The biuniqueness of syntactic argument and Case in Fillmore's theory is reduplicated in the THETA-CRITERION of Chomsky's government and binding (GB) syntax (see Chomsky 1981:36). Chomsky, however, does not make use of the content of theta-roles (the relevant principles distinguish only between having and not having one): the theta-criterion is a condition on syntactic well-formedness. Thus, since the difference between the assignment of, say, AGENT, as opposed to THEME, does not register in the syntactic structure of a sentence, it is ignored by the theory. Some theorists have even gone as far as to IDENTIFY theta-roles and argument places.[8]

Jackendoff's semantics reflects the basic approach of Gruber. In Jackendoff's work, thematic roles are identified with relational notions defined structurally over conceptual structure (1990:47), where the conceptual structure of a predicate is not constrained to match its syntactic argument structure. The need for such freedom at the semantic level is shown by the existence of syntactically unrealized argument places in the decompositional sense structure of verbs. As Katz argued (1972:332–46), *buy* and *sell* have senses with a syntactically unrealized argument place for terms expressing the

[8] See Van Riemsdijk & Williams 1986:241: 'the terms theta-role and thematic relation are synonyms for argument'.

concept of a sum of money (cf. the redundancy of *Jack bought the magic beans for a sum of money*).

Higginbotham's (1985, 1987, 1989) thematic theory, which will be the focus of our discussion, is closely related to Chomsky's theta-theory, and thus has its roots in Fillmore's work. An element of Gruber's approach enters Higginbotham's theory, however, in the latter's recognition of the possibility of syntactically unrealized, or so-called conceptual, argument structure—though, like Chomsky (and unlike Jackendoff), Higginbotham makes no use whatever of thematic content. *Big* and *toy*, for example, though syntactically monadic, are analyzed by Higginbotham as conceptually dyadic. He glosses *big butterfly* as *big-for-a-butterfly* (generally, big(x) ≡ [big-for-a-(y)](x)); and *toy gun* as *toy-for-a-gun* (i.e. as it were, toy-in-a-gunnish-way; generally, toy(x) ≡ [toy-for-a-(y)](x)) (cf. Higginbotham 1985:563). Generally, assignment, or DISCHARGE of theta-roles is

> understood as the filling of places in [a] predicate[], so that the notion of a role's being associated with a place comes on top of the more familiar idea of the sheer number of places, or adicity, of a predicate. (Higginbotham 1985:559)

Higginbotham identifies four modes of thematic discharge, two of which, theta-identification and autonomous theta-marking, are relevant to the semantics of modification. In theta-identification, the mode of modification of conjunctive compounds such as *female senator*, the theta roles of head and modifier are identified, and PROJECTED to their dominating node.[9]

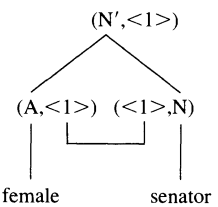

FIGURE 1. Theta-identification.

Theta-identification, Higginbotham notes, is analogous to the identification of variables in a first-order representation of a conjunctive predicate.

For nonconjunctive compounds such as *big butterfly* and *toy gun*, Higginbotham postulates two theta roles for the modifier, one identified with the open position of heads it modifies, and the other taking the attribute expressed by the head it modifies as its argument, autonymously theta-marking the phrase-marker of the head. This is represented in Figure 2. The arrow represents the autonymous theta-marking. As before, the line connecting the thematic grids represents theta-identification. Finally, the thematic grid of *butterfly* is projected to N′, representing the fact that a big butterfly, though not big and a butterfly, is nonetheless a butterfly.

On Higginbotham's theory, expressions like *toy gun* and *imitation butter* differ from *big butterfly* in that the theta-grids for their heads and modifiers are not identified, and

[9] This and the following diagram are adapted from Higginbotham 1985:559–68. The numbers enclosed in angle brackets (THEMATIC GRIDS) indicate how many theta-roles the predicate has to discharge; the line connecting them represents their identification. The ⟨1⟩ next to N′ indicates that the identified theta-roles of the modifier and head are projected to the dominating node, resulting in a single theta-role for the compound.

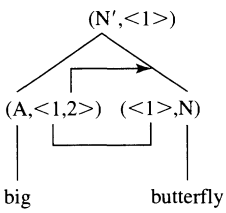

FIGURE 2. Autonymous theta-marking.

the theta-grid for the *modifier* is projected to the dominating node. Toy guns and imitation butter are thus represented as being, respectively, toys and imitations, but not guns or butter. Recall that plastic flowers—in the nonconjunctive sense—are plastic, but not flowers. These parallels suggest that our class of expressions might yield to this sort of account.

Even more suggestive is Degraff and Mandelbaum's (1993) application of Higginbotham's apparatus to 2 and 4. Following Higginbotham's assumption that autonymous theta-marking can take place only under government (see Higginbotham 1985:566), Degraff and Mandelbaum (DM) postulate a syntactic ambiguity for *old friend* and *poor man*. Treating these expressions as noun phrases, they claim that autonymous theta-marking is blocked, and the expressions have their conjunctive readings; treating them as adjective phrases, DM claim that autonymous theta-marking is permitted, and the expressions have their nonconjunctive readings. Autonymous theta-marking is also blocked in 3 and 5, where postposing of the adjectives destroys government. Thus, DM conclude, the interpretive facts of 2–5 are accounted for. Since the facts about 1a and 6 are exactly analogous, it is natural in this context to think that their explanation might be the same.

We propose to grant DM their syntactic assumptions in order to focus on the effectiveness of their strategy in explaining the semantic facts in 1 and 2, and its application to 3. According to DM, *old* means 'long-known' if it is taken as grading with respect to friendship (i.e. when 'old' autonymously theta-marks *friend*) and 'aged' if it is not. That is, following Higginbotham's treatment of *big butterfly*, an old (long-known) friend is something that is a friend and old for such, while an old (aged) friend is something that is a friend and is old.

