

Lexical Semantics and Pragmatics

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Abstract

In this paper I discuss some general problems one is confronted with when trying to analyze the utterance of words within concrete conceptual and contextual settings and to go beyond the aspects of meaning typically investigated by a contrastive analysis of lexemes within the Katz-Fodor tradition of semantics. After emphasizing some important consequences of the traditional view, several phenomena are collected that seem to conflict with the theoretical settings made by it. Some extensions of the standard theory are outlined that take a broader view of language interpretation and claim to include pragmatic aspects of (utterance) meaning. The models critically considered include Bartsch's indexical theory of polysemy, Bierwisch's two-level semantics and Pustejovsky's generative lexicon. Finally, I argue in favor of a particular account of the division of labor between lexical semantics and pragmatics. This account combines the idea of (radical) semantic underspecification in the lexicon with a theory of pragmatic strengthening (based on conversational implicatures).

1 Introduction

In the view of Katz & Fodor (1963) the scope of a language description covers the knowledge of a fluent speaker "about the structure of his language that enables him to use and understand its sentences". The scope of a semantic theory is then the part of such a description not covered by a theory of syntax. There is a second aspect which Katz and Fodor make use of in order to bound the scope of semantics. This is the pragmatic aspect of language and it excludes from the description any ability to use and understand sentences that depends on the "setting" of the sentence. *Setting*, according to Katz & Fodor (1963) can refer to previous discourse, socio-physical factors and any other use of "non-linguistic" knowledge. A nice demonstration of the essence of "non-linguistic" knowledge in the understanding of sentences has been provided by psychologists in the 70's (e.g. Kintsch 1974, Bransford et al. 1972). Let's consider the following utterance:

(1) The tones sounded impure because the hem was torn.

I guess we do not really understand what this sentence means until we know that this sentence is about a bagpipe. It is evident that this difficulty is not due to our insufficient knowledge of English. The syntax involved is quite simple and there are no unknown words in the sentence. Instead, the difficulty is related to troubles in accessing the relevant conceptual setting. The idea of *bagpiping* is simply too unexpected to be derived in a quasi-neutral utterance context. The example demonstrates that we have to distinguish carefully between the linguistic aspects of representing the (formal) meaning of sentences and the pragmatic aspects of utterance interpretation (speaker's meaning).

In this paper I restrict myself to the semantics of lexical units and intend to explain the interaction of lexical meaning with pragmatics. Already Katz & Fodor (1963) have stressed the point that a full account of lexical meaning has to include more information than that which allows one to discriminate the meanings of different words. In one of their examples they argue that *take back* is used in very different ways in the sentences (2a,b), although the relevant lexical entries are semantically unambiguous.

(2) a. Should we take the lion back to the zoo?
b. Should we take the bus back to the zoo?

An obvious difference between these sentences is that the lion is the *object* taken back to the

zoo in (2a), but the bus is the *instrument* that takes us back to the zoo in (2b). The problem for the pragmatic component of utterance interpretation is to explain the difference in terms of different conceptual settings ("world knowledge"), starting from a lexicon that doesn't discriminate the two occurrences of *take back* semantically and from a syntax that is completely parallel for the two sentences.

As a third introductory example let's consider the perception verbs in English (cf. Sweetser 1990). This example may be helpful for demonstrating a way of how to discriminate between the purely lexical semantic component of language and the pragmatic component in more practical terms. If Saussure is right, there is an essentially arbitrary component in the association of words or morphemes with what they mean. Consequently, the feature of arbitrariness could be taken at least as a sufficient condition for the presence of semantic information. It is certainly an arbitrary fact of English that *see* (rather than, say, *buy* or *smell*) refers to visual perception when it is part of the utterance (3a). Given this arbitrary association between a phonological word and its meaning, however, it is by no means arbitrary that *see* can also have an epistemic reading as in (3b).

- (3) a. I see the tree.
b. I see what you're getting at.

