Sense Generation: A "Quasi-Classical" Approach to Concepts and Concept Combination

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This article presents a detailed formal approach to concepts and concept combination. Sense generation is a competence-level theory that attempts to respect constraints from the various cognitive sciences, and postulates "quasi-classical" conceptual structures where attributes receive only one value (but are defeasible and so do not represent necessary and sufficient conditions on category membership) and where classification is binary (but explicitly context-sensitive). It is also argued that any general theory of concepts must account for "privative" combinations (e.g., stone lion, fake gun, apparent friend) as extreme test cases of representational and classificatory flexibility. The approach presented therefore provides a treatment of these combinations. The approach differentiates between the "lexical concept" (the stable information represented in a mental lexicon) which acts as a base from which the various "senses" (flexible contents associated with words and phrases in context, and used in classification) are "generated." Generation allows nonmonotonicity, so that in different circumstances, different attributes may be defeated or modified. Classification is treated as relative to the perspective adopted, so that a classification acceptable from one perspective may be unacceptable from another, without contradiction. The result is a view that assumes bottom-up priority in concept combination, where the range of senses generated by bottom-up rules of combination is tempered by pragmatic-communicative constraints on classification. An account of the representational and classification behavior of privative combinations is outlined, and the article concludes with a discussion of some of the implications of the approach.

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1. INTRODUCTION

An approach to concepts that respects constraints from the various cognitive sciences is currently lacking. This article seeks to begin to ameliorate this lack, elaborating on sketches presented elsewhere (Braisby, Franks, & Myers, 1992; Franks & Braisby, 1990). A central theme of the sense generation approach is that “quasi-classical” representations (cf. Braisby, 1993) enter into a generation process via formal combination rules that have bottom-up priority, though this is tempered by whether the resulting concept representations are pragmatically acceptable for classification and referential uses. These pragmatic constraints are reflected in the perspectival relativity of classification judgements. The presentation is developed through a consideration of privative concept combinations (e.g., fake gun, stone lion, apparent friend, red lemon), whose behavior provides a test case for generalisable theories of concept combination.

Section 2 outlines some theoretical foundations with their empirical motivations concerning the representational and classification functions of concepts. Section 3 notes the main attributes of privatives. Sections 4 and 5 outline the means for handling context-sensitivity in representations and in classifications, respectively. This allows a recasting of the problematic of privatives in Section 6, followed by a presentation of the sense generation account in Section 7. Section 8 canvasses some theoretical and empirical implications of the approach.

2. ON CONCEPTS: SENSE GENERATION, REPRESENTATION, AND PARTIALITY

2.1 The Functions of Concepts

Concepts are generally held to perform three functions in cognition, two basic and one derivative. The two basic functions are representation and classification (Franks, 1992). The representation function portrays concepts as stable representations in long-term memory that act as the contents for thinking and inference. The classification function postulates some method of feature-detection and comparison for determining whether an entity “falls under” a concept. Finally, the linguistic function takes concepts as represented in a “mental lexicon,” associated with particular lexemes and their linguistic attributes, so that language understanding requires accessing and concatenating the concepts associated with the linguistic expressions. In general, a theory of concept combination must account for the effects of linguistic combination on the representations associated with the constituents and on their classification behavior. A distinctive aspect of sense generation
is that it views the classification and representation functions as being effected by different constructs.¹

2.2 Motivations From the Psychology of Concepts

In this section, some of the psychological phenomena that motivate the sense generation approach are briefly outlined. These principally concern the context dependence of classification, distinctions between types of conceptual representational content, and context-dependent variation in that content.

2.2.1 Classification: Radical Context Sensitivity

Barsalou and Sewell (1984) found that judgements of the typicality of category members vary with the "viewpoint" participants are asked to adopt (e.g., a "Chinese" viewpoint leads to rating peacocks as more typical birds than eagles, and an "American" viewpoint reverses this). One interpretation of this is that such different judgements might be based on participants' using different proper subsets of the features represented in a default concept for bird, since such different subsets may be more appropriate to the different viewpoints adopted. Related variations have been found for changes in sentential context (e.g., Roth & Shoben, 1981), changes in combining concepts (e.g., Hampton, 1987), and changes in goal-based or ad hoc categories (e.g., Barsalou, 1982). Similarly, McCloskey and Glucksberg (1978) found that judgements of category membership are often unstable for single participants across different times and for different participants at any one time. Well-worn examples concern classifying an amoeba as an animal or a nonanimal, bookends as an item of furniture or not, a crab as a fish or not, and a tomato as a fruit or not. An interpretation of such findings could be that on one occasion the properties represented in the concept animal are inclusive enough to allow an amoeba into the category, and on another occasion they are restrictive enough to prevent this. Such findings have a general moral: Categorisation judgements may be made on the basis of implicit background conditions that are different from the features that might be hypothesised to be represented in a default concept. A single overt categorisation judgement (e.g., in a statement "a rabbit is an animal") might be based on an array of different implicit conditions, which people may draw upon or be attuned to in discourse about referents. Evaluating the acceptability of categorisation judgements therefore requires us to take

¹ This contrasts with the widespread view that both functions are performed by a single construct (e.g., the prototype theory described by Hampton, 1992). Barsalou's critique of stable representations theories (Barsalou, 1987) also assumes this: His argument is that since classification is unstable, representations must therefore be unstable: The hidden premise is that a single construct performs both functions.
into account not simply whether the categorised entity has the properties represented in the default concept for the category label, but rather whether it has the properties in the implicit background conditions. The implicit background conditions, which may diverge to a greater or lesser degree from the default concept, are a better guide to the content or information that a person is actually using to classify an object. This is reflected in this article’s account of the perspectival relativity of categorisation judgements.

2.2.2 Representation: Content Types, Specificity, and Flexibility

In general, inferences about the representational function of concepts are based on evidence about classification. Recent work has utilised a distinction between diagnostic and central features in the representation of concepts (e.g., Medin & Shoben, 1988; Smith & Osherson, 1984; Smith, Osherson, Rips, & Keane, 1988). This distinction starts from the basis that some observable properties of an object are more critical in its categorisation than others: The more diagnostic a property, the greater the likelihood a person will make an appropriate categorisation of the object when that property is present. Observable diagnostic properties are the basis for (nondemonstratively) inferring the presence of (usually nonobservable) central properties, which allow the classification of an object as being of a given type. If a lay theory (cf. Murphy & Medin, 1985) posits a strong, often causal or explanatory connection between a property and the sortal type of the entity, then that property is central. Neisser (1987) and Medin and Ortony (1989) suggest that central properties of natural kinds reflect ontological beliefs concerning a presumed "essence" or ontogenesis (e.g., lions have an "essence" of lionhood, or are born of lion parents). For artifacts, central properties may comprise intended or actual function (e.g., umbrellas keep the rain off, or are intended to do so). Medin and Shoben (1988) also note that central attributes are most clearly indicated by combinations in which they are denied, such as soft diamond (denying the intrinsic hardness of diamonds), straight boomerang (denying the presumed necessary bent shape) and wooden skillet (denying the necessary material to perform its function). Moreover, within the set of diagnostic properties for an object, different degrees of diagnosticity can be defined by their different import in supporting the inference to central properties. Shape and color of a lion might be diagnostic, but an entity with a radically wrong shape (e.g., a refrigerator) would not be classified as a lion, whereas one with the wrong color (e.g., purple) might. The lay-theoretic explanatory relation between shape of a lion and its presumed "essence," is stronger than that between color and its essence. The former is highly diagnostic, the latter is not.

Because classification is underpinned by concept representations, accounting for the context sensitivity of classification requires an account of the context sensitivity—the flexibility and specificity—of those representations
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(Braisby, Franks, & Myers, 1992; Franks & Braisby, 1990). The flexibility of classification (and, by inference, the representations used to carry out the classification) is demonstrated by what Clark (1983) calls "nonce sense": the word lion, for instance, can be used to classify or refer to real lions, statues of lions, toys, dead lions, and even people. In each case, a representation associated with the word lion, derived in a contextually appropriate manner from the default concept for lion, supports the classification: The representation used denies more or less of the default attributes in lion, indicating varying degrees of flexibility. In a complementary manner, the concept for lion can be made increasingly specific, so as to classify gradually fewer things as lions. For different purposes, all lions could be so classified, or only all female lions, or only all adult female lions. More specific representations thus indicate different additions to the default concept.

How might flexible and specific representations be derived from a default concept? The view presented here is motivated by several psychological phenomena. Provision for specificity is informed by "instantiation" (Johnson-Laird, 1987), which involves the reciprocal interaction between the generation of a representation for an expression and the assignment of a discourse referent to that expression. The discourse provides information concerning the referent over and above that provided by the default concept for the referring expression, and this can be used to add features to the representation for the expression thus making it more detailed or specific. For example, Anderson, Pichert, Goetz, Schallert, Stevens, and Trollip (1976) found that recall of sentences like A fish attacked a swimmer was better when cued with shark than with fish. In understanding the sentence, the instantiation of fish (the discourse referent assigned to it) appears to have the attributes of a shark (e.g., potential ferocity) rather than the parallel attributes of a default fish (e.g., docility), so that the representation associated with fish is more specific than the default concept for fish (since it has additional features derived from shark). A crucial further possibility that will be central to the treatment here is that in some cases (and unlike the preceding one), the instantiated entity may not be a subordinate of the noun instantiated (in the preceding case, shark is a subordinate of fish). In a privative case like stone lion, the instantiation could be "statue of a lion," and so the concept for statue acts as a source of features for the representation of the stone lion noun phrase (cf. also, Gerrig & Murphy, 1992; Murphy, 1988). Moreover, Gerrig and Murphy (1992) have shown that it may not be crucial to instantiate the combination as an actual referent in the current situation, but rather to have accessible a discourse referent, which is taken as providing an additional, relating concept. This "additional" concept is referred to as the implicitly attached concept (NI, for "noun that is implicitly attached"; cf. Platts, 1979). For privatives like stone lion, the referent of the NI is of a different ontological type from the referent of the head N. The
NI, then, provides a source of additional features that support specification of a sense. On many views (e.g., Hampton, 1987; Murphy, 1988), specification is taken to occur after an initial combination of the constituent concepts, and sense generation follows a similar pattern. Flexibility in conceptual representations, here, is handled by allowing various types of defeat of the features of a concept so as to render its content more contextually appropriate. Particular mechanisms are discussed later.

2.3 Motivations From the Pragmatics and Psychology of Communication

A central part of communicating with a referring expression involves a speaker employing the representation associated with that expression as a medium for classifying a referent, and intending the hearer to construct a (sufficiently similar) representation to associate with that expression (see, e.g., Clark & Marshall, 1983; Clark & Schaeffer, 1989; Sperber & Wilson, 1986). Satisfying this pragmatic function constrains the generation of representations. For example, in order that the hearer can understand our utterance (and so work out which object we are referring to, and how we are referring to it), the information we use in constructing our representation must be shareable. Hence, the content of our representation must be available in the physical situation, in the shared conventions of language use, or in the conventions of the communities that the speaker and hearer belong to; otherwise, it must be inferrable from the facts that are thus available. This pragmatic constraint on concept combination echoes relevance theory (Sperber & Wilson, 1986). Relevance theory claims that communication involves the constrained expansion of the "mutual cognitive environment" (a notion that has similarities to Barwise's, 1988, notion of a "focus situation"), which is the set of beliefs that are common to a speaker and hearer in a situation. A successful speaker generally uses expressions that facilitate the hearer's efforts in inferring appropriate additions of information to the mutual cognitive environment, and communication demands a balance between the amount of cognitive effort required to make these inferences and the amount of information thus derived.

So, unless an expression is used for particular stylistic effect, it is assumed that the processing costs will be worth the informational benefits. Both the types of content a speaker wishes to associate with a referring expression (i.e., the degree of flexibility) and its degree of detail (i.e., the degree of specification) will be constrained by what content he or she can presume the hearer can associate with that expression with minimum effort. For some purposes, a speaker may wish to communicate very detailed content; for others, he or she may wish to communicate content that departs from the expression's default content. In such cases, communication will only succeed if the hearer has direct or inferential access to sufficient informational resources to support the construction of appropriate content for the expression: In particular, the NI
the speaker uses should be available to the hearer. Otherwise, the speaker’s utterance about the referent may be infelicitous (i.e., the information the hearer has available to associate with the expression may be inadequate to individuate the referent). One way of attempting to ensure that the NI is available to the hearer is for the speaker to adopt a perspective on the referent that is also easily adopted by the hearer (Clark & Marshall, 1983; Franks & Braisby, 1990). How can a speaker simultaneously convey his or her general perspective on a referent, and the particular information he or she wishes the hearer to associate with the referring expression? One way is in the choice of linguistic expression. Clark, Schreuder, and Buttrick (1983) note that, in helping the hearer establish reference, a speaker employs expressions reflecting different perspectives on the referent. And, having established reference, there is a pattern to the perspectives that are used in later referring to the same entity. For example, initial reference to “the object that looks like a man with his arms in the air” allows later perspectives to pick out subparts: “the man with his arms in the air” or “the man.” Similar considerations are discussed by Ariel (1988) in the context of relevance theory. In addition to the choice of linguistic expression, the brute facts of the situation—facts that the speaker will know must be part of the hearer's cognitive environment—facilitate shared perspectives. In a broad sense, this view of conceptual content as generated according to a “logic” of social exchange echoes the view of reasoning advanced from within evolutionary psychology (Cosmides, 1989), and in particular, the possibility of switches in perspective giving rise to different content guided by such a logic relates to perspective-based reasoning (Gigerenzer & Hug, 1992). That this is more than a passing resemblance is also suggested by the relatively encapsulated or modular view of concept combination developed here: Such domain-specific contents and mechanisms tied to the nature of communication exchanges define precisely the kind of faculty that evolutionary considerations appear to dictate (e.g., Tooby & Cosmides, 1992).

These general considerations and phenomena from the psychology of concepts and the pragmatics of communication provide a motivation for the general sense generation orientation on concept combination, whose general properties are sketched in an informal fashion in Section 2.4.

2.4 A Brief Overview of Sense Generation and Perspectival Relativity
Given that concepts are principally implicated in representation and classification, the overview of sense generation is presented in two strands. These are summed up, in Section 2.4.3, in five general principles of concept combination.

2.4.1 Representation: Lexical Concepts and Senses
As noted earlier, senses for expressions are generated from their default concepts, and in the case of representations that display flexibility, senses may be nonmonotonically related to their input concepts. Senses are here
taken to be descriptions or contents that mediate between uses of words and referents, and are individuated by Evans' (1982) "intuitive criterion of difference" for Fregean senses (Frege, 1892/1970). This states that, if a rational agent can both assent to and remain agnostic about the application of a referring expression to an entity, that referring expression must have two different senses. Such senses express an entity's different "modes of presentation" with respect to an agent, and correspond to different ways of referring to or cognizing that entity: They are thus indicative of different perspectives. As context-sensitive contents fulfilling the classificatory function, senses manifest flexibility and specificity. Lexical concepts, on the other hand, comprise the "semantic" component of the lexical entries for words in a mental lexicon, and so fulfill the representational function. The lexical concept for a word thus expresses the content upon which a language user regularly draws in understanding a use of that word. A generative process takes a lexical concept as input, operates upon it according to contextual demands for specificity and flexibility, and produces as output an appropriate sense. All nondefault senses are generated from the word's lexical concept and may be nonmonotonically related to it. Whereas lexical concepts are the contents represented in long-term memory, senses are taken to be temporary representations, constructed for the current context of communication only.

The content of lexical concepts and senses is described (see Section 4) in a logic of attribute-value structures (Johnson, 1988; Kasper & Rounds, 1986), and generation is characterised via operations over such structures. Senses and lexical concepts are expressed as structures of single-valued attributes—"quasi-classical" representations whose attributes are defeasible and so do not express necessary and sufficient conditions on category membership (unlike the classical theory of concepts; cf. Smith & Medin, 1981). This characterisation makes no identity claim between the formal language and the mental representations described. Rather, the account is pitched, in terms of levels of description (Marr, 1982), "above" the algorithmic level: In talking of the contents of concepts, it makes no claim either about the precise nature of their mental representation, or about the algorithms that combine such representations. Instead, it follows what Peacocke (1986)

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2 This contrasts with prototype theory, which usually accounts for variations in conceptual content by representing the set of different possible values for an attribute within the lexical concept itself (from which set the appropriate value is selected according to context), rather than by context-dependent changes to that content. The supposition appears to be that the set of permissible values that are represented for an attribute will exhaust the range of possible properties of objects (of a given type) that a person could encounter.