Notice, however, that an old (aged) friend is something that is a friend and, not old simpliciter, but old for a human. That is, in the terminology of Katz 1972 (254–61) *old* is a relative adjective like *tall* and *big* rather than an absolute adjective like *carnivorous*. The age qualification is relative to a reference class, as is clear in the contrast *old American city* and *old European city*. Old men are men and old for such; old mayflies are mayflies and old for such.[10] *Old* is a covertly relational predicate, but, since autonymous theta-marking is blocked by the syntactic configuration assigned to the 'aged-friend' reading, *old* cannot be functioning as a relational predicate in noun phrases: it cannot discharge its attribute position.

Further, the attribute with respect to which *old* grades on the 'long-known' reading of *old friend*, viz., humanity, is expressed by *friend* only on the assumption that *friend*

[10] Note, moreover, *old man* and *old mayfly* are not ambiguous between *long-known man/mayfly* and *man/mayfly that is old*.

is decompositionally complex. But this kind of lexical semantic structure is not available in Higginbotham's thematic semantics, and, hence, not available to DM either.[11]

The situation is slightly different, and slightly worse, in the case of *poor man*. Not only is *poor* relational on its conjunctive reading—poor (impoverished) kings and Rockefellers for example are kings and Rockefellers and poor for such—for which there can be no explanation given that autonymous theta-marking is blocked, but the theory predicts that this is what *poor man* means on its nonconjunctive reading—which is plainly false.[12] What is supposed to happen is that, in virtue of grading with respect to the attribute expressed by *man*, *poor* will mean 'pitiable', just as *old* is supposed to mean 'long-known' when it grades with respect to friendship. But *poor* in *poor man* grades with respect to manhood and it means 'poor for a man'. So the ambiguity of the expressions *poor man* and *old friend* is not explained. The relational readings of these predicates are independent of whatever thematic structure they may have.

Also unexplained is the lack of ambiguity—the unavailability of the long-known and pitiable readings—in *friend who is old* and *man who is poor*. Higginbotham claims that when an adjective with an attribute position does not govern the noun it qualifies, as in Fig. 1, the choice of attribute with respect to which it grades is FREE (Higginbotham 1985). But if the choice of attribute is free, why can't 7

(7) That butterfly is big.

mean, not that the butterfly in question is big for butterfly, but that it is big for a toaster, or a microbe, or a planet?

Likewise, if *old* and *poor* are taken as grading with respect to an attribute whose choice is free in *friend who is old* and *man who is poor*, or, for that matter, when *old friend* and *poor man* are read as noun phrases (in both cases, no government; no autonymous theta-marking), then not only may *old* and *poor* receive false interpretations such as 'old for a mayfly' and 'poor for a king', and absurd interpretations such as 'old for a train wreck' and 'poor for a peacock feather', but they may also receive just the interpretations that are supposed to be blocked.[13] Finally, Degraff and Mandelbaum's account predicts that the conjunctive readings themselves ought to be ruled out in these cases, since, as we have seen, these also require the sort of relativization to an attribute that is reconstructed here as autonymous theta-marking.[14]

Introducing a third thematic role, whose discharge would not be blocked by the phrase structures that prevent autonymous theta-marking (to be identified with the second role in configurations of government?), would not help much, since it would not rule out the absurd cases. Moreover, since on Higginbotham's account thematic structure adds nothing to argument structure, the theory's resources seem to have been

[11] It is explicitly rejected by Higginbotham, quoting Davidson 1984:

> '. . . it is hard to exaggerate the advantages to philosophy of language of bearing in mind this distinction between questions of logical form or grammar, and the analysis of individual concepts'.
>
> The semantic structure of a belief sentence, according to [Carnap] . . . is given by a three-place predicate with places reserved for expressions referring to a person, a sentence, and a language. It is a different sort of problem entirely to attempt an analysis of this predicate. (Higginbotham 1985)

[12] This problem does not crop up in the case of *old friend* because *old* grades with respect to friendship on its nonconjunctive reading and humanity on its conjunctive reading—different attributes.

[13] It is also worth noting that there are indefinitely many *old* phrases for which a 'long-known' reading is simply not available: e.g. *old soldier*, *old shoe*, *old house*, and so on. How is this to be explained?

[14] It also does not seem to have the resources to cover a third sense of some *old* compounds, viz., the 'former' sense (*old car*, *old boyfriend*, etc.).

exhausted. Indeed, even if theta-roles were restored their content, it is hard to see what that content, i.e. the notions of agent, patient, theme, and so on, would have to do with the meanings of these compounds.

In any case, application of this apparatus to the expressions in 1 results in interpretive disaster. Assigning *plastic* two theta-positions, one to be identified with the open position of nouns it modifies, and one to mark their phrase markers, we assign two different syntactic structures (NP and AP) to *plastic flower*, one permitting and one blocking autonymous theta-marking. But then, in strict analogy to Higginbotham's examples, *plastic flower* would be ambiguous between 'plastic and a flower' and 'plastic for a flower', that is, 'plastic relative to the attribute flower'. Moreover, *that flower is plastic* could mean that the flower in question is plastic for a flower, or for a plant, or for any other attribute. None of which makes any sense at all.

We conclude that thematic role theories in the style of Higginbotham also cannot do justice to the intuitive meanings of the expressions in 1.

4. PRAGMATIC EXPLANATION. We have claimed that the expressions in 1 are semantically ambiguous between a conjunctive and a nonconjunctive sense. In this section we will consider the objection that what we have taken to be a grammatical fact about expression types is in reality a pragmatic fact about their tokens. The competing pragmatic construal is that expressions such as *plastic flower* and *stuffed animal* have only ONE sense in the language and that what we take to be another sense is an utterance meaning, obtained on a token-by-token basis as a function of grammatical sense together with features of context in accordance with general principles of pragmatic interpretation. We will argue that no pragmatic approach can be implemented in a noncircular or non–ad hoc way, and, hence, that the pragmatic objection has no force.