Moreover, it is not random that other sensory verbs such as *smell* or *taste* are not used to express an epistemic reading. Sweetser (1990) tries to sketch an explanation for such facts and insists that they have to do with conceptual organization. It is our knowledge about the inner world that implicates that vision and knowledge are highly related, in contrast to, say smell and knowledge or taste and knowledge, which are only weakly related for normal human beings. If this claim is correct, then the information that *see* may have an epistemic reading but *smell* and *taste* do not must no longer be stipulated semantically. Instead, this information is pragmatic in nature, having to do with the utterance of words within a conceptual setting, and can be derived by means of some general mechanism of conceptual interpretation.

Considerations of this kind raise a standard puzzle for lexical semantics when we ask how to separate the (mental) lexicon from the (mental) encyclopedia. How should we separate information about the meaning of words from information about the (supposed) reality associated with these words? Admittedly, it may be rather difficult to discriminate these two kinds of information. Tangible, theory-independent empirical tests simply don't exist. There are two principal possibilities of dealing with this situation. First, the distinction between the lexicon and the encyclopedia is said to be illusory (as it has sometimes been suggested by representatives of Cognitive Semantics, e.g. Lakoff 1987). In this case all the relevant information has to be put into the lexicon. It will be argued in what follows that this view leads to a highly non-compositional account of meaning projection. The second possibility is to take the distinction as an important one. As a consequence, we are concerned with two different types of mechanisms: (i) a mechanism that deals with the combinatorial aspects of meaning and (ii) a pragmatic mechanism that deals with conceptual interpretation. Once we have adopted such theoretical mechanisms, the problem of discriminating lexical semantic information from encyclopedic information need no longer look so hopeless, and we really may profit from a division of labor between semantics and pragmatics. It is the position of this paper to argue in favor of the second option.

The aims of this paper are threefold. First, I want to demonstrate some general problems we are confronted with when trying to analyze the utterance of words within concrete conceptual and contextual settings and to go beyond the aspects of meaning typically investigated by a contrastive analysis of lexemes within the Katz-Fodor tradition of semantics. Second, I want to discuss and criticize some extensions of the standard theory.

The models considered include Bartsch's indexical theory of polysemy, Bierwisch's two-level semantics and Pustejovsky's generative lexicon. Finally, I would like to argue in favor of a particular account of the division of labor between lexical semantics and pragmatics. This account combines the idea of (radical) semantic underspecification in the lexicon with a theory of pragmatic strengthening (based on conversational implicatures).

The organization of this paper is as follows. In the next section I will emphasize some important consequences of the traditional view of (lexical) semantics. In the third section some phenomena are collected that have a *prima facie* claim on the attention of linguists, and I will show that most of these phenomena conflict with the theoretical assumptions made by the traditional view. The fourth section aims to demonstrate that several simple extensions of the traditional view which are suggested in the literature can't deal with these problems in a systematic and theoretically satisfactory way. In the fifth section I introduce a particular way of combining (radical) semantic underspecification with a theory of pragmatic strengthening.

2 Three features of the standard view of (lexical) semantics

In this section I will remain neutral about what sort of thing a semantic value should be taken to be: an expression in some language of thought, a mental structure as applied in cognitive semantics or a model-theoretic construct. To be sure, there are important differences between conceptualistic accounts à la Katz & Fodor and realistic accounts as developed within model-theoretic semantics. These differences become visible, first at all, when it comes to substantiate the relationship between individual and social meaning (see Gärdenfors 1993). For the purpose of the present paper, however, the question of whether semantics is realistic or conceptualistic doesn't matter. In the following I will concentrate on some general features that can be ascribed to both accounts in their classical design. These features are not intended to characterize the family of theories called *the standard view* in any sense completely. Rather, their selection is intended to emphasize several properties that may become problematic when a broader view of utterance meaning is taken. In section 5, I will use these features for demarcating the borderline between semantics and pragmatics.

2.1 Systematicity and compositionality

One nearly uncontroversial feature of our linguistic system is the *systematicity of linguistic competence*. According to Fodor & Pylyshyn (1988: 41-42) this feature refers to the fact that the ability to understand and produce some expressions is intrinsically connected to the speaker's ability to produce and understand other expressions that are semantically related. The classical solution to account for the systematicity of linguistic competence crucially makes use of the *principle of compositionality*. In its general form this principle states the following:

- (4) The meaning of a complex expression is a function of the meanings of its parts and their syntactic mode of combination.