3 On a processing account of sense generation, senses could be viewed as being constructed in a working store somewhat akin to the very short-term conceptual memory argued for by Potter (1993). Such a store represents fleeting, semantically evaluable contents which, without rehearsal or use, decay rapidly and so do not lead to alterations in contents represented in long-term memory.
labels "Level 1.5." Hence, the "mechanism" of sense generation, and its "stages," are not intended as direct specifications of mental algorithms, but rather as specifications of the relations between contents.

2.4.2 Classification: Partial Information and Perspectives
Senses express partial information about the referent to be classified, and they are generated so as to more closely approximate the referent than do their input lexical concepts. Informationally then, in terms of the facts of the matter, the lexical concept \( L \) subsumes the sense \( S \); that is, \( L \subseteq S \). However, it is not the case that the associated attribute-value structures lie in a subsumption relation, because the relationship between the lexical concept and sense attribute-value structures may be nonmonotonic. In what follows, senses are treated as akin to pegs (Landman, 1986), partial objects that have features ascribed to them during processing; they are the objects that are assumed in a discourse, and whose features can be varied through that discourse. A single peg cannot be ascribed incompatible features, and there may be more than one peg per referent. In expressing partial information about referents, pegs/senses (the terms are used interchangeably here) may be said to approximate those referents. By possessing the properties represented in a sense for an expression, an entity can be classified as a member of that expression's category (whose properties it approximates). Relative to a set of properties employed for classification, the sense should be an indiscernible approximation to the referent: Taking \( a = \) classifying type, and \( d = \) sense, then \( d \) is an indiscernible approximation of \( a \) in information state \( s \), iff for all features \( F \):

\[
\text{if } s \rightarrow F(d) \text{ then } s \rightarrow F(a), \text{ and if } s \rightarrow F(d) \text{ then } s \rightarrow F(a); \text{ and}
\]
\[
\text{if } s \rightarrow \text{must } F(d) \text{ then } s \rightarrow \text{must } F(a), \text{ and if } s \rightarrow \text{may } F(d) \text{ then } s \rightarrow \text{may } F(a).
\]

The turnstile, \( \rightarrow \), is read, "warranted ascription on the basis of the contextual evidence \( s \)," \( \rightarrow \) is "unwarranted ascription on the basis of the evidence \( s \)," \( \rightarrow \) must is "warranted ascription of central features to the sense," and \( \rightarrow \) may is "warranted ascription of diagnostic features to the sense." Intuitively, where a sense is an indiscernible approximation to a referent, the features of the sense will mirror the referent's properties, and the referent may also have additional properties (that is, there should be no features in the sense that do not represent properties of the referent, but there may be properties of the referent that are not represented as features in the sense).

Understanding a referring expression is taken to involve setting up a discourse referent (i.e., peg) with certain features. We can then adopt various perspectives on that discourse referent or view it as performing different roles, whilst still aware that it is the same referent. For example, an apple could play the roles of a dessert, a still life, a missile, or a cricket ball. Under these roles, the apple remains an apple, but we adopt different perspectives.
on it, utilising different subsets of its features to classify it as a member of the "role" categories. Consider the mini discourse, *Three-year-old Rory painted a watercolour of an apple, then threw it at his cat and missed. Having lost his cricket ball, he briefly batted the apple along the floor before examining it for bruises. Finding that it was unblemished, Rory swiftly ate the apple.* Pegs with different roles are labelled *alecs* (Landman, 1986), and an alec is an indiscernible approximation to its various roles (i.e., to the default content of the lexical concepts associated with the roles' categories). The general picture is that the generation of a sense for an expression involves ascribing features to a peg; these features allow it to act as an alec, and so play more than one role in the discourse. A peg with the features of a *stone lion* may be classified as a *lion* under one role (and relative to one set of attributes), and a *statue* (i.e., non-lion) under another (relative to another set of attributes). However, no conflict arises between roles or classifications, as they are made from different perspectives and are not intended to be generalised over. This view takes it that classification is all-or-none or binary (unlike prototype theory, but like classical theory), but relative to context or perspective (unlike classical theory).*

This relativity of classification judgements can be viewed from two complementary viewpoints: one concerning the range of linguistic expressions used to refer to a single object, and another concerning the range of objects that can be referred to with a single expression. Concerning the first, the most extreme context dependence is a case where an entity is classified as an *x* from one perspective, but as *not-x* from another. That is, variation in perspectives can give rise to apparent self-contradictions in classification. They are, however, only apparent self-contradictions because the classifications intentionally use *different kinds of information.* Only if contradictory classifications were to be made using *the same* information, would they be truly self-contradictory. So, it is coherent to classify a statue of a lion as a non-lion, or a fake gun as a non-gun, from one perspective (relating to presumed essence, or central attributes), but as a lion and a gun from another perspective (relating to diagnostic, appearance attributes). The choice of classification perspective will depend on the purpose of making reference to the object in the discourse. The purpose of the classification judgement relates to the intended contrast set (i.e., the range of entities that the classification statement is intended to set the object apart from). Consider two questions: Given a toy lion and a cup of coffee, which is the lion? The response here differs from that to: Given a toy lion and a real lion, which one is the lion?

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*4 Nonbinary (i.e., fuzzy) classification is assumed by prototype theory and also by theories in which diagnostic attributes are responsible for quick classification (e.g., Keil, 1987; Smith et al., 1988). An empirical and conceptual critique of fuzzy classification is given in Braisby and Franks (1995a).*
Relative to different presupposed contrast sets, then, different classification judgements are made and there are no obvious grounds for wanting to generalise over those different contrast sets. Indeed, there are clearly good pragmatic-communicative reasons to not want to generalise over different contrast sets. The information required to set a lion apart from a cup of coffee differs from the information required to set a lion apart from a statue of a lion, both in terms of the central attributes (reflecting flexibility) and in terms of the degree of detail of diagnostic attributes (reflecting specificity). If we take it that a goal of communication is in general to convey just sufficient information for the purpose of the exchange, but no more (as in Grice’s maxim of quantity; Grice, 1975), generalising over the two sets would obscure the difference in information employed, and so obscure the communicative difference between the two classification statements. This formulation reflects the other vantage point on the perspectival relativity of classification: As Nunberg (1978) noted, most common noun terms can be used in precisely this way. So vacillation between these two classification perspectives is part of most common nouns’ conventional use.

2.4.3 Principles of Concept Combination and Classification

On the basis of these considerations, sense generation postulates three simple principles of concept combination, and two principles of classification. These principles interact to ground the particular rules postulated for combining concept representations (Section 4) and the schemas that are postulated to govern classification (Section 5). The most basic assumption is that concept combination is rule-describable, hence compositional.

\[ P_1: \text{Compositionality: The sense associated with an expression is a function of} \]
\[ \text{the lexical concepts of its parts and the way they are combined.} \]

The notion of compositionality here is not the strict feature-summation one found in (and often taken to be contradicted by) the cognitive psychology of concepts (Hampton, 1987), but a broader linguistic-semantic one (Partee, 1984). The way the parts are combined is contextually constrained, such that a sense for a noun phrase may be generated from the lexical concepts of its constituents, plus lexical concepts accessed due to contextual influences (i.e., the NI—implicitly attached concept—derived from the instantiation). Sense generation, then, may not respect surface compositionality (since there may be attributes in a combination’s sense that are not present in the constituents’ lexical concepts), but it does respect a deeper compositionality in that “emergent” attributes can only arise in restricted, rule-governed ways. Again, in explicitly allowing for nonmonotonicity (i.e., the defeat of

\[ \text{I am grateful to Ray Jackendoff for suggesting this formulation.} \]
attributes), the surface compositionality (of the contents of the head and modifier's lexical concepts) is not adhered to, but the constrained, rule-governed occurrence of nonmonotonicity does respect a deeper compositionality. This is to say that, by allowing for quite complex rules of combination (rather than simple feature-summation, which is expressible as unification; see Section 4.2), compositionality can be respected even if its usual epiphenomena (monotonicity and nonemergence) are not.

The other principles about representation are more specific instances of \( P_1 \) and further constrain how the compositional process is hypothesised to operate. \( P_2 \) reflects a communicative motivation to minimise flexibility.

\( P_2: \) Default Content: Unless there is good reason, the content represented in a constituent's lexical concept will also be represented in any sense generated for that constituent or for a phrase of which the constituent forms a part.

If language users represent roughly the same default content for a term, the communication benefits arising from restricting deviations from that default will be transparent. Other arguments in favour of postulating default contents are provided in Franks and Braisby (1990) and Braisby, Franks, and Myers (1992); similar views have recently been aired by Barsalou (1993). A default content, then, is the stable and iterable content that is accessed immediately as the content of a mental lexicon in on-line processing (cf. Moss & Marslen-Wilson, 1993); it does not reflect all or even most of the detailed commonsense theories of world knowledge people have about categories of objects (see Section 8.1 for a discussion of this point). The central example of "good reason" for diverging from this default content, which is taken up later, is the syntactic priority of a modifier over a head in a modifier + noun combination (cf. Brown & Miller, 1980; Gagne & Shoben, 1993; Hampton, 1987).

A question that might be raised is, should "typical" attributes be included in the default content? That is, should attributes that form no part of the diagnostic or central attributes be added as a third major attribute-value structure (AVS) to the lexical concept for a word? For example, wild birds typically fly away when approached by humans, though such behavior is not diagnostic of being a bird, nor central to it. Three reasons militate against inclusion of such typical attributes. First, typicality structures (and hence typical attributes) are unstable across both contexts and perspectives (Barsalou, 1987); this raises a problem of which contexts or perspectives to take as defining a default typicality structure. Second, typicality structures are also variable across different sources for typicality. Lakoff (1987) notes that what is typical for one background theory (or idealised cognitive model) is atypical for another, and what is typical relative to an ideal central tendency may differ from what is typical relative to a factually-based generalisation; this again raises the question of which basis to adopt for
typical attributes. The final reason is the classificatory and ontological irrelevance of typical attributes; if they are noncentral and nondiagnostic, their role in concepts is unclear, except as indicating conceptual connotations. For these reasons, then, typical attributes are not included in the representation of the default content. Two aspects of this argument should be stressed. First, notice that these are substantive reasons; the AVS formalism itself does not restrict the number of subtypes of attributes. Second, none of these reasons appear to apply to central and diagnostic attributes.

A third principle reflects the communicative motivation to minimise specification.

P₃: Partial Information: Unless there is a communicative or cognitive demand for additional information, the sense for an expression will comprise the minimum information necessary to support reference and communication.

Beyond the default content, the detail of content ascribed to a sense is subject to informational and communicative "demand": So the sense remains nonspecific unless there is definite communicative demand for additional content. The fact that comprehension can occur without extensive elaboration has been demonstrated by Erickson and Mattson (1981). Similar notions have been espoused by text grammarians (e.g., Van Dijk & Kintsch, 1983), and in relevance- (Sperber & Wilson, 1986), common ground- (Clark & Marshall, 1983), and implicature-based (Grice, 1975) theories of communication.

These principles are the representational assumptions about concept use which, individually and in interaction, constrain the rules postulated for a sense generation account of concept combination. In addition to principles concerning representations, I postulate two principles of classification that are analogues to P₂ and P₃. Principles P₄ and P₅ can be viewed as ways of being more precise about the pragmatic motivations for the approach.

P₄: Default Classification: Unless there is information to the contrary, the classification judgement expressed by associating a referring expression with a referent indicates a default, general perspective comprising both central and diagnostic attributes.

Information to the contrary may include the fact of employing a linguistic expression indicative of a "narrower" perspective than one used earlier in a discourse; for example, if we have already referred to a toy gun as a fake gun, later reference to the same object may be achieved by gun. The change of expression indicates a change of perspective. If the initial perspective departs from the default perspective, facts about the object itself may be adequate to inform the hearer about the speaker's intended perspective. If a speaker refers to a toy gun as a gun, the hearer than has two clear options. The first is to take it that the speaker is both adequately informed about the object and linguistically competent; hence, the natural inference is to a narrow perspective restricted to diagnostic attributes, and since the hearer
shares this, the communication will be felicitous. The second is to take it that the speaker is not adequately informed about the object or not linguistically competent; here, the inference may be to a general, default perspective, and the communication may fail. Departures from default perspectives are also constrained by communication factors.

P₂: Perspectival Classification: Any divergences from default classification will involve a judgement under a perspective comprising the minimum information necessary to support reference and communication, unless there is additional supporting information available or inferable from the context.

As with P₁, this balances the addition of nondefault information against the extra processing effort required. This means that classification from a nondefault perspective requires additional information to be available to the hearer. The flexibility of perspectival classification is bought at the cost of additional information requirements on coherent communication.

3. PRIVATIVES: A TEST CASE FOR THEORIES OF CONCEPT COMBINATION

Privatives have been addressed more in formal linguistic semantics than in cognitive science, though their characteristics suggest a role as a test case for theories of concepts. Although Kamp (1975) contrasts privative adjectives with the rest of adjectives, I argue that similar behaviors accrue to combinations also, prompting a reconstrual of the nature of privatives. On most views (e.g., Hoepelman, 1983; Kamp, 1975; Montague, 1974), privatives have three qualities. First, they display a certain type of classification behavior: in particular, a failure of the inference from an entity's being of privative NP (noun phrase) type, to its being of head N type. For any privative adjective A and any noun N, the sentence “No AN is a N” is a logical truth (Kamp, 1975, p. 125). So, an object classified as a fake gun just cannot be categorised as a gun in any sense. Secondly, all privatives have the same classification behavior and hence can be accounted for by a single treatment. Adjectives as superficially disparate, as fake, alleged, former, false, apparent, ersatz, ostensible, and sham receive the same treatment.6 Thirdly, privative behavior is exclusively a function of a restricted set of adjectives: If the modifier in a head-modifier noun phrase is not a member of the class of privatives, then by definition the defining classification behavior noted does not occur.

In Section 6, I challenge each of these assumptions. Under perspectival relatively, entities classifiable by a privative noun phrase can be classified as

6 That some privatives may have additional properties (e.g., former has an additional temporal or modal property) is not at issue here; they all have the same essential classification characteristics.
members of the head noun category, from a limited perspective only. Such classification behavior is also permissible with combinations in which the modifier is not intrinsically privative (i.e., it is not restricted to obviously privative operators like *fake*). Examples of such "functional privative" combinations, like *stone lion* or *straight boomerang*, support the same type of classification behavior as a result of the interaction between the contents of the combining concepts. Finally, I differentiate between the classification behavior of "negating privatives" (e.g., *fake*, *former*, *stone lion*) and "equivocating privatives" (e.g., *alleged*, *apparent*, *red lemon*).

Overall, the problematic of privatives has one aspect for representations, concerning how a sense for a privative noun phrase arises from combining the constituent lexical concepts, since those concepts appear to conflict: *Fake* in fake gun denies some central features of *gun*, whilst *stone* in *stone lion* clashes with *lion* on central features. For classification, it has a different aspect, concerning how it is possible to classify entities of privative noun phrase type as members of their head noun category (e.g., a fake gun as a *gun*, or a statue of a lion as a *lion*). Privatives are thus extreme cases of context sensitivity of classification and interaction of representations. This suggests that a general theory of concepts and concept combination, in addition to accounting for "affirmative" combinations (i.e., ones in which the defining classification behavior of privatives does not occur: A red apple can be classified as an apple in a general sense), should also provide an account of privatives that is consistent with the basic theory.

In Section 2, the motivations for the sense generation account of concepts and concept combination was outlined, and an informal characterisation of its general features was given. This allowed a specification of five general principles for concept combination governing the rules hypothesised to account for representation and classification behavior. In Section 4, the rules for combining representations are specified more formally, and in Section 5, the rules governing classification are also detailed.