For guidance in the formulation of pragmatic principles, it is natural to start with the work of H. P. Grice. Grice 1989 proposed a number of principles by which utterances in context may be assigned meanings that diverge from the linguistic meaning of the expression types uttered. His philosophical purpose was to argue against Strawson's 1952 view that some of the logical particles of natural language are ambiguous (and hence not captured by the univocal operators of standard first-order logic). In light of these origins, Grice's approach seems a natural alternative to the account we have proposed.

On Grice's account, under certain circumstances, utterances that conflict with conversational imperatives assumed to govern verbal exchanges generally are reinterpreted in such a way as to render them consistent with those imperatives.[15] Thus, for example, if S utters a sentence p in conversation with H that both S and H know, and know each other to know, to be false (and hence in conflict with a maxim of Quality) and H has reason to think that S is adhering to the conversational imperatives, then S's utterance should be interpreted as having the linguistic meaning of another unuttered but true (and relevant) sentence, q. In such circumstances, S is understood to have said that p, but conversationally implicated that q.

Conversational implicatures may be particularized or generalized. A particularized conversational implicature holds in virtue of particular features of the context of utterance. A generalized conversational implicature is due to some stable grammatical fea-

[15] These imperatives fall under the general Cooperative Principle (make only appropriate contributions to the exchange in which you are engaged), in the categories of Quantity (don't be over- or underinformative), Quality (don't say what you know to be false or unsupported by evidence), Relation (be relevant) and Manner (be clear and concise).

ture of the expression in question, and holds across a variety of contexts, in the absence of special considerations (NORMALLY, as Grice says). S's utterance of 8 for example, would normally not be interpreted to mean that the car Paul drove was his own, though such an interpretation is not grammatically or logically precluded (if Paul drove his own car, it certainly follows that he drove a car).

(8) Paul drove a car today.

It is a generalized implicature of this form of words (due, no doubt, at least in part, to the occurrence of the indefinite article) that the car in question is not owned by its driver (cf. Grice 1989:37–38).

If utterances of the expressions in 1 are regularly to be interpreted as having nonconjunctive readings, as it seems they must, then it would seem that it is the notion of a generalized implicature that the pragmatic account requires. We must ask, then, what feature of the expressions in 1 could underwrite a generalized conversational implicature, and how it is that their nonconjunctive interpretations are implicated.

We have already pointed out that the expressions in 1 are neither semantically contradictory nor anomalous. But, since they are certainly syntactically well-formed, and, furthermore, they aren't spelled or pronounced in any distinctive way, there is no GRAMMATICAL feature of these expressions that could distinguish them from other expressions such as *plastic bag*, *stuffed artichoke*, and *kosher chicken* that do not normally receive nonconjunctive interpretations. Hence, Grice's notion of generalized implicature does not seem adequate to our cases. If there is an implicature, it would have to be particularized.

One might say that it is a special feature of all contexts of utterance of these expressions—at least those of the type of 1a—that the referents of the head nouns (flowers, chickens, Indians, and so on) cannot (for, the hearer assumes, reasons having to do with general but contingent facts about biology) be made of the materials denoted by the modifiers (plastic, rubber, wood, etc). Utterances of these expressions would be marked as odd since they are generally known to be, one might say, BIOLOGICALLY INCONSISTENT. It would be this oddness, presumably, that would alert hearers to the presence of an implicature, and prompt them to search for a nonconjunctive interpretation. Utterances of *plastic flower* would be interpreted by hearers who presume that botanical facts preclude flowers being made of plastic as meaning 'imitation flower made of plastic'.

This proposal faces several serious problems, however. For one, it is hard to see how natural (or any other sort of) inconsistency would induce hearers to infer just the interpretations required. Particularized implicatures are not constant across contexts; they must be inferred from contextual information and the conversational maxims. Grice says

> the assumptions required in order to maintain the supposition that [the conversational maxims] are being observed . . . are in systematic correspondence with non-conventional implicata of the conversational type. (Grice 1989:41)

What maxim is violated by the utterance of an expression with an extension empty by natural necessity? It can't be that referentially empty phrases generally are so interpreted, for then the word *unicorn* would always mean 'imitation unicorn'—which it obviously doesn't.[16] But even were we to assume some dubious maxim such as *Try*

[16] The sentence *There are no unicorns* is true, while the sentence *There are no imitation (or representations of) unicorns* is false.

not to talk about or refer to things that don't (or couldn't) exist, it is not at all clear how the violation of such a maxim in utterances of *plastic flower* would ensure that anyone would work out the implicature 'imitation flower made of plastic', as opposed to simply assuming the speaker had made a mistake or that some other concept had been implicated, such as 'flower that looks like it is made of plastic', or 'bit of plastic shaped like a flower'.[17]

Grice himself acknowledges this sort of problem. He had claimed that S's utterance to H of *He's a fine friend*, referring to someone S and H both know (and know each other to know) to have betrayed S, would naturally be interpreted by H to mean the 'most obviously related proposition: He's not a fine friend' (see Grice 1989:34). But there does not seem to be any more reason for H to reason to the contradictory of what was said than to any of a number of other propositions. Thus, as Grice says, '[H] might just be baffled, or might suppose that, despite the apparent falsity of the remark, [S] was meaning something like He is, usually, a fine friend: how could he have treated me like that?' (Grice 1989:53).

If the ambiguity of *plastic flower* were a consequence of the mechanisms for producing particularized implicatures, either along Gricean lines or along the lines of Sperber and Wilson's 1986 simplification of Gricean pragmatics, then utterances of *plastic flower* would have to receive the sense 'imitation flower made of plastic' on the basis of their grammatical meaning 'flower made of plastic' together with features of the context. It is farfetched to suppose that speakers use an expression with the meaning 'flower made of plastic' to get across the meaning 'imitation flower made of plastic' via a violation of an imperative to speak the truth or be relevant. This would be an extreme of indirection.