### 4. REPRESENTATION: ACCOUNTING FOR SPECIFICITY AND FLEXIBILITY

In this section, I specify in more precise terms the framework for describing and combining representations in concept combination. The rules suggested for combining representations in concept combination are either instances of principles P₁, P₂, and P₃, or they arise as a result of their interaction. The general picture is that specification is viewed as the addition of features to those in an existing AVS, flexibility as the extent to which the features in a lexical concept are defeated. We conclude this section by discussing a prima facie difficulty facing the approach to representations.
4.1 Describing Lexical Concepts and Senses

Modelling the relations between words and senses via lexical concepts prompts one question concerning the number of lexical concepts postulated, and one concerning the relations between the contents of senses and lexical concepts. Indexing the lexical concepts for a particular word, and the various senses for a lexical concept, the AVS describing the jth lexical concept of the ith word will be notated \( L_{ij} \); and the kth sense of \( L_{ij} \) as \( S_{ijk} \). Sense generation posits a single lexical concept underlying all different senses of a nonambiguous word (i.e., \( i = j \)), and a potentially nonmonotonic relation between a lexical concept and its senses (i.e., \( j \leq k \)). For describing content, an attribute-value language similar to that of Johnson (1988) and Shieber (1986) is used. An attribute-value structure is a quadruple \( \text{AVS} = <\text{ATTR}, \text{VAL}, \text{LAB}, \partial> \): \( \text{ATTR} \) is a set of atoms called \textit{attributes}, \( \text{VAL} \) a set of atoms called \textit{values}, and \( \text{LAB} \) a set of atoms called labels, where \( \text{ATTR}, \text{VAL}, \text{LAB} \) are disjoint. \( \partial \) is a partial function such that \( \partial: \text{LAB} \times \text{ATTR} \rightarrow \text{LAB} \cup \text{VAL} \). This produces attribute-value structures: Structures to the right of a colon are the values of the attributes to the left, where values can themselves be complex AVS's:

\[
\begin{align*}
&\text{a}: [\text{a}: p] \\
&\text{b}: [\text{b}: p] \\
&\text{c}: [\text{c}: r]
\end{align*}
\]

Identity of attribute-value structures (say AVS and AVS') holds if and only if the corresponding partial functions (\( \partial \) and \( \partial' \)) are identical. AVS is said to subsume AVS', \( \text{AVS} \subseteq \text{AVS}' \), if and only if \( \partial' \) is an extension of \( \partial \). The subsumption relation amounts saying that, where \( \text{AVS}(L_{ij}) \subseteq \text{AVS}(S_{ijk}) \), then \( \text{AVS}(L_{ij}) \) is an indiscernible approximation to \( \text{AVS}(S_{ijk}) \): that is, \( \text{AVS}(S_{ijk}) \) has either identical feature-value pairs to \( \text{AVS}(L_{ij}) \), or some proper superset of such features. Centrality and diagnosticity are represented as higher-order features whose values are AVSs comprising the set of central and diagnostic attribute-value pairs, respectively. The AVS for each concept will therefore comprise two higher order features. Further, following Dawar and Vijay-Shanker (1989), I adopt a three-valued treatment of negation in the attribute-value logic. This can be thought of as a characteristic function \( \mathcal{F} \) that maps AVSs onto the truth-values \{1, 0\}, where this function is only a partial function: some AVSs will be mapped to 1 ("AVS

\[\text{Strictly, the subsumption relation is one that holds over AVSs, whilst the relation of being an indiscernible approximation is one that holds over referents. So, if it is the case that referent } x \text{ is an indiscernible approximation to referent } y \text{, then an AVS description that can support individuation of } x \text{ will subsume one that individuates } y. \text{ I will preserve the appropriate use for each of these cases. However, where the relata are senses and discourse referents, which will be the case in our treatment of privatives (Section 7), I use either phrase according to context.} \]
warranted on the basis of the evidence’’) others to 0 (‘‘AVS is rebutted: It is not warranted on the basis of the evidence’’), and others to neither (‘‘AVS is undercut: It is neither warranted nor unwarranted on the basis of the evidence’’). Only if there is sufficient evidence can we warrantedly ascribe either an AVS or its negation to a sense. Because an AVS can be a single attribute-value pair, in context there may be evidence to ascribe such a pair to the sense, to ascribe its negation, or neither.

The sense generation relation can be thought of, formally, as parallel to the generation relation in a theory of grammar. Thus, a sense generation system consists of a triple: <AVS, R, start>:

\[
\begin{align*}
\text{AVS} & = \text{set of attribute-value pairs}, \\
R & = \text{set of concept specification and combination rules}, \\
\text{start} & = \text{the starting constituent (i.e., the first lexical item processed)}. 
\end{align*}
\]

A sense is legitimately generated if the AVS for the sense is licensed by the rules R. Every attribute-value pair in a sense AVS must be thus licensed. AVS a is generated by the sense generation system iff:

i. the first lexical item processed is start, and

ii. for every attribute-value pair in a,

(a) the pair is encoded in the lexical concept associated with start; or

(b) there is a rule, \( r \in R \), whose application to the lexical concept associated with start generates the pair; or

(c) there is a rule, \( r \in R \), whose application to the output of (b) generates the pair.

The rules of the sense generation system can be seen to comprise a “syntax” that operates under all circumstances. They have the capacity to generate potentially any AVS, as is required by the radical context-sensitivity and creativity in language and concept use. However, the particular AVS generated for an expression, hence its flexibility and specificity, is, in practice, governed by pragmatics. So, the rules’ bottom-up generative capacity is tempered by top-down communication constraints.

### 4.2 Specificity: Unification and Implicit Semantic Attachment

Specification is achieved through the unification of feature structures. Unification is the basic information-combining operation, such that the unification of two attribute-value structures is the least upper bound on the subsumption lattice that subsumes both attribute-value structures. Intuitively, it directly reflects P, and constitutes the summation of two sets of features; thus, it is a monotonic operation: \( A \sqcup B \rightarrow A \sqsubset AB \). It requires that, for two AVSs to be unified, none of their component attributes have conflicting values: If values on an attribute are in conflict, then unification fails.
Unification might then be expected to be the basic mechanism for "affirmative" combinations (like happy man), because they do not appear to involve any conflict between the head and modifier contents. Much, however, depends on the content demanded by P1: The more precise the default content for the head noun is, the more likely that any modifier that combines with the noun will conflict with that content. Consider unifying the concepts for red and apple. If the default color for apple is red, unification succeeds. If, however, the default color is green, unification fails. What other options are there? One would be to specify no color at all. But this would be implausible: The default content for apple must surely encode diagnostic information regarding color. Anyway, if we do away with color because of potential conflicts, there is no reason why the same fate should not befall the other attributes for apple, as a result of other conflicts due to different combining concepts. Another option would be for the attribute "color" to take a disjunctive value—the disjunction of all possible colors for apples (as in prototype theory; e.g., Hampton, 1992; Smith et al., 1988). Any modifier would necessarily be unifiable with such an attribute. This again falls foul of P1: The range of all possible colors just is not a default color. In addition, the list of all possible colors would presumably be infinite, and so not to be encompassed within a finite lexicon in a finite brain (see Braisby, Franks, & Myers, 1992; Clark, 1983; Franks & Braisby, 1990, for related arguments). So P1 constrains the contents represented in lexical concepts, and as a result the kinds of operations possible in R are also constrained. In particular, flexibility requires a more complex operator than unification. A second way of providing for flexibility is to unify a sense AVS with the AVS of the NI lexical concept (the implicitly attached concept deriving from instantiating an expression as a discourse referent). Constraints on selecting the NI are examined in Section 4.4.

4.3 Flexibility: Type Coercion, Negation, and Priority Union

Priority union is one mechanism that provides a means for achieving flexibility in concept combination. It parallels unification, except that where there is a conflict between the values of two attributes, the value in the priority constituent is inherited in the combination (Kaplan, 1987). Kaplan suggests its use for handling defaults in morphology, and in treating syntactic phenomena such as "gapping." For the latter, consider He listened to Schubert and she to Bach, or He read Beckett and she Giono: The verbs listened and read are elided in the second conjoined clause of each sentence. Kaplan suggests that the mother verb phrase inherits the priority union of the functional structure of the second clause, with the structure of the first clause acting as default. So, the verb for the second clause will also be the verb for the first clause, unless there is an explicit verb in the second clause that conflicts with the verb in the first clause. The priority union of A and B is expressed
The function outputs the set of pairs \(< a : v >\) where \(v\) is the value of the attribute \(a\) in the priority AVS \(A\), if \(a\) is in the domain of \(A\), otherwise the value of \(a\) in the AVS \(B\). The values in \(A\) override the values in \(B\), but any \(< a : v >\) pair in \(B\) that does not have a corresponding pair in \(A\) will be inherited by \(A / B\). A combination rule where the modifier’s value is inherited in cases of conflict expresses the syntactic dependency relation (Brown & Miller, 1980). If the default color for \(apple\) is red, and a sense for \(green\) \(apple\) is generated, the modifier’s priority means that the attribute “color” will take the value “green” in the combination’s sense.

Another way of providing for flexibility is by type coercion (cf. Klein & Sag, 1985; Moens, 1990; Pustejovsky, 1989). This operation changes the semantic type of an argument into the type required by the functor, where otherwise application of the function would result in a type error. The general idea is that the usual, default interpretation of a given expression needs to be adjusted or coerced, under well-specified conditions only, in order to reconcile it with the interpretation required by context. Type coercion has been employed in modelling a range of phenomena including the semantics of tense and aspect (Moens & Steedman, 1988), and syntactic control (Pollard & Sag, 1989). Probably the earliest use of this notion was by Nunberg (1978), who employed it to deal with metonymy. Consider a phrase like \(after\) the \(alarm\); here, \(the\) \(alarm\) has to be coerced from referring to an object (as it would normally, by default) to referring to an event (since objects cannot be arguments of \(after\), in this kind of construction). A plausible representation for \(the\) \(alarm\), as an object, would incorporate a component denoting the event of an alarm sounding, so interpreting this phrase requires coercing the interpretation of \(the\) \(alarm\) from the “object” representation to its subpart, the “event” interpretation. Similarly, Pustejovsky’s (1989) approach to lexical semantics employs metonymic coercion. He takes nouns to have four semantic components, and, in context, their meaning can be coerced to one of these components. So, in the phrase \(Mary\) began a \(book\), the NP \(a\) \(book\) is coerced to only one of its semantic components (concerning function). Whilst this is of much utility in computational lexicography, the current approach to conceptual content is more directly motivated by psychological evidence, and so differentiates only two types of content within a concept representation (central and diagnostic).

I propose a form of metonymic-type coercion (MTC), where the modifier coerces the head N’s default lexical concept AVS (which comprises central and diagnostic features) to one of the diagnostic features, plus central features that have been “negated.” The general picture is that the coerced
representation for the head N's lexical concept can then be ascribed to the
sense for the combination. Given the three-valued approach to negation (see
Section 4.1), there are two possibilities for negating central attributes: Coer-
cision may rebut the central features (ascribing their negation to the sense), or
it may undercut, or cast doubt on them (so that neither the features nor
their negation can be ascribed to the sense). It will be suggested that
negating privatives (e.g., false eyelashes) reflect the former case where cen-
tral features of the head N's lexical concept are rebutted, whilst equivocating
privatives (e.g., alleged criminal) reflect the latter case where the central
features of the head N are undercut (see Pollock, 1987). Hence, two meta-
nymic-type coercion operators are defined: MTC\(R\) (metonymic-type coercion
with rebuttal), and MTC\(U\) (metonymic-type coercion with undercutting).
MTC\(R\) thus has the form:

\[
\begin{align*}
\text{Central:} & \quad \begin{bmatrix} P:q \\ R:s \\ T:u \end{bmatrix} \\
\text{Diagnostic:} & \quad \begin{bmatrix} A:b \\ C:d \\ E:f \end{bmatrix} \\
\neg & \\
\text{Central:} & \quad \begin{bmatrix} \neg P:q \\ \neg R:s \\ \neg T:u \end{bmatrix} \\
\text{Diagnostic:} & \quad \begin{bmatrix} A:b \\ C:d \\ E:f \end{bmatrix}
\end{align*}
\]

By contrast, MTC\(U\) has the form:

\[
\begin{align*}
\text{Central:} & \quad \begin{bmatrix} P:q \\ R:s \\ T:u \end{bmatrix} \\
\text{Diagnostic:} & \quad \begin{bmatrix} A:b \\ C:d \\ E:f \end{bmatrix} \\
\neg & \\
\text{Central:} & \quad \begin{bmatrix} A:b \\ C:d \\ E:f \end{bmatrix}
\end{align*}
\]

Two points should be made about this use of metonymic-type coercion.
Firstly, the coercion operator is in effect a quantifier over all of the attribute-
value pairs that comprise the value of the central attribute: In these examples,
it quantifies over \(<P:q>\), \(<R:s>\), and \(<T:u>\). It is, however, a negative
quantifier whose effect is to negate (i.e., rebut or undercut) all of the values
of attributes within its scope, so that it has the force of a negation that is in-
ternal to the scope of the quantifier. That is, it corresponds to "all not"
which, taking \("\neg\) to cover both rebuttal and undercutting for exposition
(though in the treatment of privatives, it will be taken to express rebuttal or
explicit negation only), yields the equivalent to \((\neg <P:q> \& \neg <R:s> \& \neg <T:u>)\), as opposed to "Not all," which would yield \(\neg (\neg <P:q> \& \neg <R:s> \& <T:u>)\), which is equivalent to \((\neg <P:q> \vee \neg <R:s> \vee \neg <T:u>)\). It is thus "downward monotonic" (in the terms of Barwise &
Cooper, 1981), in that negation percolates down through to the subparts of the "central" AVS to all of its atoms. Intuitively, then $MT_{CU}$ involves a quantification that leaves undefined the ascription of all of the central attributes to the sense, whilst $MT_{CR}$ ascribes the negation of all of the central attributes.

The second point concerns the question of why the approach should employ both priority union and type coercion, since both have a "negating" effect on the head's lexical concept. The principal reason is to respect the flexibility allowed by $P_2$, but to do so within the confines of $P_3$, since in some cases priority union adds too much detail to the sense, contravening $P_3$. To provide for nonspecific flexible interpretations, combination must be able to override a noun's default content without adding in (specifying) any other content. By contrast, priority union necessarily produces an AVS whose specificity is equal to or greater than that of the noun AVS (since it replaces the values of conflicting attributes with its own values, and may add further attribute-value pairs of its own). To allow for contradiction of the head's lexical concept to have both specific and nonspecific outcomes, then, both metonymic type coercion and priority union are employed.

In order for priority union and metonymic-type coercion to play a role, the priority of constituents in a combination must first be determined. The general principle is that resolution of conflicts follows a pattern according to attribute importance within the combining concepts, and syntactic importance between the combining concepts. In the former case, following Hampton's (1987) findings, central attributes of one concept take precedence over diagnostic ones of the other, if they conflict. However, where central attributes of the two lexical concepts conflict, this is resolved by appeal to information outside of these concepts: syntactic or discourse/situational information. In the case of syntactic precedence, the modifier usually takes precedence over the head in cases of conflict. In the case of discourse precedence, the NI (derived from the instantiation of the discourse referent) takes precedence over the concepts explicitly attached to the NP. The pattern of outcomes in conflict resolution is noted in Table 1.

Two things should be noted about the priorities in conflict resolutions presented in Table 1. First, notice that the ordering of precedence explicitly follows a pattern of bottom-up priority: Discourse precedence only occurs in the explicit absence of syntactic precedence; that is, the NI has no explicit syntactic marker, and so cannot enter into priority relations based on surface syntax. Secondly, notice that conflict resolution usually involves rebuttal of the attribute values of the nonpriority constituent, but with one exception. In conflicts between a head's central attributes and a modifier's highly diagnostic attributes, the trade-off between the modifier's usual syntactic priority and the usual priority of central over diagnostic attributes is taken to motivate an undercutting of the central attributes of the head. The proposal for treating privatives is that type coercion operators are "triggered"
<table>
<thead>
<tr>
<th>Modifier</th>
<th>Head</th>
<th>Central</th>
<th>Highly Diagnostic</th>
<th>Diagnostic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>MTCR of Head&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Priority Union: Modifier/Head</td>
<td>Priority Union: Modifier/Head</td>
<td></td>
</tr>
<tr>
<td>Highly diagnostic</td>
<td>MTCV of Head&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Priority Union: Modifier/Head</td>
<td>Priority Union: Modifier/Head</td>
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</tr>
<tr>
<td>Diagnostic</td>
<td>Priority Union: Head/Modifier&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Priority Union: Head/Modifier&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Priority Union: Modifier/Head&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

Note. Each cell indicates a conflict between attributes noted in the column and row for that cell.
<sup>a</sup> These conflicts occur in privative combinations.
<sup>b</sup> Resolution of these conflicts is an empirical matter: Would the relative priority of central over diagnostic attributes be such as to outweigh the relative priority of modifier over head?

in two conditions: when the attributes of the concepts conflict as in Table 1, and when the modifier is a negating privative like fake (triggering MTC<sub>R</sub>) or an equivocating privative like apparent (MTC<sub>V</sub>).

### 4.4 Flexibility and Specificity: Implicit Semantic Attachment

Unification, priority union, and type coercion are operations that provide for flexibility and specificity. As noted earlier, the lexical concepts over which these rules operate can be either explicitly or implicitly attached to the head and modifier. In Section 2.2.2, I sketched the psychological motivation for implicit attachment (deriving from instantiation). Here, I note some linguistic-semantic motivations and suggest the constraints on selecting the NI during concept combination.

Platts (1979) notes a widespread assumption of explicit semantic attachment regarding the modification of the head noun in head-modifier noun phrases: It is usually assumed that the property of the modifier is evaluated with respect to the head N. Consider Netty is an attractive ballet dancer; on explicit semantic attachment, this is read as, “Netty dances ballet attractively.” However, as Platts suggests, there may be contexts in which the preferred reading is, “Netty dances ballet and is attractive in some other way,” of which a specific instance would be “Netty dances ballet and is attractive to look at.” Here, the attractiveness of the referent is evaluated not against the person’s qualities as a member of the head N type (ballet dancer), but with respect to qualities derived from some other type, perhaps physiognomy, or a goal-directed type such as people with whom one might dine. Ballet dancer is the explicitly attached N, whilst physiognomy is an implicitly attached one. The sense generation approach utilises this possibility so that by unifying the sense’s AVS with the lexical concept associated
with the NI category, the generation mechanism can tap into otherwise inaccessible knowledge.

As noted earlier, selection of the NI lexical concept follows the instantiation of the sense for the phrase, where instantiation assigns a discourse referent of a certain type to the phrase, even though the content of the phrases's sense underspecifies that type. The NI lexical concept is then the concept associated with the head noun of a phrase that individuates the referent. For example, if a discourse or text states that, *A girl was sketching a stone lion in the park*, the instantiation of *stone lion* would likely be as a statue of a lion, and not an ornament in the shape of a lion. The NI lexical concept selected would then be *statue*, and not *ornament*. This is one constraint on NI selection: In addition to being situationally appropriate, an AVS description of the instantiation must be subsumed by the sense AVS of the phrase that it instantiates; in this case, the AVS for *statue of a lion* would be subsumed by one for a *stone lion*.

A second constraint on selecting the NI comes from the relation between the head and the modifier in a combination. The semantics of many combinations has often been claimed to require mediating or thematic relations that indicate how the modifier modifies the head (see, e.g., Gagne & Shoben, 1993; Levi, 1978). For example, *mountain range* might employ the relation “head MADE OF modifier,” and *mountain magazine*, “head ABOUT modifier.” The view presented here is that the NI for a combination must instantiate such a relation. That is, comprehending combinations does not actually use mediating relations per se, but rather involves the use of NIs, which themselves indicate the relation in question. If the NI for *stone lion* were *statue*, the relation between the head and modifier indicated by this NI might be paraphrased as “lion MADE OF stone.” The NI, then, must instantiate an appropriate relation to connect the head and the modifier.

On this approach, respecting P, implies that choosing a particular NI (which reflects a particular modification relation between the concepts) does not occur inevitably, but only where there is informational demand for further specification. Understanding a combination in a nonspecific manner does not require accessing a particular NI. For example, an object described as a *stone lion* is simply a stone object in the shape of a lion on a nonspecific reading. This carries no commitment to knowing the detailed attributes of the object (e.g., whether it is a statue, ornament, or whatever), since such detailed attributes derive from the NI. A related view has been presented by Hobbs, Stickel, Appelt, and Martin (1993), who suggest that noun-noun combinations have an initial stage of interpretation that employs a general, imprecise mediating relation, one which is then further sharpened or specified by contextual information. In the view put forth in this article, these two phases are achieved by an initial nonspecific sense which can then be specified by an appropriate NI should there be sufficient demand for and availability of information.
4.5 A Problem About Representations?

On the Extent of Flexibility and Specificity

The rules of concept combination potentially allow the generation of a huge range of senses, but the range actually generated is constrained by pragmatic factors. If concepts support communication, there must be limitations on the flexibility and specificity of senses generated. Consider flexibility: If sense generation allows the defeat of attributes, then could not all of the attributes in a lexical concept be defeated in generating a sense? Or specificity: Since sense generation allows for the addition of attributes to a sense to make it more specific, then could there not be an infinite number of different attributes ascribed to a sense?

The rules in $R$ themselves do not prevent either of these outcomes. They are not intended to do so. Concept deployment as expressed through language use is creative; this is manifest in shifts of content. The factors that favor degrees of flexibility and specificity are ones that hold in principle: In principle, there is no limit on the flexibility of senses; in principle, there is no limit on the specificity of senses. To specify limits on the rules, we would need first to specify the limits on acceptable shifts of content, which itself would require knowledge of all possible senses for every expression. And given the ubiquity of "nonce sense" for everyday expressions (Clark, 1983), to delimit the possible senses for an expression requires also delimiting the range of possible contexts in which the expression can be used, and the aspects of contexts that influence the senses arrived at. Any rules for concept combination that posited an a priori limit on acceptable senses would thus necessarily succumb to counterexample after counterexample (cf. Clark, 1983; Franks & Braisby, 1990).

The view here is that constraints on senses arise in practice from the interaction of bottom-up rules with top-down pragmatics. That is, rather than attempting to stipulate an a priori upper-bound on creativity, it is taken that what is acceptable in adding detail or denying content depends on the knowledge and abilities of the hearer, and on the information available within the discourse or textual context. The sense generation process is thus one in which bottom-up and top-down factors interact: The rules propose, but communication disposes. The rules, logically, provide a space of possibilities which is, in practice, restricted by the facts of communication. This is not, however, a claim that the bottom-up rules generate a set of possible senses from which pragmatic factors then determine the choice of the appropriate sense in context. Rather, the pragmatic factors and the bottom-up rules conspire together to produce a single sense that is appropriate to context. These factors enter into the generation mechanism at various points (details are given in Section 7). First, after an initial bottom-up driven combination (which is blind to context), the decision as to whether to go on to further specify the sense is taken on pragmatic grounds. If there is communicative demand, then the combination rules are triggered and again operate
according to their own dictates. Second, once the decision to specify has been taken, contextual information is important in determining the instantiation of the NP, and so in selecting the NI. Instantiations must be able to fulfill the roles of the referent in the discourse context. Third, in cases where there is conflict between the central attributes of combining lexical concepts, but no surface syntactic priority of one constituent over the other, the lexical concept for the NI takes priority; so context determines the flexibility of the resulting sense. In these ways, context enters into the process at every stage combination, but is largely confined to a facilitatory role. That is, the pragmatic influences cannot prevent a speaker from manipulating content in whatever way he or she wishes (so that, even if there is no pragmatic support to carry out any of the three manipulations noted, the speaker may nonetheless generate a sense that is more specific and flexible than the hearer can generate on the basis of the available support). But where there is such pragmatic support, then the correlative alterations in content will support successful communication, and so will also have a plausibility they would otherwise lack.

In some cases, therefore, communication may fail: In the speaker’s adding content, the hearer may not have direct or inferential access to the information that the speaker presumes. If the speaker defeats content, it is possible that the hearer may not then be able to individuate the appropriate referent, or do so from the appropriate perspective. In the treatment of privatives discussed later, the classification perspectives or viewpoints that can be supported by different senses are outlined: In effect, given an intention to communicate about a referent in a particular way, only if the hearer can “follow” the speaker in making appropriate transformations of conceptual content, will those classification perspectives be warranted. Once again, the trade-off between the speaker’s manipulating content and the hearer’s cognitive effort must be respected.

5. CLASSIFICATION:
ACCOUNTING FOR RELATIVITY TO PERSPECTIVES

Just as the principles of concept combination outlined in Section 2.4.3 constrain the account of representations, they also constrain the account of classification presented. In this section, I first note the general approach, and then provide a more formal characterisation of the classification schemas that are motivated by principles $P_1$ and $P_2$. I conclude the section by discussing a prima facie difficulty with the account of classification presented.

5.1 Relativity and Perspectives
Classification is usually held to emerge from the taxonomic organisation of knowledge: Default content for the categorising type subsumes that about the categorised token, and all of the features of the type are found in and
used to classify the token. In contrast, I suggest that the evidence noted in Section 2.2.1 indicates two ways in which an explicit categorisation judgement may be relative to additional, often implicit information that differs from the default content for the classifying type: criterion relativity and sortal relativity. Geach (1967) argues that “x is y” is an abbreviated form of “x is the same N as y,” where N is an implicitly attached “covering sortal” noun type understood from context. Where the covering sortal changes, the validity of the identity statement can alter. Consider evaluating a statement like, *The Thames is the same as the Isis* (where “the same” river in fact has different names according to the location—along one stretch it is known as the *Isis*, whilst along another stretch it is known as the *Thames*). This requires making explicit the implicit covering sortal: If it is *river*, the statement is warranted; if *water*, it is unwarranted. The content of identity statements can then be expressed (with implicit content in brackets).

I:  

\[ X \text{ is the same as } Y \text{ [qua } N \text{]} \]

The covering sortal provides a description against which the entities are compared: It provides a criterion of indiscernibility—if the two entities are indiscernible with respect to this criterion, the identity statement is warranted. The change in the warrant or acceptability of a classification judgement arises from the change in criterion that the change of sortal brings. Now, consider making an identity statement using only a proper subset of the features of the lexical concept of that covering sortal, ignoring, say, the precise geographical location for *river*. The Thames and the Isis may be labeled the same river, but they have different locations along the same course. We then express the content of an identity statement,

I':  

\[ X \text{ is the same as } Y \text{ [qua } N, \text{ with respect to } c \text{]} \]

where N is the covering sortal, and c the criterion of indiscernibility that is a subset of the attributes in N's lexical concept. As outlined in Section 2.4.2, in classifying an entity, the type is an indiscernible approximation to the token entity on some criterion. As with identity, the classifying criterion c may be a subset of the features in the type's lexical concept. The content of affirmative classifications (e.g., *an apple is a fruit*) with criterion relativity, can then be paraphrased:

AC:  

\[ X \text{ is a } Y \text{ [with respect to } c \text{]} \]

where we read “is a Y’’ as “is a member of the category of Y.” This would capture cases like *a tomato is a vegetable [with respect to culinary use]*. In detailing the paraphrases of the contents of identity and classification statements, the content in brackets is not assumed to be explicit in the communication. Rather, the speaker is taken to associate this content with the referring expression, and, in successful communication, the hearer can directly access it or infer it.
Classifying an entity of privative NP type as a member of the head N category, in contrast, may involve both criterion and sortal relativity: The head N type is, under a given criterion, an indiscernible approximation to the NP entity, but only because the NP entity is itself also an indiscernible approximation to some other N, an implicitly attached NI under a more inclusive criterion. For example, a fake gun is classifiable as a gun (N), because a gun is an indiscernible approximation to a fake gun with respect to a (diagnostic attribute) criterion of shape (c) which itself is possessed by the fake gun in the form that is had by a replica or a toy (NI). So the criterion relative to which the head N is an indiscernible approximation to the NP entity, is itself relative to a NI:

PC: $X$ is a $Y$ [with respect to $c$, qua $N$],

where the covering sortal $N = NI$, and $c$ derives from the head N and NI; for example, *A fake gun is a gun [with respect to shape, in the form of a replica]*.

Classification an entity by employing a conceptual representation occurs through *adopting a perspective* on that entity. The perspective defines the classification intention of the speaker. This indicates the sense in which "$X$ is a $Y$," that is, the precise mode of presentation relative to which the classification is made, which is based on the intended generality of the classification judgement that the speaker makes. Such a representation comprises the criterion of indiscernibility and, for PC, the covering sortal. Implicitly associating a representation with an entity in this way expresses the extent to which the speaker intends the explicit categorisation statement to be generalisable to other contexts of classifying the referent, or to other ways of viewing that referent. This intention of generality in the classification judgement is reflected by the degree to which the criterion of indiscernibility employed in the perspective matches the default content of the lexical concept of the categorising type. If a criterion comprises all of the properties of the categorising N's default concept, the classification will be generalisable to all other ways of viewing or interacting with the entity as a member of that category. If, by contrast, a criterion comprises only a small subset of the N properties, the categorisation has limited generality (limited to views of or interactions with the entity that focus on that range of properties). The implication is that evaluating the acceptability of a categorisation judgement should involve evaluating the perspectival description against the facts of the matter (i.e., the properties of the referent), and only in limited cases will this amount to evaluating it by ascertaining whether the categorised entity has *all* of the default properties of the categorising type.

On the basis of the classification intention, different types of perspectives can thus be defined: A *Type I Perspective* is based upon all of the central and some or all of the diagnostic attributes of the categorising N type. Under Type I Perspectives, the categorised referent is construed as being of the categorising N type in the general sense. A Type I Perspective is implicit
in schema AC, and is governed by $P$. By contrast, a Type II Perspective is a restricted categorisation in which the criterion of indiscernibility does not include central features of the categorising N type. Hence it does not allow full generalisation of the categorisation. This is implicit in schema PC, and is governed by $P^*$.

The implications of this view of classification for the treatment of privatives are straightforward. Entities of privative NP type can be classified as members of their head N categories, but to appreciate this we need to uncover the perspective relative to which the classification is made. The way a fake gun is a gun, or a stone lion is a lion, is expressed through a Type II Perspective; and the way they are members of their NIs (replica, statue) is expressed through a Type I Perspective. Because the sets of attributes employed as criteria under these perspectives are not identical, there is no conflict between the two classifications. The Type II Perspective is not intended to generalise (i.e., to capture the nature of the entity in a general sense), unlike the Type I Perspective. Real conflict would arise only if the classifications were both intended to be under Type I Perspectives. Adopting different perspectives allows a rational agent to both assent to and demur from using the terms lion and gun to classify a stone lion and a fake gun, respectively. This satisfies the Fregean intuitive criterion for differentiating senses (Section 2.4.1). The two extreme types of perspectives allow for the vacillation in classification uses of nouns, between referring to entities in virtue of their appearances (Type II), or their assumed ontological nature (Type I).

Perspectival relativity implies that classification judgements, although context-sensitive, are nonetheless binary. Relative to the perspective, an entity is judged clearly as a member or nonmember of a category, even though that judgement may not generalise to other contexts or perspectives. This contrasts with the assumption of "fuzziness" underpinning prototype theory; on the view here, the appearance of fuzziness emerges from the (unmotivated) attempt to generalise judgements across different, incompatible perspectives (see Section 2.4.2; these points are elaborated in Braisby and Franks, 1995a). Although the notion of a perspective remains underspecified, and so requires further development, its role as a flexible pragmatic intermediary in classification allows it to play a useful role as an adjunct to lay theories (Murphy & Medin, 1985). In being sensitive to current information flow and circumstances, it provides a bridge between long-term, stable lay

---

8 These are two extreme types of perspective; the possibility of different "shades" of perspectives between these extremes is canvassed in Braisby, Franks, and Harris (1992). The relationship between the approach to classification developed here, and the distinction between "referential" and "attributive" uses of descriptions (e.g., Bach, 1987; Donnellan, 1966) is discussed in Braisby and Franks (1995b).
theories, and radically context-sensitive senses and classification. Although I have not provided a detailed account of what a perspective actually is, I have given a functional characterisation in suggesting some of the components that underpin permissible perspectives (concerning the pragmatic and cognitive limitations in communication), and also have noted the outcomes of perspectives for classification.

5.2 A More Precise Characterisation of Perspectival Relativity

Generating a sense for a combination is characterised as ascribing features to a discourse referent or peg for that combination (see 2.4.2). Pegs can, as ales, play different roles and thus be categorised as members of the roles’ noun types. A peg for fake gun can play the role of gun under a Type II Perspective, and the role of replica under a Type I Perspective. To be more precise, consider ales again. Recall the example of a discourse referent with the features of an apple, construed under different roles as a dessert, a missile, and a cricket ball. Beginning with a peg that has the features of an apple (from apple’s lexical concept), under one contextually appropriate “branch” of information addition, these features may be modified and features from the lexical concept for dessert added to form the first role; another branch would modify apple’s lexical concept with features for a missile, and so on. In doing so, the apple peg remains as it is—temporary roles or perspectives are adopted on it, each of which employs some subset of its features. Relative to each such subset of features, each role is an indiscernible approximation to the apple peg. We know it is an apple peg being classified as a missile, and so forth: The roles or classifications reflect independent perspectives, so they do not conflict. After construing the peg under these roles, it can also be viewed under its original role. Landman defines an alec:

peg a is an alec with respect to a set of features Y in s, iff:
For every “branch” b and every peg d which at some stage of that “branch” has the features in Y, there is an alternative b’ for b where at some stage a has the features in Y and a is an indiscernible approximation of d.

In the case of generating a sense,

Y = the features ascribed to a peg (as the sense for the expression), and
s = the discourse situation or context.

The peg or discourse referent for the sense (as an alec) subsumes its roles: The roles have all of the peg’s features plus their own ones. The following classification schemas are more precise versions of AC and PC, noted earlier, and so can be seen as constraints that govern the categorisation of the alec as a member of the role category.
AC': Peg $a$ can be categorised as a member of the noun type of peg $d$ iff $a$ is an alec with role $d$, such that $d$ is an indiscernible approximation to $a$ under some criterion $c$, where $c \subseteq Y$.