A second problem is that cases with conjunctive and nonconjunctive interpretations BOTH of which are nonempty—such as *plastic heart* and *stuffed animal*—would be unaccounted for. In these cases, there is no natural inconsistency, and so no basis for the application of the suggested pragmatic rules. Hearers do not infer that speakers mean 'imitation heart made of plastic' or 'stuffed toy animal' because there can be no plastic hearts or stuffed animals in the conjunctive sense. Clearly, there are such things.

Conversely, the pragmatic approach cannot account for cases where natural inconsistency does not seem to implicate nonconjunctive interpretation—cases such as *immortal animal*, *human horse*, *invisible woman*, *positive electron* and *rubber air*. There simply are no such things—imitation or otherwise. How shall these differences be explained?

Finally, even granting that hearers routinely are able to infer nonconjunctive interpretations for those compounds whose conjunctive senses are not in general use, the question of whether or not the interpretation they infer is one that is already available in the language is left open. Compare the expressions in 1 to the expressions *cleave* and *dust*. We do not claim that these words have only one meaning in the language, say, 'split apart' and 'remove dust from', respectively, and that their other meanings—'remain joined' and 'put dust on'—are derived pragmatically on the basis of clues from the contexts of their utterance. We do not claim this, even though the interpretations are quite closely related. At best, we allow that on a given occasion of utterance a speaker may (perhaps because of lexical ignorance) have to reason from contextual information to a reading of the word-type *cleave* or *dust* that is already available in

[17] It is important that such implicatures be established by reasoning (Grice 1989:31) based on knowledge of features of the expression and the context of utterance—and not just assigned to utterance types generally. Such assignment would not differ in anything but name from the semantic account we favor.

the language. So the possibility of determining an interpretation of a speaker's utterance on the basis of a linguistic meaning and features of context does not in itself indicate that the inferred interpretation is only a pragmatic one. The claim that an ambiguity is pragmatic, and not semantic, must be justified on other grounds.

Consider, then, the following cases. Astronauts newly arrived on an Earth-like planet wonder whether the store called *Silk Flowers*! sells flowers made of silk or silk imitation flowers. The heart specialist leaves her assistant a note saying *Bring a plastic heart with you*; the assistant wonders whether she wants a real (working) heart made of plastic, or a plastic model. The taxidermist's son doesn't know whether to be elated or disgusted when his mother tells him she's going to bring him a stuffed animal on his birthday. The rabbi wonders whether or not he should bemoan lax alien standards when he sees *kosher bacon* on the menu of the Twin-Jerusalem Restaurant. In each case, we claim, context permits a choice of interpretation, but it is a choice from among a limited number of determinate options. Particularized implicatures don't work this way. If one is puzzled by an utterance because its intended meaning is obviously not its literal one, further information does not enable a choice among antecedently available interpretations, but rather an inference to a novel one. Though one might glean from context that an utterance of *stuffed animal* is intended to refer to a sexually repressed colleague, for example, the boy has no reason to wonder whether his mother intends to bring her boss to his birthday party.

Plastic flower et al. also pass Recanati's plausible test for distinguishing semantic from pragmatic ambiguity, viz., that 'In uttering a semantically ambiguous sentence, the speaker rarely intends to communicate more than one of the possible readings . . . but he may very well do so if the ambiguity is pragmatic' (Recanati 1987:63, n. 8). Note that, in fact, it is semantically impossible to assert more than one of the possible readings of *plastic flower* et al., since they are necessarily inconsistent—imitation plastic flowers CAN'T BE real plastic flowers. Double entendres are special cases, usually intended to cause amusement (*vide* the last sentence of the previous paragraph).[18]

There does not seem, then, to be a rationale for the claim that the nonconjunctive interpretations of the expressions in 1 arise in context on the basis of pragmatic reasoning. Without explicit principles that might produce these interpretations, the pragmatic approach is left implausibly claiming that, for no particular reason, we assign utterances such as *plastic flower* interpretations only partially related, and in unknown ways, to the meanings of their expression types in the language. In contrast, a semantic account, such as the one we will propose in the next section, provides an explanation for the availability of the nonconjunctive interpretations of utterances of these expressions as a feature of the expression type of which they are tokens. The task of a pragmatic theory is thus just to explain how tokens of the type *plastic flower* are disambiguated by contextual factors that control the assignment of one or the other interpretation on one or another particular occasion of utterance.

5. COMPOSITIONAL IDIOMS. In contrast with the conjunctive senses of the expressions in 1, the nonconjunctive senses are not straightforwardly compositional. The only way in which both senses of *plastic flower* et al. could be straightforwardly compositional is if either the modifier or the head also had the sense *imitation*. But it would not be plausible to postulate ambiguity in this way. Recall the point made in the discussion

[18] See also §7, below, exx. 21–26, for further illustration of what we take to be the purely semantic facts in these cases.

of exx. 2–6 that such expressions as *that flower is plastic* and *that animal is stuffed* are not ambiguous. Moreover, we would also have to say that indefinitely many modifiers (*tin*, *clay*, *paper*, *cloth*, *rubber*, and so on) or noun phrases (*soldier*, *animal*, *Indian*, *chicken*, *bacon*) were ambiguous, thereby multiplying ambiguity beyond necessity and giving us the wrong meanings for indefinitely many expressions (*plastic is cheap*, *tin is a metal*, *animals are not toys*, *bacon is pork*, *stuffed artichokes are edible*, etc.).

Inasmuch as the nonconjunctive senses of the expressions in 1 are not derived from the senses of their lexical constituents, they resemble the senses of standard (fully noncompositional) idioms such as *kick the bucket*, *chew the fat* and *shoot the breeze*. But they also differ from the senses of standard idioms in that the lexical constituents of a compositional idiom contribute their senses to the sense of the syntactically complex expression. Thus, *kosher bacon* means 'imitation bacon made according to kosher law', which includes the senses of both the lexical constituents *bacon* and *kosher*.