PC': Peg $a$ can be categorised as a member of the noun type of peg $d'$ iff $a$ is an alec with roles $d', d'' \in \{NI\}$, such that $d'$ is an indiscernible approximation to $a$ under some criterion $c'$, where $c' \subseteq Y$ and $c'$ is the combination of the criterion-level features of $d'$ and $d''$, and such that $d'$ is an indiscernible approximation to $a$ under some criterion $c^2$, where $c' \subseteq c^2$ and $c' \subseteq Y$.

These schemas express constraints on classification, such that the classification judgement (i.e., the antecedent of the biconditional in the schema definition) is felicitous if and only if the various kinds of content (the consequent of the biconditional) form part of the sense associated with the referring expression by the speaker, and can be directly accessed or inferred by the hearer. Schemas AC' and PC' are elaborations of AC and PC, presented earlier. AC and AC' reflect classificatory principle $P_1$. An example of privative categorisation (PC') is in categorising a stone lion as a lion:

\[
a = \text{peg/sense constructed for stone lion}, \\
a' = \text{role of } a, \text{ of lion type (head N)}, \\
d'' = \text{role of } a, \text{ of statue type (implicitly attached N)}, \\
c' = \text{diagnostic features}, \\
c^2 = \text{central and diagnostic features}, \\
Y = \text{features currently ascribed to stone lion sense (central and diagnostic)}, \\
\{NI\} = \text{set of possible implicitly attached noun concepts (possible roles of } a)\]

This categorisation satisfies the schema and so would be permissible; its content could be paraphrased, "the stone lion is a lion with respect to its appearance qua a statue." PC' defines two classification perspectives on an entity of privative NP type: as a member of the head N type under a Type II criterion $c'$ (from a combination of diagnostic features of the head N and NI concepts), and as a member of the NI type, under a Type I criterion, $c^2$, which is "deeper" or more inclusive than $c'$.

PC' does, however, fail to satisfy principle $P_1$ by demanding too specific a perspective (and thus too specific a sense, contravening $P_2$). This is because it requires the selection of a particular NI for a privative combination, so that the NP sense describes an entity with diagnostic properties of a particular N type of object, and also with particular central properties (of NI). Instead, in order to satisfy $P_3$, we must allow that a stone lion may be a lion in diagnostic features, but in some cases there may be insufficient information to tell precisely how these features are presented in the referent (i.e., to tell precisely what kinds of central attributes the stone lion has). The resulting modification of PC' is:
PC'': Peg a can be categorised as a member of the noun type of peg \( d^1 \) iff a is an alec with role \( d^1 \) and possible roles \( \{NI \mid NI = d^2, d^3, d^4, \ldots, d^n\} \), such that \( d^1 \) is an indiscernible approximation to a under some criterion \( c' \); and where \( c' \subseteq Y \) and \( c' \) comprises criterion-level features of \( d^1 \), whose combination with criterion-level features of any \( d^i \in \{NI\} \) would preserve \( d^1 \) as an indiscernible approximation to a under the same depth of criterion.

PC''' does not demand selection of a particular NI. Rather, the criterion of indiscernibility is consistent with all members of \( \{NI\} \). So a choice of \( d^i \in \{NI\} \) would not restrict further the generalisability of the categorisation. Notice that it defines only the Type II Perspective categorisation of the NP-type entity as a member of the head N type. The "same depth of criterion" means that we cannot order the criteria on which \( a \) matches \( d^i \), and \( a \) matches any of the \( d^i \in \{NI\} \), in terms of information inclusion. All members of \( \{NI\} \) will thus bear the same "depth" of indiscernible approximation to the NP: None will be closer or more precise approximations to the attributes in the NP sense.

To reiterate, for a categorisation of the appropriate type to be warranted, it must be an instance of the appropriate schema. Following communicative requirements, \( c \) and NI must be a part of the shared or available information for the agents, present in or derivable from a text or discourse context. Given this availability, perspectival content can, and usually does, remain implicit. Additionally, of course, there is the requirement that the information encoded in the perspectival description subsumes information available about the referent (i.e., that the criterion employed for classification \( c \) subsumes the information available about the discourse referent \( Y \)).

5.3 A Problem About Classification?

On "Word Use" and Perspectival Relativity

A prima facie objection to the picture of classification sketched here is that it conflates classification with "word use." The objection runs as follows. Word use is notoriously complicated by pragmatic factors, so an agent may, in context, refer to an object with virtually any expression. Examples would include the cases provided by Nunberg (1978): referring to a customer in a cafe as a "ham sandwich," for example. Such referential use is held to be subject to the vagaries of communication in a way that "real classification" is not. The factors mediating reference in the "word use" cases result in the default content for an expression being hedged about with qualifications, whereas in "real classification" there is a more "direct" connection between the default content and the properties of the object classified. A detailed discussion of this question is given in Braisby and Franks (1995b).

There are two prongs to a counterargument. The first is that the classification investigated by cognitive science has usually been linguistically
expressed classification, in that the principal experimental technique employed has involved the use of words in classifying entities (Braisby & Franks, 1995b; an exception being categorical perception; cf. Harnad, 1987). Such classification is a type of word use, and thus as influenced by pragmatics as is "word use." The second is a slippery slope argument: If word use differs from classification, what then is classification? Exactly how much of a concept's default content must be employed for an entity to be "really" classified as a member of the category? It cannot be that we must use all of the default content associated with a concept, for this would exclude many entities that clearly are classified as members of categories from being such members at all. The well-known cases from nonmonotonic reasoning (see Ginsberg, 1987) are instances here: We can at once know that birds usually fly, and also know that Tweety is a bird that does not fly. Of course, one way in which all of the default content could be used in classifying Tweety as a bird, would be by positing a nonspecific default content, one that made no specification of attributes such as birds' being able to fly. Two problems with this would be that there may, in principle, be no limit on the number and variety of attributes that can be defeated (and hence, the default content would have to be maximally nonspecific), and that although such a content would provide for classification of exceptional cases as members of the category, it would also thereby allow many other entities to be classified as members in a counterintuitive fashion (see Franks & Braisby, 1990, for an elaboration). So, the "real classification" view would have to place requirements on the kinds of contents that must be employed in classification. But the possibility of different kinds of exceptions with different degrees of divergence from the properties represented in the default content suggests that we can place no such arbitrary requirement on the amount of default content to be employed, and hence no limitation on the content that can be defeated. There is no qualitative difference between apparently obvious cases of "real" classification, and cases of "word use"—it is a matter of degree of divergence between the default content and the content employed in the word use (between the lexical concept and the sense), or (equivalently) the degree of divergence between an intention to classify an object as a member of a category in a fully generalisable manner and an intention to classify it in a more restricted manner, that is, a quantitative difference. Such a position is substantiated by linguistic-pragmatic considerations (e.g., Sperber & Wilson, 1986). This appears to issue in two options. Either perspectival relativity is not classificatory, which implies that "real" classification also is not (as they differ only in degree and not in kind), or "real" classification is truly classificatory, which implies that perspectival relativity also is.

A final issue concerns which is the more general, the "real" classificatory use of referring expressions or the "word use" cases. If the real cases are not qualified by pragmatic factors, and require use of all of the default con-
tent for a lexical concept, this suggests that real classification is a rare thing indeed. The perspectival relativity view allows that the use of all of the default content in classification is just one of a vast range of options, each of which will be informed by the pragmatic requirements in the particular communicative or textual content. It allows us to see the various kinds of use of referring expressions as instances of a unitary phenomenon, and not as qualitatively distinct phenomena arbitrarily demarcated.

6. PRIVATIVES: A SKETCH OF AN ALTERNATIVE CHARACTERISATION

The perspectival relativity of classification and the flexibility in the generation of a sense allows a recasting of the nature of privatives, in which two orthogonal distinctions between types of privatives can be made. The distinctions are between negating and equivocating privatives, and between proper and functional privatives.

6.1 Negating and Equivocating Privatives

The paradigm case of negating privatives is *fake*, whereas that of equivocating privatives is *apparent*. Negators are taken to involve a rebuttal of the central features of the head N: A fake gun cannot perform the essential function of a gun. In contrast, equivocators involve an undercutting of the head N’s central features. If someone is an *apparent friend*, on the basis of current information all that can be stated is that he or she in some way resembles a friend. But the use of the equivocating privative indicates our epistemic attitude to person in question: We have partial, insufficient information to decide whether he or she is a real friend or not. With further information, we might derive a privative or an affirmative interpretation of the combination, indicating that he or she either is or is not really a friend.

The two major differences between *negators* and *equivocators* concern the effects on the representation and classification functions. As noted, regarding the former, they motivate different kinds of defeat of the central features of the head N lexical concept. Regarding the latter, they involve different classification potentials for an entity possessing the attributes in the NP sense: Whilst entities of both negating privative NP and equivocating privative NP type can be classified as members of their head N categories from a Type II perspective, the latter may potentially (subject to further information) also be so classified from a Type I perspective.

6.2 Functional and Proper Privatives

The second distinction between types of privative arises from two different sources of privative behaviour, as distinct from the two different types of privative behavior that distinguish negators and equivocators. That is, both equivocating and negating behaviors may have two different sources. In
general, the evaluation of modifiers is a result of the interaction of the modifier’s content and that of the head N. Although stone, plastic, square, or waterless behave affirmatively in many N contexts, they have privative effects in others. Consider the contrasts between these pairs:

- stone lion
- plastic flower
- square basketball
- waterless ocean

- stone bridge
- plastic container
- square picture
- waterless paint

In the first of each of these pairs, the same privative effects on classification and representation as in negators arises. But the source of these effects differs from proper privatives: Whereas in proper privatives, the privative effect is an inevitable result of the semantic nature of the modifier, in functional privatives, the privative effect is contingent upon the interaction of the features of the modifier and head N. The analogues of the equivocating privatives, apparent friend, ostensible honesty, probable murderer, and so on, in the functional case, include blue orange, wooden frying-pan, square lemon, and soft knife. The same classification and representation effects occur, again with different sources.

7. A SENSE GENERATION ACCOUNT OF PRIVATIVES

An account of privatives in this framework consists of (a) a sense generation account of how the AVSs for the NP senses are derived from the constituents’ lexical concepts in context, and (b) a perspectival relativity account of the classification potential for an entity possessing the properties represented as the AVS for the NP sense. Rather than entering into vast detail concerning the treatments of each of the four kinds of combination, I present a detailed account of the “proper privative” cases, and note the salient differences from “functional privatives” as they arise. Although contents of lexical concepts and senses are given, the AVSs are illustrative only: They are not intended to be exhaustive specifications of the content represented by agents; the distinctions between types of content are more important (see Section 8.1 for a discussion of related points).

7.1 An Account of Negating Privatives

The example treated is fake gun.

Lexical Concepts

gun:
fake:
Operator with two functions:
1. \( MTC_R \): coerces head N AVS.
2. Ascribes output of 1 to NP sense.

Information State 1
(a) Representation: Application of \( fake \), a \( MTC_R \) operator, to the AVS for \( gun \) negates the central features of \( gun \):

The resulting AVS describes the NP sense under this state of information, and represents properties of an object that has diagnostic properties of a gun, but not the firing mechanism. Although these diagnostic properties are compatible with the object's really having several different types of central properties (e.g., of a model that looks like a gun, a replica, a toy), the sense is nonspecific as regards these properties, and therefore as regards the type of the entity. The lexical concepts for \( gun \), \( toy \), \( replica \), and \( model \) are indiscernible approximations to the NP sense on a criterion of diagnostic features.
(b) **Classification:** A peg with these features can play various roles, and can be classified as a member of those roles' N categories, under appropriate perspectives. So, a referent with the properties represented in the sense could be classified in (at least) the following ways (where "appearance" denotes diagnostic properties): (1) "The fake gun is a gun [with respect to appearance]," (2) "The fake gun is a toy (gun) [with respect to appearance]," (3) "The fake gun is a replica (of a gun) [with respect to appearance]," (4) "The fake gun is a model (of a gun) [with respect to appearance]." These classifications are under Type II perspectives. Categorisation (1) satisfies schema PC':

\[ a = \text{peg constructed for sense of \textit{fake gun}}, \]
\[ d' = \text{role of } a, \text{ of "gun" type}, \]
\[ d^2, d^3, d^4 = \text{"toy," "gun," "model" N types (possible NI roles of } a), \]
\[ Y = \text{features currently ascribed to \textit{fake gun} sense}, \]
\[ c = \text{diagnostic features criterion (i.e., "appearance of a gun").} \]

Here, \textit{gun}'s lexical concept is an indiscernible approximation to \textit{fake gun}'s sense on "appearance" (diagnostic) features, and the combination of the sense's diagnostic features with those of any of \textit{gun}, \textit{toy}, \textit{model} lexical concepts would result in a peg that is also an indiscernible approximation to the \textit{fake gun} sense on a diagnostic criterion. Similarly, the categorisations regarding the NI's satisfy schema AC:

\[ d' = \text{each of "toy," "gun," "model" N types (possible NI roles of } a), \]

respectively.

Each \( d' \) is an indiscernible approximation to the NP peg, with \( c = \"appearance of a gun\)." If there were sufficient information about the fake gun, the sense could be further specified, in Information State 2.

**Information State 2**
(a) **Representation:** Specifying the sense occurs via a NI; this requires instantiating the NP, and the candidate instantiations must have diagnostic properties that subsume those of the peg, and must be able to play the role, with the causes and effects, of the peg in the discourse context. For example,

The private eye found the fake gun in the display cabinet. He brandished it at the hood, telling him to turn around and walk with his hands in the air. Then he sluged the hood on the head, knocking his hat off, and leaving him out cold. The hood deserved it.

The instantiation of the fake gun must be something kept in a display case, must be realistic enough to frighten a hood, and must be solid enough to knock him out. This suggests instantiation as a replica of a gun. The NI is the immediate superordinate of the label for the instantiation, \textit{replica}. The lexical concepts for \textit{replica}, \textit{statue}, \textit{representation}, and so on can be viewed
as relational concepts, as they have features that take variables as values,
and the variables are bound to the type of entity modified. For example,
replica:

\[
\begin{align*}
\text{Central} : & \quad \text{Aim: deception} \\
\text{Diagnostic features of: } N \\
\text{Diagnostic} : & \quad \neg \text{Central features of: } N
\end{align*}
\]

Notice that the negation of the central features of the N is a diagnostic
feature of the replica N, and possession of the diagnostic features of the N is
a central feature of the replica N. This AVS can be unified with the NP sense
to produce a more specific sense than before:

\[
\begin{align*}
\text{Central} : & \quad \neg \text{fires: bullets} \\
& \quad \neg \text{made of: metal} \\
& \quad \neg \text{mechanism: explosion} \\
& \quad \neg \text{function: kill} \\
& \quad \text{Aim: deception} \\
\text{Diagnostic features of: gun} \\
\text{Diagnostic} : & \quad \text{trigger: +} \\
& \quad \text{size: portable} \\
& \quad \text{barrel: +} \\
& \quad \text{handle: +} \\
& \quad \text{colour: grey} \\
& \quad \neg \text{Central features of: gun}
\end{align*}
\]

(b) Classification: Since the fake gun peg has been ascribed central and
diagnostic features of the NI, replica, it can play the role of two N types,
which are indiscernible approximations to the fake gun peg on different
criteria: (1) “The fake gun is a gun [with respect to appearance, as a
replica],” (2) “The fake gun is a replica [with respect to function].” The
first is warranted under a Type II perspective on the NP entity as a head N
entity (schema PC’’). Here,

\begin{align*}
a &= \text{peg constructed for sense of fake gun,} \\
d^1 &= \text{role of } a \text{ of “gun” type,} \\
d^2 &= \text{replica N type (NI role of } a), \\
Y &= \text{features currently ascribed to fake gun sense,} \\
c^1 &= \text{diagnostic features criterion,} \\
c^2 &= \text{central and diagnostic features criterion.}
\end{align*}
The fake gun can be classified as a gun, since a gun is an indiscernible approximation to a fake gun with respect to diagnostic features, and these features result from combining the diagnostic features of gun and replica. Additionally, the replica is an indiscernible approximation to the fake gun on both central and diagnostic features, so that the criterion under which the gun is an indiscernible approximation to the fake gun subsumes (is less detailed than) the criterion under which the replica is such an approximation. Classifying the fake gun as a replica via AC', where $c = \text{central} + \text{diagnostic}$ features, is implicit in this. Note that attempting to classify the fake gun as a gun in respects other than its appearance (e.g., as something intended to fire bullets) would be unwarranted, and so is ruled out because it would require a criterion including central features where only diagnostic ones have contextual support. Such a judgement is not permissible because it would be an attempt to overgeneralise the classification.

The Functional Case

"Functional negating privatives" have the same classification potential at each information state as proper privatives, though minor differences also occur. Consider, again, stone lion.