The point is strikingly illustrated in the contrast of the nonconjunctive sense of *plastic flower* with both senses of *kick the bucket*. On the one hand, the senses of *plastic* and *flower* do not comprise the sense of *plastic flower* in the strictly compositional way that the senses of *kick*, *the*, and *bucket* comprise the 'put-a-foot-to-it' sense of *kick the bucket*, and, on the other, the senses of *plastic* and *flower* are not absent from the sense of *plastic flower* in the way that the senses of *kick*, *the*, and *bucket* are absent from the *die* sense of *kick the bucket*. The expressions in 1 thus represent a hitherto unrecognized class of expressions, intermediate between standard idioms and purely compositional expressions. Hence, the term COMPOSITIONAL IDIOM.

Compositional idioms also differ from standard idioms in being productive, as mentioned above. We have not only *plastic flower*, *stuffed animal*, *kosher bacon* and *vegetarian chicken*, but also *wooden flower*, *plastic banana*, *stuffed giraffe*, *stuffed albino Bengal tiger*, *kosher ham*, *kosher black forest ham*, *vegetarian pork*, *vegetarian barbecued pork*, and so on, all, as noted above, with related and predictable meanings. *Plastic flower* has the sense *imitation flower made of plastic*; *stuffed animal* has the sense *imitation (or toy) animal made by a process of stuffing*, *kosher bacon* has the sense *imitation bacon made in accordance with kosher law*, and so on. If we factor out the component meanings of such senses that have come from the lexical constituents in expressions like *plastic flower*, we are left with the schematic sense 9 in which *X* and *Y* are, as it were, slots for the meanings of the lexical constituents.

(9) imitation X made of Y

We will call such schematic senses IDIOM SCHEMATA. Such elements (with appropriate adjustments) are common to all compositional idioms.

The presence of an unsaturated idiomatic element is not unique to the class of expressions under consideration here. Fraser 1970, for example, discusses a class of idioms, which he calls DISCONTINUOUS, that contain an argument place, e.g. *bring [something] to light*, *lead [someone] a merry chase*, *pull [someone's] leg*, *pull the wool over [someone's] eyes*, and *lose [one's] mind*. He suggests that these expressions be entered in the lexicon with variables (*bring-[x]-to-light*, *lead-[x]-a-merry-chase*, etc.).[19]

[19] We would add to Fraser's list the idiom schema *take a(n) [x] to*, as in, for example, *take a broom to*, *take a mop to*, *take a vacuum to*, *take a rag to*, *take a sponge to*, and so on. We would also add *take a whip to*, *take a switch to*, *take a paddle to*, *take a belt to*, and so on. In these cases, the incomplete verb is assigned a meaning idiomatically—in the former cases, *clean with [the implement denoted]* and, in the latter, *hit with [the implement denoted]*—and the meaning is completed compositionally, once the variable is replaced with the meaning of the noun. Note as well that, as with the examples in 1, these expressions are ambiguous between idiomatic and nonidiomatic senses.

Contrary to the position we take here, Fraser suggests that the first two expressions mentioned above may

What is unique to the class of expressions under consideration here is that the unsaturated element in their meaning is not syntactically realized, but emerges only on a semantic analysis of the full NP. A strong argument for this account is that it explains the otherwise mysterious fact that the immediate context of *Superman* in sentences such as *Lois Lane has a plastic Superman on her desk* is intensional. If we substitute *Clark Kent* for the coreferential term *Superman* in this sentence, we may go from a truth to a falsehood (it doesn't follow from Lois Lane's having a plastic Superman on her desk that she has a plastic Clark Kent on her desk, even though Superman and Clark Kent are the same person). It is clear that the modifiers *plastic*, *wooden*, and so on are not themselves intensional, and, hence, are not the source of the intensionality of their contexts. Further, neither *has* nor any other syntactic constituent in such sentences explains the intensionality.

On our account, however, there is no mystery about why the context is intensional. The source of the intensionality of the context is the sense of the predicate *imitation* in 9. This sense is a decompositional component of the senses of the compositional idioms under consideration here, and applies to senses that replace the variable *X* in the compositional process.[20] If we replace *Superman* with *Clark Kent*, yielding *Lois Lane has a plastic Clark Kent on her desk*, the sense of *Clark Kent* replaces the variable *X* in 9, and the object of *has* is different. In the one case, it is an imitation Superman made of plastic and, in the other, an imitation Clark Kent made of plastic. Hence, substituting *Clark Kent* for *Superman* can change the truth value of the sentence. Mutatis mutandis for other coreferential expressions, such as *cordate* and *renate* or *unicorn* and *minotaur*.[21]

The compositional aspect of the sense of a compositional idiom results from the insertion of the senses of the nominal constituents into the appropriate slots in its idiom schema. The insertion works by the same compositional operations that provide meanings for purely compositional expressions. In the latter, interpretations are assigned to individual words and combined according to fixed rules associated with specific syntactic configurations to yield a derived interpretation. Thus, for example, in a grammar that assigns the verb phrase *kick the can* the structure represented in Figure 3 the meaning of the phrase is compositionally derived from the meaning of the verb and the meaning of the noun phrase. The sense of the verb *kick* is schematic, too, having a slot for senses of its subject and another for senses of its direct object. These slots are marked for the source of the senses that can occupy them. The compositional operation in this case is inserting the sense of the NP in the slot marked for NPs

be entered as *bring to light* and *lead a merry chase*, with an associated movement rule in the syntax that converts them into the forms above—in analogy to the way *look up* [NP] may be converted into *look* [NP] *up*. However, this suggestion will not work for cases like *pull [someone's] leg* and *pull the wool over [someone's] eyes*, since they do not survive extraction of their variables, cf. **pull leg* and **pull the wool over eyes*. We prefer the option affording the greatest generality.

[20] The sense of an expression σ is decompositional if and only if it has a proper part that is not the sense of any syntactic constituent of σ.