Lexical Concepts

**lion:**

\[
\begin{align*}
\text{Central:} & \quad \text{organic} : + \\
& \quad \text{animate} : + \\
& \quad \text{genus} : \text{lion} \\
& \quad \text{biological essence} : \text{lion} \\
\text{Diagnostic:} & \quad \text{legs} : 4 \\
& \quad \text{tail} : + \\
& \quad \text{texture} : \text{soft} \\
& \quad \text{colour} : \text{tawny}
\end{align*}
\]

**stone:**

\[
\begin{align*}
\text{Central:} & \quad \text{organic} : - \\
& \quad \text{animate} : - \\
& \quad \text{solid} : + \\
& \quad \text{hard} : + \\
\text{Diagnostic:} & \quad \text{weight} : \text{heavy} \\
& \quad \text{texture} : \text{rough} \\
& \quad \text{colour} : \text{grey}
\end{align*}
\]
Information State 1
(a) Representation: Stone, unlike *fake*, is not a type-coercing operator. Rather, it acts like MTC$_R$ because of conflict between values of the central features of the lexical concepts for *stone* and *lion*, for example, $<$ animate:$_-$> and $<$ organic:$_-$>. The primacy of the modifier triggers the MTC$_R$ operation on the N lexical concept, producing a coerced AVS comprising diagnostic _negated_ central attributes, which is combined with the lexical concept for *stone*.

The conflict between the color of lions (tawny) and stone things (grey), does not involve highly diagnostic features, so there is a priority union of the AVS for *stone* and the coerced *lion* AVS:

\[
\begin{align*}
\text{Central:} & \begin{cases}
\text{organic: } - \\
\text{animate: } - \\
\text{solid: } + \\
\text{hard: } + \\
\text{texture: } \text{rough}
\end{cases} \\
\text{Diagnostic:} & \begin{cases}
\text{weight: } \text{heavy} \\
\text{colour: } \text{grey}
\end{cases}
\end{align*}
\]

\[
\begin{align*}
\text{Central:} & \begin{cases}
\neg \text{organic: } + \\
\neg \text{animate: } + \\
\neg \text{genus: } \text{lion} \\
\neg \text{biological essence: } \text{lion}
\end{cases} \\
\text{Diagnostic:} & \begin{cases}
\text{legs: } 4 \\
\text{tail: } + \\
\text{texture: } \text{soft} \\
\text{colour: } \text{tawny}
\end{cases}
\end{align*}
\]

\[
\begin{align*}
\text{Central:} & \begin{cases}
\text{organic: } - \\
\text{animate: } - \\
\text{solid: } + \\
\neg \text{genus: } \text{lion} \\
\neg \text{biological essence: } \text{lion}
\end{cases} \\
\text{Diagnostic:} & \begin{cases}
\text{hard: } + \\
\text{texture: } \text{rough} \\
\text{weight: } \text{heavy} \\
\text{colour: } \text{grey} \\
\text{legs: } 4 \\
\text{tail: } +
\end{cases}
\end{align*}
\]
The resulting sense describes a stone object, with many diagnostic properties of a lion. Its nonspecificity renders it compatible with specific central and diagnostic features of statue, ornament, or rock-formation.

(b) Classification: The peg now has diagnostic features allowing it to play the role of a lion, a statue (of a lion), an ornament (of a lion), or a rock-formation (of a lion). An entity with these properties could be classified as a member of these categories relative to the appropriate Type II perspective and diagnostic criterion.

Information State 2
(a) Representation: Specification begins by instantiation, supporting access of a NI (e.g., statue) whose AVS (with a slot for the type of thing represented) is unified with the NP sense from “Stage” 1. The final NP sense has diagnostic features of a stone lion and a statue, and central features of a statue.

(b) Classification: A referent with the properties described by the peg can be classified both as a lion relative to a Type II perspective, and as a statue relative to a Type I perspective.

This general picture is repeated mutatis mutandis for equivocating privatives.

7.2 An Account of Equivocating Privatives
The example here is apparent friend.

Lexical Concepts

friend:

\[
\begin{align*}
\text{Central:} & \quad \begin{bmatrix}
\text{loyalty} : + \\
\text{affection} : + \\
\text{dubious motivations} : - \\
\text{personal gain} : - \\
\end{bmatrix} \\
\text{Diagnostic:} & \quad \begin{bmatrix}
\text{solicitous behaviour} : + \\
\text{tolerance} : + \\
\text{vague kindnesses} : + \\
\text{affability} : + \\
\end{bmatrix}
\end{align*}
\]

apparent:
Operator with two functions:
1. MTCA: coerces head N AVS.
2. Ascribes out of 1 to NP sense.

Information State 1
(a) Representation: Applying the MTCA operator apparent to the lexical concept for friend undercuts its central features: The AVS ascribed to the
NP sense comprises friend's diagnostic features; undercutting means that neither the central features nor their negation can be ascribed to the sense:

\[
\begin{bmatrix}
\text{solicitous behaviour} : + \\
\text{tolerance} : + \\
\text{vague kindnesses} : + \\
\text{affability} : + \\
\end{bmatrix}
\]

Diagnostic:

This represents properties of a person whose behavior is diagnostic of a friend, but for whom there is insufficient information to decide if he or she has a real friend's central motivation properties. This behavior is compatible with the behavior and motivation of several types of people. The appropriate lexical concepts (e.g., friend, careerist) are indiscernible approximations to the NP sense on the criterion of the N's diagnostic features, so that each lexical concept is a possible source of future specification for the sense.

(b) Classification: Someone with the properties represented by the NP sense is classifiable under Type II perspectives: (1) "The apparent friend is a friend [with respect to behavior]," (2) "The apparent friend is a careerist/social incompetent (regarding friendship) [with respect to behavior]." The first satisfies schema PC":

\[a = \text{peg constructed for sense of apparent friend},\]
\[d^i = \text{role of } a, \text{ of "friend" type},\]
\[d^2, d^3, d^4 = \text{"careerist" and "social incompetent" N types (possible NI roles of } a)\],
\[Y = \text{features currently ascribed to apparent friend sense},\]
\[c = \text{"behavior of a friend" (i.e., diagnostic features) criterion}.\]

Friend's lexical concept is an indiscernible approximation to the apparent friend sense on diagnostic behavior, and the combination of diagnostic features of the NP sense with those of careerist or social incompetent would produce a peg that is an indiscernible approximation to the apparent friend sense under a diagnostic criterion. Similarly, classifying the person as one of the NIs under the same criterion satisfies AC', where the \(d^i\) = each of the NIs.

Information State 2
(a) Representation: Since the central features of the head N remain undercut, only the diagnostic attributes can be specified by instantiation: The AVS associated with the instantiation must be subsumed by the "behavior" diagnostic features of the NP sense. Candidate instantiations include a careerist friend, who deliberately deceives to gain ascendancy in a career, and a socially unskilled person, who is unaware of the implications carried by friendly behavior. Notice that the candidate instantiations for an equivocator are specifications of a general negating privative: in this case, of false
friend. Given contextual cues, we might instantiate apparent friend as a careerist friend. The NI selected is the lexical concept associated with the phrase individuating careerist friend: careerist. Since the central attributes of friend remain undercut, apparent acts as a MTCU operator on careerist's lexical concept. The lexical concept is expressed:

\[
\begin{array}{c}
\text{Central:} \\
\text{Diagnostic:}
\end{array}
\begin{align*}
\text{loyalty : -} \\
\text{affection : -} \\
\text{dubious motivations : +} \\
\text{personal gain : +} \\
\text{solicitous behaviour : +} \\
\text{tolerance : +} \\
\text{vague kindnesses : +} \\
\text{affability : +} \\
\text{sycophancy : +} \\
\text{shiftiness : +}
\end{align*}
\]

Coercion leaves only diagnostic features, which are unified with the NP sense, producing:

\[
\begin{array}{c}
\text{Diagnostic:}
\end{array}
\begin{align*}
\text{solicitous behaviour : +} \\
\text{tolerance : +} \\
\text{vague kindnesses : +} \\
\text{affability : +} \\
\text{sycophancy : +} \\
\text{shiftiness : +}
\end{align*}
\]

This is equivalent to the diagnostic features of careerist. At this stage, then, the NP sense has diagnostic features that are a specification of the diagnostic features ascribed in the first stage.

(b) Classification: The lexical concepts for friend and deceiver are indiscernible approximations to the NP sense under a criterion, “behavior of a careerist qua a friend.” The content of the appropriate classifications may be paraphrased: (1) “The apparent friend is a friend [with respect to behavior as a careerist],” (2) “The apparent friend is a careerist [with respect to behavior (as a careerist)].” Although the criterion is of diagnostic level, as in Stage 1, the criterion at Stage 2 is in fact more precise than that at Stage 1. Additionally, the first judgement satisfies PC” (here, only one \(d^i\), careerist, is relevant). And the second satisfies schema AC”.

This NP sense is specific regarding the aspects of the apparent friend about which we do have information; this is compatible with the partiality
of our information regarding the person as a whole. Once more, appropriate inquiry may support extending the content ascribed to the peg.

**Information State 3**

Additional information can determine whether the NP is understood affirmatively or privatively. As a result of discovering that central features of the lexical concept for *friend* can be ascribed to the NP sense, the affirmative categorisation (as a friend) could be generalised to a Type I perspective; by contrast, as a result of discovering that their negation were true, the privative categorisation (as a careerist) could be generalised to a Type I perspective. Since we cannot coherently ascribe both the features and their negation under a single state of information, we cannot coherently generalise both Type II perspectives to Type I perspectives.

**Privative Outcome**

(a) **Representation:** Suppose we find that the person often acts disloyally, supporting the ascription of central features of one NI, and conflicting with a central feature of the head N. Assuming primacy of context over the head N, the earlier undercutting of the NI central features can be reversed, and they can be ascribed to the sense. These features can be priority unioned with those of the head N: The following AVS is then unified with the NP sense from Stage 2:

\[
\begin{array}{c}
\text{loyalty} : - \\
\text{affection} : - \\
\text{dubious motivations} : + \\
\text{personal gain} : + \\
\end{array}
\]

The friendly behavior of such a person can thus be explained by his careerist motivations.

(b) **Classification:** Classification possibilities are the same as for the second stage for negating privatives. The head N type is an indiscernible approximation to the peg under the criterion, "behavior of a friend qua a careerist." This Type II perspective warrants the classification, "The apparent friend is a friend [with respect to behavior (as a careerist)]," which fulfills PC'. The second warranted classification is a Type I perspective, satisfying AC': "The apparent friend is a careerist [with respect to motivation]."

**Affirmative Outcome**

(a) **Representation:** If the person possesses a central property of a friend, this will conflict with central features of a careerist, motivating priority union of the central features of *friend* with those of *careerist*. This produces central features that are unified with the AVS for the sense from Stage 2:
Here, his or her really being a friend combines with his excess zeal in manifesting that friendship.

(b) Classification: Concerning a person with these properties, a Type I perspective could be adopted, “The apparent friend is a friend [with respect to motivation]” (satisfying AC'), as could a Type II perspective, “The apparent friend is a careerist [with respect to behavior].”

**The Functional Case**

Functional equivocating privatives behave in the same general way as their proper privative counterparts. In each informational state, they give rise to the same classification possibilities. However, as with functional negating privatives, the mechanism for combination differs slightly since their privative behaviour results from the interaction of the content of the concepts. But because the difference between *wooden frying pan* (as an equivocating functional privative) and *apparent friend* (as an equivocating proper privative) is directly analogous to that between *stone lion* and *fake gun*, detailed explication is unnecessary. Conflict between the values of diagnostic features of the modifier and highly diagnostic features of the head means that the modifier acts as a MT& operator, undercutting the central features of the head N lexical concept. Priority union of the lexical concept of the modifier with diagnostic features of the head N lexical concept follows, after which the mechanism takes the same form as that for *apparent friend*.

7.3 **Summary of the Accounts of Privatives**

A unified account of the four kinds of privatives has been offered: the differences between them stem from the kind of defeat of central attributes (rebuttal or undercutting, differentiating negating and equivocating privatives), and from the source of that defeat (the lexical concept of the modifier or the interaction of lexical concepts, differentiating proper and functional privatives). A skeleton outline of the treatments is given in Tables 2 and 3.

8. **THEORETICAL AND EMPIRICAL IMPLICATIONS OF SENSE GENERATION**

Having outlined the sense generation approach, and shown how it handles a recalcitrant group of combinations, in this section I consider some implications of the approach, and some of the ways in which the approach differs from other accounts of concepts and concept combination.
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<th>Sense Representation</th>
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<td>Head diagnostic: +</td>
<td>Type II: NP as N</td>
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<tr>
<td>Head N L</td>
<td></td>
<td>Head central: -</td>
<td>Type II: NP as any NI</td>
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<tr>
<td>Modifier N L</td>
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<td>Information State 2: Specification</td>
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<td></td>
</tr>
<tr>
<td>State 1 sense</td>
<td>Unification</td>
<td>Head diagnostic: +</td>
<td>Type II: NP as N</td>
</tr>
<tr>
<td>NI L</td>
<td></td>
<td>NI diagnostic: +</td>
<td>Type I: NP as NI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Head central: -</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NI central: +</td>
<td></td>
</tr>
</tbody>
</table>

**Negating Proper Privatives (e.g., fake gun)**

- Since neither of the constituents are operators, the combination operations are based upon their contents.

**Negating Functional Privatives (e.g., stone lion)**

- Since there is a priority union of head and modifier Ls, diagnostic features from head L are inherited by the sense only if they do not conflict with modifier diagnostic features.
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<thead>
<tr>
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<tbody>
<tr>
<td>Information State 1: Combination</td>
<td>MTCu of Head L</td>
<td>Head diagnostic: +</td>
<td>Type II on NP as N</td>
</tr>
<tr>
<td>Head L Modifier L</td>
<td>Head central: ?</td>
<td></td>
<td>Type II on NP as any NI</td>
</tr>
<tr>
<td>Information State 2: Specification</td>
<td>MTCu of NI L</td>
<td>Head diagnostic: +</td>
<td>Type II on NP as N</td>
</tr>
<tr>
<td>State 1 Sense</td>
<td>NI diagnostic: +</td>
<td></td>
<td>Type II on NP as any NI</td>
</tr>
<tr>
<td>NI L</td>
<td>Head central: ?</td>
<td></td>
<td></td>
</tr>
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<td>Information State 3: Further Specification and Flexibility</td>
<td></td>
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</tr>
<tr>
<td>Affirmative outcome:</td>
<td>MTCu of NI L</td>
<td>Head diagnostic: +</td>
<td>Type I on NP as N</td>
</tr>
<tr>
<td>State 2 Sense</td>
<td>NI diagnostic: +</td>
<td></td>
<td>Type II on NP as any NI</td>
</tr>
<tr>
<td>Head L</td>
<td>Head central: +</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NI central: ?</td>
<td>NI central: +</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Privative outcome:</td>
<td>MTCu of Head L</td>
<td>Head diagnostic: +</td>
<td>Type II on NP as N</td>
</tr>
<tr>
<td>State 2 Sense</td>
<td>NI diagnostic: +</td>
<td></td>
<td>Type I on NP as any NI</td>
</tr>
<tr>
<td>NI L</td>
<td>Head central: -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NI central: +</td>
<td>NI central: +</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Equivocating Functional Privatives (e.g., wooden frying pan)

<table>
<thead>
<tr>
<th>Concept Inputs</th>
<th>Combination Operations</th>
<th>Sense Representation</th>
<th>Classification Perspectives</th>
</tr>
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<tr>
<td><strong>Information State 1: Initial Combination</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head L Modifier L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modifier L</td>
<td>i. MTCu of Head L</td>
<td>Head diagnostic: + ?</td>
<td>Type II on NP as N</td>
</tr>
<tr>
<td>Modifier L</td>
<td>ii. Priority union: Modifier/Head</td>
<td>Modifier diagnostic: +</td>
<td>Type II on NP as any NI</td>
</tr>
</tbody>
</table>

| **Information State 2: Specification** | | | |
| State 1 sense | MTCu of NI L | Head diagnostic: + | Type II on NP as N |
| N1 L | N1 diagnostic:+ | Type II on NP as N |
| Head L | Head central: ? | |
| NI | NI central: ? | |

| **Information State 3: Further Specification and Flexibility** | | | |
| Affirmative outcome: | i. MTCR of NI L | Head diagnostic:+ | Type I on NP as N |
| State 2 sense | ii. Unification: State 2 | N1 diagnostic:+ | Type II on NP as NI |
| Head L | Head central:+ | |
| NI L | NI central: - | |
| Privative outcome: | i. MTCR of Head L | Head diagnostic:+ | Type II on NP as N |
| State 2 sense | ii. Unification: State 2 | N1 diagnostic:+ | Type I on NP as NI |
| N1 L | Head central: - | |
| NI | NI central:+ | |