[21] Though it is not part of the present project to provide a complete explanation of the intensionality of these expressions, we think it is likely that the intensionality of *imitation* can be explained by reference to the fact that imitation Fs are things that are made with the intention that they serve some purpose or function served by Fs, in virtue of sharing some of the properties of Fs, though not any subset of those properties sufficient unto being an F (such things being artificial Fs, which can be Fs).

It is also worth pointing out that our account provides an explanation of the fact, mentioned above, that *plastic* et al. have independent extensions, whereas standard intensional modifiers, such as *imitation*, *alleged*, *former*, *future* et al., do not (again, *plastic* et al. are not intensional modifiers).

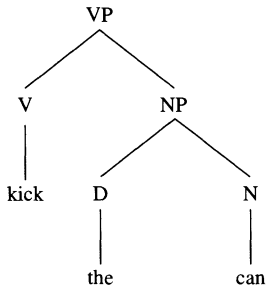

FIGURE 3. Compositional expression.

functioning as direct objects of the verb and assigning the derived sense to the VP node. (The meaning of the embedded NP is similarly derived from the meaning of the noun and the meaning of the determiner, and assigned to the NP node.) Given that the *X* and *Y* slots in 9 are suitably marked, the same compositional operation would be applicable in this case, too.

In the semantics of purely idiomatic expressions, a sense is assigned to the expression as a whole, and not determined as a function of its lexical parts and their syntactic relations. Let us suppose that the syntactic analysis of the phrase *kick the bucket* is as shown in Figure 4.

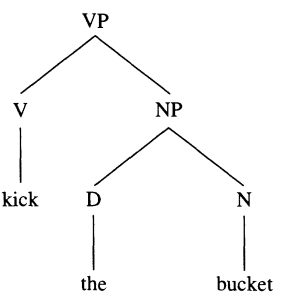

FIGURE 4. Idiomatic expression.

Here the compositional interpretation is derived in the same way as that of *kick the can*, but the idiomatic sense, *die*, must be assigned directly from the dictionary to the VP node, as if the entire verb phrase were a lexical item.

These examples illustrate the standard cases of compositionality and idiomaticity. The new case of compositional idioms shares features of both standard cases. Let us suppose that the syntactic analysis of *plastic flower* is as represented in Figure 5.[22] Like standard compositional expressions and unlike standard idioms, the terminal symbols in the structure represented in Fig. 5 must be individually interpreted. This has to

[22] The analysis assumed here is consistent with principles of recent GB syntax. According to X-bar theory, any maximal projection (NP, VP, AP, IP (= S), etc.) has three positions, Specifier, Head and Complement (see Chomsky 1986:2–4). Thus, we are here taking *plastic flower* to be an NP with head *flower* and N modifier *plastic* in the Specifier position. (The N′ level is not represented, since there is nothing in Complement position) We won't argue for this analysis here, however, since the points we want to make could easily be adapted to other syntactic analyses.

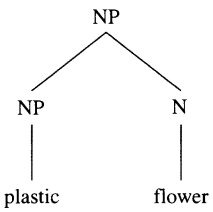

FIGURE 5. Compositional idiom.

be the case because of the generalization that the meanings of the terminal elements in the expressions in 1 are part of the meaning of the entire phrase.

But like the case of standard idioms and unlike the case of standard compositional expressions, the meanings of the terminal elements do not combine with each other. That is, the nonconjunctive sense of *plastic flower* contrasts in this respect with the conjunctive sense *flower made of plastic*. Moreover, and this is critical, there are no other terminal elements in the structure with which the meanings of *plastic* and *flower* can combine. This is precisely what makes it appear initially that compositional idioms are an impossibility. But, as with many other paradoxes, the resolution lies in locating a false assumption in the reasoning leading to the impossibility. In the present case, the false assumption is that compositional steps invoke only readings assigned to terminal elements, or readings derived from readings assigned to terminal elements.

We already know this assumption is false. In the case of the idiomatic sense of a sentence like 10,

(10) Methuselah kicked the bucket.

the sense of the terminal element *Methuselah* has to combine with the (idiomatic) sense of the VP, but the sense of the VP is not the sense of a terminal element or a sense derived from senses of terminal elements. The mistake is the supposition that the senses of the lexical items in a sentence are just senses of terminal elements in its syntactic structure. The nonterminal VP element in the syntactic structure of 10 has to obtain the sense *die* directly from a dictionary entry for the idiom *kick the bucket*. This entry has to mark the sense as the sense of expressions in the category VP and the sense has to be assigned directly from the dictionary entry to the nonterminal VP node in the part of the syntactic structure of 10 represented in Fig. 4. The idiomatic sense of 10 results when the sense of *Methuselah* is inserted into the place marked for a sense of the subject of the sentence in the compositional process.[23]

Our account of the compositional idioms in 1 simply extends this idea of having dictionary entries for senses that can be assigned to nonterminal nodes in the syntactic structure of expressions. The extension involves little more than a generalization from the category VP to the category NP. We introduce an entry for the sense 9 into the dictionary, which permits the dictionary stage of the compositional process to assign that sense to the topmost NP in structures like the one represented in Fig. 5, as well as assigning the sense in the dictionary entry for the noun *plastic* to the NP-dominated node NP and assigning the sense in the dictionary entry for the noun *flower* to the node N. Since the sense of 9 has a place marked for the sense of the term under NP-dominated

[23] See Katz 1973:357–76, for a discussion of a possible mechanism for assigning the senses of idioms to nonterminal nodes.

NP and one marked for the sense of the term under node N, the senses of *plastic* and *flower* can be combined with the sense of 9 by a familiar compositional operation.

The productivity of the compound nouns in 1 can now be explained in terms of the substitution of appropriate senses into the same idiom schema 9. Since the idiom schema is (roughly) the same for all of them, and combines with the nominal meanings in the same way for every compound, the resultant meanings are predictable as a compositional function of the meanings of their constituents. Our account thus provides a basis for explaining the semantic facts about the expressions in 1.