**Note.** "?" indicates that the values of the attributes are undercut: They can neither be ascribed nor negated.
8.1 Top-Down and Bottom-Up Processes in Concept Combination

Sense generation posits a combination process that is interactive and operates according to bottom-up priority. The outcome of generation takes into account both the bottom-up input from the default content of lexical concepts and their initial mode of combination, and also the top-down input from contextually provided implicitly attached lexical concepts. It adheres to bottom-up priority in that context cannot alter the starting points of generation (i.e., the default lexical concepts and the mode of combination); context only has a role after this initial bottom-up stage. However, this does not diminish the role of top-down factors, since the NI is critical in establishing the central attributes ascribed to the NP sense. The sense actually generated is limited by pragmatic considerations that constrain the application of the combination rules subsequent to the initial bottom-up combination operation (Information State 1 in the accounts given in Section 7). This might be envisaged as a simple, step-wise process: After applying the first combination rule, subsequent application of other rules depends on contextual support (e.g., Is there a need for further specification for the hearer to individuate the referent? Is such further information available? Without such support, the rules will not be triggered (providing that the speaker is producing utterances with the intention of being understood by the hearer). However, top-down knowledge enters the process only by being represented in the lexical concepts for the NIs, which are themselves accessed on the basis of the result of the initial combination of lexical concepts; so top-down influences must be compatible with the bottom-up beginnings. The approach thus contrasts with views that emphasise the knowledge-rich nature of concept combination; for example, Murphy's (1988) schema-based approach in which combination specialises the head noun schema. However, as Murphy concedes, because such approaches lack details both of what knowledge is used and how accessing the knowledge is constrained, it is difficult to generate precise predictions. By contrast, the sense generation approach follows a middle way between the knowledge-rich approach and a more rigidly compositional approach, and so the top-down influences are restricted to particular contents accessed as a result of the interaction of bottom-up constraints. Similarly, the approach does not court the shortcomings of "mediating relations" theories that postulate a set of relations that serve to connect the combining concepts (see Section 4.4). Such an approach appears to have the choice of postulating a compositionally appealing small set of general or imprecise mediating relations (though this has the disadvantage of resulting in senses that can only have a coarse grain of specification), or of postulating an unrestricted set of more specific mediating relations which allow for more finely-grained senses (though this has the complementary disadvantage of losing the constraint on the set of relations). Mediating relations approaches would appear to conflate the provision of content for a sense with the way
in which the constituents are to combine in that the rules for combination are provided by the mediating relations, which also suggest content for the combination's sense. This means that there are as many rules for combination as there are mediating relations—hence the need to restrict the number of mediating relations. By contrast, on the sense generation approach the rules of combination are separate from the provision of content by the NIs: Although there is no limit on the lexical concepts that can act as NIs, there is a small set of combination rules that operate over the NI in combination with a sense. Again, then, the sense generation approach steers a middle line between the rigidly compositional and the knowledge-rich.

However, although the approach eschews a rigid form of compositionality, in which the contents associated with a phrase are some simple monotonic function of the contents of the constituents, it still can be seen as compositional at a deeper level. This is because contextual influences occur (in either denying content of the constituents or in adding content beyond that of the constituents) only in a rule-governed fashion, and those rules are themselves controlled in a bottom-up manner. Hence, as noted in Section 2.4.3, deploying quite complex mechanisms of combination allows a rule-governed, compositional account of concept combination, even if the usual epiphenomena (monotonicity and nonemergence) are thereby rejected. This picture takes it that these epiphenomena of the strictest (summative) form of compositionality have often been confused for their essence, and that the latter lies in the predictable nature of content accumulation and alteration in communication. This is because a major motivation for taking compositionality as a constraint on semantic and conceptual theory is the supposition that it provides a parallel predictive anchoring of speakers' and hearers' attempts at communicative coordination: The precise way in which predictability is satisfied is not at issue. The nonmonotonicity and emergence present in this account of privative concept combinations, then, are examples of just this kind of predictable content variation. So the approach does not, in denying a rigid compositionality, thereby allow in an unconstrained flood of top-down factors.

Moreover, sense generation contrasts with schema-based approaches in the relative import accorded to the top-down factors. On schema theory, top-down factors drive the combination process and act as a major determining influence for conceptual content. By contrast, on sense generation, top-down factors do enter into the process at every stage of a combination, but they are largely confined to a facilitatory role. This facilitatory, rather than controlling, role is manifest in two ways. First, the pragmatic influences cannot prevent a speaker from manipulating content in whatever way he or she wishes (so that, even if there is no pragmatic support to carry out any of the three manipulations noted earlier, the speaker may nonetheless generate a sense that is more specific and flexible than the hearer can generate.
on the basis of the available support). But where there is such pragmatic support, then the correlative alterations in content will support successful communication, and so will also have a plausibility they would otherwise lack (see Section 8.4). Second, the contributory role of top-down factors is also indicated by the combination operations specified in Section 7. In general, where a sense representation is to be combined with a NI, the operation is unification (so that there is no precedence accorded to the top-down NI influence); this is indicated in Table 2 for negating privatives (Information State 2) and in Table 3 for equivocating privatives (Information State 3). This means that the content of the NI has to be compatible with the content already represented in the sense at that information state. The only exception—that is, the only case in which the NI actively overrides information currently represented in the sense—is when there is a privative outcome at Information State 3 for equivocating privatives. In this case, the conflict between the NI central attributes and the head N central attributes results in the latter being rebutted by the MTCR operation. But notice that this only occurs after the head N's central attributes have already been undercut by combining with the equivocating privative at State 1, and is simply the result of "demand" for further information about the sortal type of the entity described by the NP. Satisfying such "demand" requires us to go "outside" of the explicitly attached lexical concepts to obtain the information about the referent, since the explicitly attached concepts precisely do not contain the means to determine the sortal type of the referent. Indeed, the explicitly attached concepts should not contain such means, since this is the force of describing a referent with an equivocating combination in the first place. So, the general case is one in which the NI contributes diagnostic and central attributes that enhance the specification of the sense, and so can be viewed as facilitating or augmenting content that is already present since it arises from the explicitly attached lexical concepts and their mode of combination.

The approach thus allows a role for knowledge that goes beyond the default lexical concepts associated with the explicit constituents (the head and the modifier), but only insofar as this knowledge derives from the

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9 This could be viewed as a motivation for suggesting that State 3 for equivocators should not be treated in the same way as State 2 for negators: Although both states allow for the addition of important information about the central attributes of the object described, for negators such an addition can clearly be taken to constitute content that is conventionally conveyed by the noun phrase. By contrast, for equivocators, determining that the referent really is a member of some NI (e.g., that an apparent friend really is not a friend, but is someone who is deliberately deceiving) appears to go beyond the conventional content of the equivocator. Equivocators appear expressly to indicate the possession of only partial information about the central attributes of the referent. An implication may be that Information State 3 for equivocators should be viewed as an off-line state, which can only be reached via going beyond the lexicon, and not as part of the on-line processing of the combination.
default content of other lexical concepts (implicitly attached ones). So, the kind of knowledge that enters into the on-line concept combination process is restricted to the default contents for entries in the mental lexicon: On-line concept combination does not "reach beyond" that default content into wider, encyclopaedic knowledge. Only in cases where detailed reflective processing occurs, perhaps resulting from explicit verbal reasoning tasks (e.g., producing verbal protocols; see, e.g., Smith & Sloman, 1994) or evident anomaly, is it predicted that people would access additional world knowledge and detailed commonsense theories. In this way, concept combination typically proceeds on-line via lexical processing, in a manner that is relatively encapsulated and separate from the vicissitudes of central processes (Fodor, 1983; also see Section 8.4). Clearly, this position does not deny that the products of concept combination themselves (i.e., the senses) may be subject to elaboration and "clean-up" by general knowledge that is encoded outside of the lexicon, and one might not expect the same degree of bottom-up priority to hold for such cases of reflective processing (as indeed appears to be the case for Information State 3 for equivocators; see Footnote 7).

Related questions about the role of context also arise in the case of more obviously innovative or creative noun + noun combinations, such as trumpet olive (Gerrig & Murphy, 1992). Standardly construed, the problematic of such combinations has two aspects. The first concerns which of the constituents modifies the other, and the second concerns how the constituents are related. The first aspect is particularly interesting for this discussion, since it appears that the decision concerning which of the nouns is the head and which the modifier of the phrase cannot be based simply on order within the phrase (unlike noun phrases in which an adjectival modifier or adjunct

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The distinction between default lexical concepts and causal-explanatory commonsense theories is here drawn solely in terms of the content of those concepts and theories. This formulation is therefore agnostic as between an account that postulates entirely distinct representations for the two types of content, and an account that postulates a distinction based on differential access to a single representation (on the latter view, the default lexical concept reflects the content that is regularly accessed from commonsense theories when a word is used or understood). Either of these accounts of conceptual performance is consistent with the content distinctions that reflect conceptual competence. Notice, however, that the possible difficulties of drawing a precise distinction between on-line and off-line processing (or, at least, a distinction that is not context-dependent) might be taken to suggest an access-based distinction between lexical and extralexical information. Moreover, an access-based distinction would allow the influx of extralexical knowledge to be a matter of degree, which is intuitively plausible. Additionally, the precise default contents for a given lexical entry might thereby exhibit some variability. The latter possibility would be compatible with the current view as long as the content accessed never encodes information that is neither diagnostic nor central for a given category, and as long as it never includes explanatory or causal relations between attributes; that is, as long as the structural properties of the lexical concepts (over which the sense generation rules operate) remain unaltered, essentially the same bottom-up oriented account may be provided.
regularly precedes the head noun; see, e.g., Jackendoff, 1977; Kornai & Pullum, 1990). For example, the contextually preferred reading of trumpet olive is as an olive that is carved so as to be shaped like a trumpet; that is, where the lexical concept for olive has priority over that for trumpet. Taking trumpet to be the head of the noun phrase then allows the combination to follow exactly the same pattern as for stone lion and other negating functional privatives. This kind of example suggests that determining the syntactic relations within the phrase (which then determines the priority in concept combination) may be a troublesome issue, since it backs on to the general question of the resolution of local syntactic ambiguities. Given that I have presented a view that takes concept combination to be driven by bottom-up priorities, this may carry the implication that the resolution of such ambiguities should itself not require access to nonsyntactic information (as argued by, e.g., Ferreira & Clifton, 1986). This relation between the default lexical content and wider, background knowledge or commonsense theories is echoed in the nature of the representations hypothesised for lexical concepts. Rather than incorporating vast swathes of world knowledge in the default content for lexical concepts, the sense generation approach postulates very simple representations, with only two different types of content differentiated. Central attributes are ones that are often construed as being embedded in wider, commonsense theories, so that those who postulate the representation of central attributes within concepts typically take the view that this requires that all of the associated causal-explanatory relations must therefore be represented in the concepts as well (e.g., Keil, 1994; Medin & Ortony, 1989). This gives rise to different orientations, some suggesting that a “concepts-within-theorics” account is to be preferred (e.g., Keil, 1994), and others preferring a “theories-within-concepts” approach (e.g., Murphy, 1988). Both approaches take it that the deployment of central attributes in concept processing tasks necessarily implies the inextricability of the representation of (at least, central attributes of) concepts and theories.

11 A different option is to allow that the resolution of syntactic ambiguities is influenced by nonsyntactic information, but to deny that this information is strictly conceptual. For example, Trueswell, Tanenhaus, and Kello (1993) suggest that thematic role information attached to lexical items may aid in disambiguation; and Altmann and Steedman (1988) argue that coarse-grained referential information (e.g., concerning the cardinality of the set of entities picked out by a referring expression) may also play such a role. Neither of these kinds of contents overlap with the information associated with lexical concepts, and nor (it is arguable) does their use demand the prior processing of lexical concept content. On this argument, then, concept combination can still be principally bottom-up, even if the determination of the syntactic factors that form part of that bottom-up input is itself influenced by (nonconceptual) top-down information. This position is substantiated by the finding that real-world plausibility of relations does not influence the resolution of syntactic ambiguities (Rayner, Carlson, & Frazier, 1983), since the decision about real-world plausibility requires using precisely the kinds of information that is constitutive of lexical concepts. However, a word of caution is in order, since the available evidence does not relate directly to ambiguities within noun phrases.
By contrast, the view given here represents central attributes as simple lists of features within a lexical entry, and without the range of detailed causal and explanatory connections between them. Such theoretical information is taken, in this view, to not comprise part of the default lexical concept, though it is directly available to off-line, reflective processing. The prediction here is that people only access and deploy detailed causal-explanatory relations when the task or style of processing demands it. Otherwise, only the results or a distillation of such causal-explanatory theories, in the form of a list of the central attributes, is normally used. Similarly, detailed aspects of correlations and connections between diagnostic attributes may be omitted by the simple AVS structures; but, as with central attributes, this does not entail that such aspects are unavailable to concept processing. The view then implies that greater degrees of theoretical and causal-explanatory information may become available to concept processing where the task is relatively more off-line, such that the participant has time to reflect upon and reason about the task and about the content needed for its solution.

Sense generation thus accords an important role to the distinction between central and diagnostic attributes, but does not capture the distinction in the same way as theory-based or schema-modification theories. Moreover, as I have noted at several points so far, the general approach differs from other approaches to concepts in being in two ways, “quasi-classical.” First, it represents conceptual contents as sets of single-valued attributes, like the classical approach; but those attributes are all potentially defeasible in generation and so do not constitute necessary and sufficient conditions on category membership. The approach accounts for context-sensitivity of representations not by encoding the range of possible values for attributes in a single concept (as is usual in prototype theory), but by the generation process. Second, it takes classification judgements to be binary, all-or-none, like the classical approach, but also takes them to be fundamentally context-sensitive, and so they do not produce rigid, once-and-for-all classification structures. On both counts, the general framework is distinctive.

8.2 Some Questions About the Formalism
Although I use some powerful operators (priority union and type coercion), I have not employed a full set of logical relations within AVSs to express intraconcept dependencies. Now, Medin and Shoben (1988) have shown that attribute-value pairs are correlated, and this could be expressed as a conditional relationship between values. AVSs with such complex internal structures have been applied to linguistic phenomena (Pollard & Sag, 1989), and they could be employed in this view without altering its essentials (although the question of whether such relations should be encoded in the default content of the lexical concept is a moot one, as noted in Section 8.1). It is noteworthy that recent proposals to view concepts as frames (e.g., Barsalou,
1993; Barsalou & Hale, 1992) imply building more powerful structure into concepts than results from using first order logic to express within-AVS relations.

Another question concerns the computational complexity requirements of the AVS formalism employed. The most unconstrained attribute-value logics demand exponential time for recognising the set of permissible strings (i.e., they can characterise all recursively enumerable languages); the recognition problem is thus undecidable for these formalisms (the process of making the decision on recognising all inputs as acceptable or unacceptable, is not guaranteed to reach a halt). The approach taken here borrows the LFG (lexical functional grammar) technique of priority union; LFG recognition is, however, decidable as a result of the "off-line parsability constraint," which disallows vacuous derivations from the rule base. Is there an analogue of this constraint in this approach? Given the interaction of top-down and bottom-up factors, we cannot stipulate an a priori formal constraint on generation, precisely because we cannot delimit in advance the possible senses for an expression; rather, this is guided by the top-down factors of communication. It is clearly difficult, however, to ascertain the complexity of such factors, and hence determine how far they might reduce the complexity of generation via an attribute-value logic. However, it should also be noted that an approach that places no specific constraints on top-down influences may be computationally untractable (cf. Garey & Johnson, 1979; Rounds, 1991), since it could issue in an undirected search through the whole of world knowledge. And, an approach that builds into lexical concepts large amounts of logical structure similarly courts intractability. The virtue of sense generation is that world knowledge has an influence in a constrained and well-specified manner, through the NIs.

8.3 Alternative Accounts of Privatives
In addition to providing a distinctive general framework for concepts and concept combination, the sense generation approach also fosters a distinctive account of privative combinations. As noted in Section 3, the extreme context-sensitivity of classification and representation that is the hallmark of privatives suggests that they can be taken as a test case for any theory of concept combination that wishes to be truly general in its scope. The question then arises as to how other theories of concepts might handle privatives. As far as the author is aware, the view presented here is the first explicitly to attempt to handle privative concept combinations. In this section, I briefly consider the extent to which two extant theories of concept combination might account for the defining representation and classification behaviors of privatives. Some general differences between this view and these theories have already emerged. Here, I focus solely on the theories’ scope for handling privatives.
Firstly, since the schema-based approach is more of a general orientation on theorising than a formalised model of combination in itself, I do not examine this approach's potential for handling privatives, since to do so would require making ad hoc assumptions about representation and processing from which schema theorists may well demur.