Of course, not any sense of an expression occurring as NP-dominated NP in the structure represented in Fig. 5 can combine with the sense of 9. For example, senses expressing color concepts cannot. The idiomatic senses of *blue moon* and *blue movie* or *red spy* and *red herring* are not compositionally idiomatic in the way that *plastic flower* is. Similarly, senses expressing smell, shape, size, weight, commercial value, and so forth cannot combine with the sense of 9 to yield a compositional idiom. There is a restriction governing the Y slot in 9 that limits insertions to senses containing the sense 'material substance'. Similarly, not any sense of an expression occurring as N can appear in the X slot in 9. There is a restriction to senses containing the sense *physical object* that blocks senses for expressions like *plastic heartburn*, *plastic ectoplasm*, and *plastic fraction*. (The restrictions governing the X and Y slots will undoubtedly require some fine tuning, especially for the cases we have not explicitly represented.)

No further substantive clauses are required. The nonconjunctive sense is a general feature of expressions with the structure represented in Fig. 5 where the sense of the modifier has the component *material substance* and the sense of the head has the component *physical object*. In some cases, the nonconjunctive sense may not be immediately apparent, but it becomes so when we think of it in an appropriate sentential context. The expressions *plastic comb*, *gold coin*, and *wooden tree* initially seem not to have a nonconjunctive sense. But *plastic comb* means 'imitation comb made of plastic' in *The sign over the door of Hilda's hair salon is a five-foot-long plastic comb*, *gold coin* means 'imitation coin made of gold' in *The director wanted to have a jewelry shop in the neighborhood make gold coins for this production of the Merchant of Venice*, and *wooden tree* means 'imitation tree made of wood' in *Can you go to the store and get wooden trees for the model railroad to replace those crummy plastic ones*?

On this account of compositional idioms, the explanation of the fact that the senses of the expressions in 1 have a component sense in common is that an idiom schema like the one in 9 is part of the meaning of those expressions, and the explanation of the fact that the senses of the expressions differ as their lexical items differ is that the meaning of such expressions comes from the insertion of the senses of their items into the appropriate slots in the idiom schema.

The apparatus of semantic markers and categorized variables in Katz 1972 provides a means of formalizing this account of compositional idioms. We assume that lexical entries generally consist of a lexical item with an associated set of syntactic, phonological and semantic representations. Entries for idiom schemata will differ only in that their syntactic categorization allows their semantic representation to be assigned directly to phrasal constituents. Thus, the semantic representation for the idiom schema 9 is Figure 6. The categorized variables in Fig. 6 are the expanded versions of the X and Y in 9. They are categorized both syntactically and semantically. The syntactic categorization appearing in brackets above the *X* specifies the constituent(s) in a partially interpreted phrase marker from which their values can come. The syntactic categoriza-

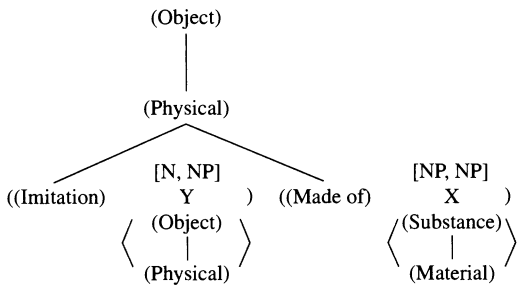

FIGURE 6. Idiom schema.

tions of the variables thus restrict the availability of this interpretation to complex NPs with just the syntactic structure we have assigned to the expressions in 1. Further, they restrict the interpretation of NPs with this structure by assigning the reading associated with the item on the left branch to the right variable, and the reading associated with the item on the right branch to the left variable (thereby preventing the expression *glass eye*, for example, from being assigned the reading *'imitation glass made of eye').

The selection restriction in angle brackets below the *X* specifies the semantic marker(s) that a semantic representation must have to qualify as a value of such a variable. In this way, selection restrictions insure that no semantic representation is assigned where there is no sense to represent. The clauses of these selection restrictions prevent expressions like *chocolate intention*, *rubber number*, and *wooden vacation* from being represented as having a sense, and, hence, as meaningful. However, the representations of NP-dominated NP and N in the expressions in 1 have the semantic markers that qualify them as values of the variables in the representation in Fig. 6, and, hence, these expressions are assigned derived representations. They are thus represented as having a sense, and, hence, as meaningful.

6. COMPOSITIONAL EXPRESSIONS, IDIOMS, AND COMPOSITIONAL IDIOMS. Since the senses of the expressions in 1 are not FULLY a function of the senses of their syntactic constituents, they are partly idiomatic. Since the senses of the whole expressions in 1 are PARTIALLY a function of the senses of their syntactic constituents and their syntactic relations in the expression, they are partly compositional. The complete meaning of the syntactically compound nouns represented by the expressions in 1 is thus both partly idiomatic and partly compositional. To characterize the notions of compositionality and idiomaticity in a way that allows for compositional idioms, we offer the definitions 11–13.

(11) A syntactically complex expression *E* is fully compositional just in case the meaning of *E* and of each syntactically complex subconstituent of *E* is a function of the meanings of the terminal elements in *E* and their syntactic relations.

(12) A syntactically complex expression *E* is a standard idiom just in case the meaning of *E* is not a function of the meanings of the terminal and nonterminal elements in *E* and their syntactic relations.

(13) A syntactically complex expression *E* is a compositional idiom just in case the meaning of *E* is not fully compositional, but is a function of the meanings of *E*'s terminal and nonterminal elements and their syntactic relations.[24]

[24] The term NONTERMINAL ELEMENTS should be understood as not including nondominated nonterminal elements, since, of necessity, the sense of every expression is a function of the sense of the whole expression itself (viz., the identity function).