A second possibility for accounting for privatives arises from prototype theory (Hampton, 1992). On a standard prototype view, concepts comprise sets of attributes weighted according to diagnosticity, and each attribute has a set of permissible values. So, for example, the concept for apple might include attributes for color or for shape, and color might receive a higher diagnosticity weight than shape. The various values that color can take (e.g., brown, red, green, yellow) are listed, and can be ordered according to subjective probability of occurrence. On the selective modification model (Smith et al., 1988), combination occurs by determining in advance which of the attributes of the head concept is to be altered by the modifying concept. The modification process then changes the diagnosticity associated with that attribute; for example, combining brown with apple would increase the diagnosticity of the color attribute relative to the other attributes in the concept. Other views (e.g., Hampton, 1992) also allow for attributes of one concept to override those of the other. This might, in principle, provide a means of handling privative combinations. Both views require a prior stipulation of which attribute is to be modified, in the same way as does schema theory; that is, there are knowledge-driven interventions prior to the combination process. However, neither view supports a distinction in the combination process between equivocating and negating privatives, which appears to require a three-valued account of negation (i.e., if it is taken that privatives do involve the defeat of content of the head N's lexical concept, then equivocators do appear to require two interpretations of negation, that is, rebuttal and undercutting). In Hampton's account of concept conjunctions (Hampton, 1987), he treats negation of attributes as corresponding solely to rebuttal and allows no place for undercutting. More generally, prototype theories have been held to deploy a characteristic function that maps attribute-value pairs onto truth-values in the range \( \{0, 1\} \), thus allowing, in principle, for an infinite set of truth evaluations. The three-valued approach, by contrast, partitions this range into three cases: True, false, and undefined, where increments of information might lead to the progressive elimination of the undefined case; such a supervaluation approach (see, e.g., Kamp & Partee, 1990) is fundamentally at odds with the underpinnings of prototype theory. On this argument, it seems that it would be problematic for prototype theory to attempt to handle the representational aspect of equivocating privatives. Additionally, in positing a very rich conceptual structure, prototype theory appears, like schema-based theory, to have no obvious means of providing for default content that can undergo varying
degrees of specification in the combination process. Concerning the classification aspect of privatives, prototype theory might also have difficulties. I have stressed the context-sensitivity of classification judgements, and noted how objects classifiable by privative NPs like *stone lion* can be classified as members of *lion* from a restricted Type II perspective (but not from a wider Type I perspective), and as, say, members of *statue* from a Type I perspective. On prototype theory, an object can be classified as a member of a category if it is similar enough to the representation for the category, where such similarity can be computed by calculating the weighted sum of attribute matches (less mismatches) between the object and the representation. If this similarity level exceeds a preset threshold, then the object is classified as a member of the category. The principle way of allowing for context-sensitive classification in this view is by varying the level of the threshold. Intuitively, lowering the threshold makes the category more inclusive and thus allows more things to be classified as lions than would normally be permitted. This might allow into the category an object that did not match the representation on biological essence, but it would also allow in real lions. Moreover, it would also allow in lots of other things (perhaps four-legged things like tables). In essence, prototype theory's mechanism for context-sensitive classification allows for either expanding or restricting the scope of the category in a general manner, which results in a statue of a lion being classifiable relative to some restricted category definition (which is what privatives appear to require), but only by also allowing into the category every other object whose similarity exceeds threshold level (tables, dogs, cats, etc.). Overall, it appears that current formulations of prototype theory may therefore have some difficulty in accounting for privatives without making additional, unwanted predictions about classification behavior.

A final account, which is perhaps more in sympathy with the sense generation orientation than either schema modification or prototype theory, is one suggested by R. Jackendoff (personal communication, December, 1994), that builds upon the view of plurals presented in Jackendoff (1991). Instead of privatives acting as "feature-altering" (and, in particular, feature-defeating) modifiers, and so behaving differently from other adjectives, Jackendoff suggests that privatives are different because they embed the meaning of the head N that they modify. This distinction parallels that made by Wisniewski & Gentner (1991), between "property mapping" approaches to concept combination (relating to feature-altering), and "slot-filling" approaches (relating to embedding). The view presented here is that privatives require an element of both feature-embedding and feature-altering (i.e., both property mapping and slot-filling), with embedding being restricted to information state II, and feature-altering occurring at all states. On a feature-embedding account, *fake* would have a schematic content, of the general form, "object the purpose of whose appearance is to make people think it is an N, but without the function of an N," where "N" indicates
the head N that is modified. Similarly, *apparent* has the schematic content
"object whose appearance leads people to think it is an N" (note the lack of
deliberate intent to deceive). Both treatments would ultimately lead to the
same general contents forming the representations for the combinations as
suggested in this view. More detailed analyses would require restrictions on
feature percolation from the head N concept up to the sense for the priva-
tive NP—stipulating which features would be inherited by the combination’s
sense, which would be inherited in a negated form, and finally which would
not be inherited at all. This general picture would extrapolate to the func-
tional cases in the following manner. In *stone lion*, since *stone* conflicts with
the ‘‘animate’’ attribute of *lion*, a form of coercion takes place in which the
default content of *lion* is replaced by one with rough content ‘‘visual
representation of N.’’ This coerced content can now combine in a straight-
forward manner with *stone*. Again, a similar content for the sense of the
combination would emerge from this mechanism. This embedding account
differs from the view taken here in that the lexical concept of the head N is
preserved whole in the combined concept (at least before the feature per-
colation restrictions come into play). Unsurprisingly, this picture preserves
much of the treatment given in this view, as well as being consonant with (or
at least, not overtly contradicting) the general sense generation orientation.
Given this, any arguments for preserving one view over the other must
advert to more general considerations, and in particular the kinds of psy-
chological factors discussed earlier. A general reason for preferring the cur-
rent, feature-altering view over the embedding view concerns the relation-
ship between functional and proper privatives, and in particular how it is
that an erstwhile affirmative modifier like *stone* comes to act in a privative
manner in certain contexts. On the feature-altering view, the combination
process is driven by bottom-up priority so that *stone lion* has a privative
outcome as a result of general principles concerning concept combination
and general rules about conflict resolution: Top-down influences are
brought to bear only after the initial combination stage, and it is at the ini-
tial stage that the privative effect of the interaction of the noun and modi-
fi er arises. So the same outcome is achieved for functional privatives and
proper privatives, although on the basis of entirely different mechanisms.
On the embedding view, by contrast, the way in which the head N is coerced
by the modifier in the case of functional privatives appears not to be driven
in a bottom-up manner: There must be a knowledge-driven aspect to the
combination, in order for *lion* to be coerced so that it can be inserted into
the function ‘‘visual representation of N.’’ Presumably, this function would
not comprise a subpart of the concept for *lion*, so contextual factors would
first have to detect a conflict between head and modifier and then decide to
coerce the head N. So selection of this kind of function cannot be an inevi-
table, knowledge-free result of central attribute conflicts. Consider, as a
potential counterexample to the embedding proposal, a combination like in-
visible picture: Here, the modifier appears to deny a central attribute of the head N, but if this enforced the postulated coercion process on the head N, the result would be "visual representation of a picture." This could then be combined with invisible, but it results in a sense which does not reflect strong intuitions about invisible entities (i.e., that they are not visual representations of anything). By contrast, the feature-altering view presented here would treat this kind of combination in exactly the same way as stone lion: Indeed, any combination in which central attributes are in conflict would have the same outcome of type coercion, followed by potential instantiation and specification. The embedding view thus appears to miss a generalisation: Although it might, possibly, ameliorate the general difficulty of appeal to knowledge-rich processes by specifying a finite list of embedding functions from which a contextually appropriate one could be selected according to context. An additional though less serious qualm about the embedding view is that it appears to require that the sense of a combination be too specific than might always be necessary. Consider again the well-worn stone lion case, where the head N is coerced and the function "visual representation of lion" replaces it. But in order to provide for the necessary relative lack of specificity in the sense for a combination a less precise function would be necessary. This is needed to handle cases in which something "looks like" a lion sufficiently to warrant it being labeled a lion from a restricted perspective, but where it does not constitute a full-blown "representation" (as something intentionally designed to share the appearance of the thing represented) such as a rock outcrop in the shape of a lion. The sense generation approach presented satisfies the cognitive requirement of bottom-up priority, coupled with allowing for degrees of specificity, in a way that is not obviously available to the embedding approach.

8.4 The Generality of the Approach

In this final section, I consider some empirical predictions of the approach, and sketch how it might apply to combinations other than privatives.

In general terms, the approach predicts that readings of privatives (including representational and classification behaviors) may be considered infelicitous only once the top-down information has been fixed. Thus, readings of privatives will not be admissible or inadmissible tout court, but only given a

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12 A view that postulated a finite set of such coercing functions echoes one that posits a finite set of "mediating relations" between the combining concepts (after Levi, 1978). However, it has been argued that such a view is implausible in that, in order to handle the observed flexibility in combinations, it would need to postulate highly nonspecific relations or functions if the list of functions is to be kept small (see, e.g., Gagne & Shoben, 1993), since the lists that have usually been offered have been found to succumb to counterexample after counterexample. But specifying highly nonspecific functions appears then to sacrifice the potential explanatory power of the approach.
particular context. Consider a case in which there is insufficient information to select one of the possible NIs—a sense for plastic dog might be restricted to Information State 1 (it has some diagnostic attributes of a dog, some of those of a plastic object, and the central attributes of a plastic object). This is compatible with NIs such as toy, model, statue, and so on. However, if the context is underspecified, there are no grounds to select any particular NI. An interpretation of plastic dog that made claims about the object involving central or diagnostic attributes of a particular NI would thus be unwarranted. So, ungrounded specifications of senses lead to problematic classifications, in that a hearer just may not be able to follow the speaker if the latter makes specifications based on a NI that is not available to the hearer.

In a similar fashion, it is the top-down influences that lead us to consider some combinations as more felicitous than others. Consider, for example, the difference in intuitive acceptability or plausibility between stone lion and stone sonata. A bottom-up combination mechanism does not prevent the unification of the lexical concepts for stone and sonata. However, the resulting sense will not be susceptible to specification in the same way as stone lion, because of the absence of plausible candidates for instantiation and the corresponding absence of plausible NIs. So the relative lack of plausibility of the combination as a whole results from the absence of a ready source of top-down information for specification. Such cases of (possibly, creative) language use thus appear to be ones that require people to look for theoretical information or world knowledge from beyond the lexicon; indeed, such "effort after meaning" appears to differentiate "live" from "dead" metaphors, where the content of the latter may be generated, like other combinations, from operations over explicitly and implicitly attached lexical concepts alone (cf. Lakoff, 1987). So failure to locate an appropriate NI could, depending upon the task, result either in a sense whose content is schematic and, because it has no opportunity for elaboration via a NI, is relatively implausible, or one that could only be elaborated by accessing world knowledge from outside of the lexicon. Two points of note arise here. First, only an account of concept combination that allows for the relative lack of specification in senses could provide for the relative lack of plausibility of stone sonata. Theories that demanded the selection of, for example, a particular specific mediating relation to connect the constituents before combining them, could not allow for such nonspecificity (except, perhaps, by taking it that people deploy a nonspecific relation; but it seems clear that such an option flies in the face of the usual motivation for postulating mediating relations anyway; that is, that such detailed relations are necessary to indicate how it is that the constituents are to combine in the first place). Second, this need to "exit the lexicon" in interpreting stone sonata differs from the case of equivocators. Understanding equivocators appears to involve accessing extra-lexical knowledge in
order simply to decide which of the possible NIs is appropriate; by con-
strast, understanding the likes of \textit{stone sonata} appears to require such
knowledge to inform the choice of the set of possible ways the two concepts
might be modifying each other. So for equivocators, extralexical knowledge
determines the choice of content that has been provided by the lexicon,
whereas for \textit{stone sonata}, extralexical knowledge must both provide that
content and choose amongst any possibilities. A further possibility for order-
ing the plausibility of combinations might be based on the relative frequency
of occurrence of the NI lexical items in the language, or even the relative fre-
quency of or familiarity with the instantiation referents in the experience of
the language users (so that the higher frequency lexical items and the higher
familiarity referents engender senses with higher apparent plausibility).

Relative to this background, more detailed empirical predictions can be
specified. As the account splits into two sides, concerning representation
and classification respectively, so do the empirical implications. To give a
flavour of ongoing and projected tests, I note two sets of predictions for
each side. First, concerning representations. Consider attribute-listing, in
which participants list the properties of objects described by concepts or
concept combinations. The prediction is that the degree of specification
provided for combinations depends upon the degree of contextual support,
and also upon the perspectives the participants are asked to adopt. With no
contextual cues to the NI, the set of attributes will be consistent with all
possible NIs. Given different contextual cues (to adopt a perspective), dif-
ferent NIs should be selected, and so different sets of features listed. Results
consistent with this have recently been obtained by Hampton (1993). More-
over, whereas for negating privatives, the difference between attribute sets
for the different NIs may be small, for equivocating privatives, this differ-
ence should be larger (since for equivocators the NI provides the combina-
tion's central attributes, and these can vary considerably depending on
whether the outcome is privative or affirmative). Similar predictions would
be made for the psycholinguistic technique of identical word monitoring, in
which participants have to monitor spoken text for the occurrence of a
target word, and then signal that word's presence as quickly as possible. In
a null context, monitoring speed for the various NIs for a combination
(where the combination is part of the text), should not differ significantly;
with different contextual cues in the texts, differences between the context-
appropriate and inappropriate NIs should emerge.

Second, concerning classification, participants are predicted to make ap-
parently self-contradictory judgements, classifying an object as a member
of a category under one perspective, but as a nonmember under another
(although such a possibility has been noted in passing by, for example,
Lakoff, 1987, the view taken here is perhaps the first to accord this general
flexibility sufficient import). This pattern of results was obtained by
Braisby, Franks, and Hampton (1992, 1994). Classification is also claimed
to be binary and not fuzzy; a test case concerns borderline cases of category membership. Perspectival relativity predicts that participants would view such cases as clear category members under one perspective, and as clear nonmembers under another, rather than as unclear or uncertain members. Such a finding is reported in Braisby, Franks, and Harris (1992), and Braisby and Franks (1995a).

Finally, I briefly survey some combination types other than privatives and suggest how the present approach might handle them. The first case is where a detailed sense for a NP requires a series of different NIs to mediate between the head and modifier, each providing successively closer approximations to the intended referent by giving more specific information than the last. Understanding Fillmore's (1978) example of a *topless district* may require a series of NIs, from “bars in the district,” through “waitresses working in the bars,” to the final “uniforms of the waitresses.” Now, in the view taken here, a constraint on selecting the NI is that it has sufficient specific information to individuate the discourse referent. In this case, the first NI does not provide sufficient individuation information for the referent, so another NI is necessary to add further content, and so on. Each NI then provides content for accessing the text, until a referent can be individuated. So it is that deploying multiple NIs does not require postulating any additional rules for combination, but rather only requires a generalisation of the constraints on accessing an NI.

A second type of combination results from the productive iteration of modifiers, producing NP's like *fake fake gun*, or *fake stone lion*, which any general account of combinations should be able to handle. In such cases, the first-encountered modifier usually has scope over the rest of the phrase: In *fake stone lion*, for example, *fake* has scope over *stone lion*. However, there are two distinct readings: *fake(stone lion)*, that is, a stone lion that is a fake, and *fake stone(lion)*, that is, a lion made of fake stone. A sense generation analysis of these readings would be straightforward: The former applies the type coercion operator *fake* to the sense for *stone lion*, whilst the latter applies the operator to the lexical concept for *stone* and then combines the output with the lexical concept for *lion*.

The final type of combination involves nonpredicating (or attributive) modifiers in general: In cases like *attractive ballet-dancer* or *engine repair*, it cannot be inferred that an object of NP type is also of modifier type (so an engine repair is not a member of the set of engines). Here, the NI is the lexical concept associated with the group of objects relative to which the individual is being described as *attractive*, possibly that for *ballet-dancer*, or for some other set of objects (Franks, 1989). Priority union of the NI lexical concept with the combination for the constituent concepts is then the basis for generating the sense. Again, no alteration to the basic principles of concept combination and classification are necessary. Indeed, the operators that handle privatives naturally apply also to nonpredicating combinations.
9. CONCLUSIONS

In this article, I have spelled out a novel, sense generation approach to concept combination, and the complementary perspectival relativity view of classification. The approach contrasts markedly with extant theories concerning fulfilment of both the representation and classification functions of concepts, and posits an interaction between top-down requirements on communication and bottom-up rules of concept combination, with quite strict bottom-up priority. From within this approach, I have proffered an account of privative concept combinations, which are test cases for a general theory of concept combination. The availability of a unified account of this group of combinations may perhaps render less distant the prospect of providing a fully generalisable account of concept combination.

REFERENCES