7. IMPLICATIONS FOR EXTENSIONALIST APPROACHES. Extensional approaches do not recognize the grammatical structure necessary to account for the productive way the expressions in 1 blend compositionality and idiomaticity. The reason is simply that extensional functions are not senses. Extensional functions are mappings from a domain to an extension. Senses are not relations between language and the world, but, like phrase structure, are part of the structure of the sentences of a language. Senses are purely grammatical objects. Hence, the mathematical functions that appear in a theory of sense structure must be sharply distinguished from extensional functions. Such intensional functions are, on the one hand, noncompositional functions that assign senses to lexical items and, on the other, compositional functions that assign senses to syntactically complex expressions. The role of such functions in the semantic interpretation of sentences is to relate senses and sentences within the language.

The basic claim of extensionalist approaches to meaning—that meanings are mappings from the expressions of a language into its domain—assumes that the only grammatical structure required for writing rules which account for all the semantic properties of a language is the phonological and syntactic structure of the expressions. Since the rules of such a grammar do not refer to semantic levels of grammatical structure, there is no grammatical level at which the structure of senses is represented. In GB theory, the assumption is that grammatically specifiable semantics can be handled entirely at the grammatical level of LOGICAL FORM.

In contrast, the basic claim of intensionalist approaches to meaning is that rules for writing grammars refer to a level beyond syntax at which the structure of senses is represented. Parallel to the claim of transformationalists that there is a level of deep structure not reflected in surface structure, intensionalists claim that there is a level of sense structure not reflected in syntactic structure. The claim has been based on cases where grammatical rules have to refer to sense structure not reflected in syntactic structure in order to capture significant grammatical relations.

The literature contains many examples supporting this claim. One set is 14–20.

(14) good knife
(15) knife that cuts well
(16) good watch
(17) watch that keeps time well
(18) Good knives cut well.
(19) The knife is good even if its blade doesn't cut well.
(20) The knife is good even if its handle isn't.

Katz (1966:288–317) uses these examples to show that we cannot account for properties and relations like synonymy, analyticity, and contradiction without a level at which sense structure is displayed. The synonymy of 14 and 15 and of 16 and 17 cannot be accounted for without representing the syntactic simples *knife* and *watch* as having semantically complex senses in which, respectively, the senses *having the function of cutting* and *having the function of keeping time* are represented and distinguished from other sense components such as *physical object* or *having a handle*. Similarly, for the analyticity of 18, the contradictoriness of 19 and the noncontradictoriness of 20.

The cases discussed in this article provide further support for the thesis that the grammar of a natural language has a decompositional semantic level at which the complex sense structure of syntactic simples can be formally displayed. Without such a level, the absence of a correspondence between syntactic structure and semantic structure prevents extensional approaches from being able to explain the sense properties and relations of such cases. We cannot explain the fact that *plastic flower* and the

other expressions in 1 are ambiguous. The explanation, as shown above, requires a decompositional analysis. Not only do we have to refer to the components of the sense of NP-dominated NP and N in NPs like *plastic flower*, just as the explanation of 14–20 requires us to refer to the components of the senses of the words *knife*, *watch* and *good*,[25] but we have to refer to an underived component of the sense of the entire NP. This reference is all the more obvious when compositional idioms appear as constituents in expressions, such as 21–26.

(21) Kosher bacon is not real bacon.
(22) Valuable antique wooden Indians regret current laws.
(23) This plastic flower is a better imitation of the real thing than that.
(24) The real thing, of which this plastic flower is an imitation, is a flower.
(25) counterfeit gold coin
(26) picture of a stuffed alligator

Such reference is required to explain the analyticity (on a sense) of 21, the semantic deviance (on a sense) of 22, the analytic entailment of 24 by 23, and the ambiguity of 26 but not of 25.

In addition to significantly extending earlier evidence for thinking that extensional approaches do not account for all grammatical properties and relations, this evidence also shows that such approaches cannot even account for all extensional properties and relations. To be sure, extensional functions can account for the extensional structure of the conjunctive readings of the expressions in 1, but they cannot account for the extensional structure of the nonconjunctive readings. If the nonconjunctive readings were purely idiomatic, the expressions in 1 could receive an appropriate extension by simply assigning them an extensional function. But, since the expressions in 1 are partly compositional, a proper treatment of them requires rules that relate their idiomatic and compositional aspects. Without a level at which complex sense structure is formally displayed, such rules have to assign an extensional function f_i to NP-dominated NP and an extensional function f_j to N, and then get the extension of the entire NP from f_i and f_j. Since expressions like *toy gun* and *imitation butter* do not involve an idiom schema, they might be handled by assigning *toy N* or *imitation N* a function whose output is the set of toy or imitation Ns. But the expressions in 1 are different in not containing a lexical item that can be treated in this way, thereby making such an extensionalist approach unavailable.[26]

Having no lexical item that might be interpreted on the basis of an extensional function whose output is the set of imitation, the only strategy for using extensional functions to interpret the expressions in 1 is to assign a function (perhaps to the NP node) which transforms the function assigned to NP-dominated NP into a function

[25] Compare, for example, the analyticity (on a sense) of *wooden legs are imitation limbs*, the contradictoriness (on a sense) of *stuffed parrots are not imitation birds*, and the antonymy of *kosher bacon* and *kosher ham*.

[26] Though we would claim that such an extensional approach doesn't work even in cases like *toy gun* because a full description of them would require reference to decompositional structure. An account of the sense of *toy* has to represent it as meaning something like *imitation X to serve in play involving pretending to Y*, where X is the component of the sense of the NP-dominated NP and Y is the component of the sense of the NP-dominated N which expresses the function the artifact is intended to serve. On this account, *toy gun* will be represented as meaning 'imitation gun to serve in play involving pretending to shoot'. Similarly, *toy watch* will be represented as meaning 'imitation watch to serve in play involving pretending to tell time'. Decompositional analysis of *gun* and *watch* is required to obtain the functions of shooting and telling time for *toy gun* and *toy watch*, respectively.

whose output is the set of imitation Ns. But surely this is ad hoc in the context of a theory that does not recognize syntactically unrealized semantically significant structure. Moreover, such a strategy will fail to explain facts such as that kosher bacon is kosher meat, rubber ducks are rubber birds, and stuffed elephants are stuffed animals.

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