In an approximation that is sufficient for present purposes, the principle of compositionality states that "a lexical item must make approximately the same semantic contribution to each expression in which it occurs" (Fodor & Pylyshyn 1988). As a simple example consider adjective-noun combinations as *brown cow* and *black horse*. Let's take "absolute" adjectives (such as *brown* and *black*) as one-place predicates. Moreover, non-relational nouns are considered as one-place predicates as well. Let's assume further that the combinatorial semantic operation that corresponds to adjectival modification is the intersection operation. Fodor & Pylyshyn (1988) conclude that these assumptions may explain the feature of

systematicity in the case of adjectival modification. For example, when a person is able to understand the expressions *brown cow* and *black horse*, then she should understand the expressions *brown horse* and *black cow* as well. Note that it is the use of the intersection operation that is involved in explaining the phenomenon, not compositionality per se. Nevertheless the principle of compositionality is an important guide that helps us to find specific solutions to the puzzle of systematicity.

Lexical semantics is concerned with the meanings of the smallest parts of linguistic expressions that are assumed to bear meaning. Assumptions about the meanings of lexical units are justified empirically only in so far as they make correct predictions about the meanings of larger constituents. Consequently, though the principle of compositionality clearly goes beyond the scope of lexical semantics, it is indispensable as a methodological instrument for lexical semantics. I state the principle of compositionality as the first feature characterizing the standard view of (lexical) semantics.

2.2 The monotonicity of the lexical system

Another general characteristic of the standard view is connected with the idea of analyzing the meanings of lexical items as a complex of more primitive elements. The main motivation for a componential (decompositional) analysis is connected with the explanation of certain semantic relations such as antonymy, synonymy, and semantic entailment. If the meaning of a lexical item were not analyzed into components, the lexical system of grammar would have to simply enumerate the actually realized relations as independent facts. This procedure would not be descriptively very economical. More important, it would miss the point that these facts are *not* independent of each other. The componential approach can be found both in theories of meaning in generative semantics (cf. Fodor 1977) and in model-theoretic based (especially Montagovian) semantic work (cf. Dowty 1979).

Defining the meaning of lexical items in terms of a repertoire of more primitive elements leads to a second order property which I will call the *monotonicity* of the lexical system. In short, the monotonicity restriction refers to the fact that we can incrementally extend the lexical system (by adding some definitions for new lexical material) without influencing the content of elements already defined.

At first glance, the monotonicity of the lexical system looks quite natural as a constraint within formal semantics. Of course, it would be very surprising if the content of *...is a bachelor* would change if the system learns what a spinster is (by acquiring the corresponding definition). Similarly, the meaning of *prime, even, odd (number)* should be independent of whether the system knows the meaning of *rational number* or *perfect number*¹.

It should be stressed that it is not the idea of decomposition (definition) per se that leads to the monotonicity feature of the lexical system. Instead, it is its classical treatment within a formal metalanguage that exhibits all features of a deductive system in the sense of Tarski.²

In the simplest case, definitions are explicit and can be represented as $Q(x) : C(x)$, where Q is the definiendum and C the definiens (an expression constructed in terms of a given system of lexical "primes"). In other cases, for example when we have to define disposition-like expressions like *soluble*, Carnap's (1936) reduction pairs may be used. An interesting case are bilateral reduction sentences. They have the form $F(x) \supset (Q(x) : C(x))$, with definiendum Q and definiens C (under condition F). In both cases, the system of (explicit or implicit) definitions bears the feature of monotonicity.

The following picture illustrates the difference between monotonic systems and non-monotonic ones in a schematic way. The picture simplifies matters by identifying meanings with extensions (represented by Venn-diagrams). In the case of a monotonic system, the addition of a new predicate R doesn't change the extensions of the old predicates P and Q . However, the same doesn't hold in the case of a non-monotonic system. In this case we have

"field"-effects: there seem to be attracting and repelling "forces" that shift the extensions of old predicates in a particular way when new lexical material comes into play.³

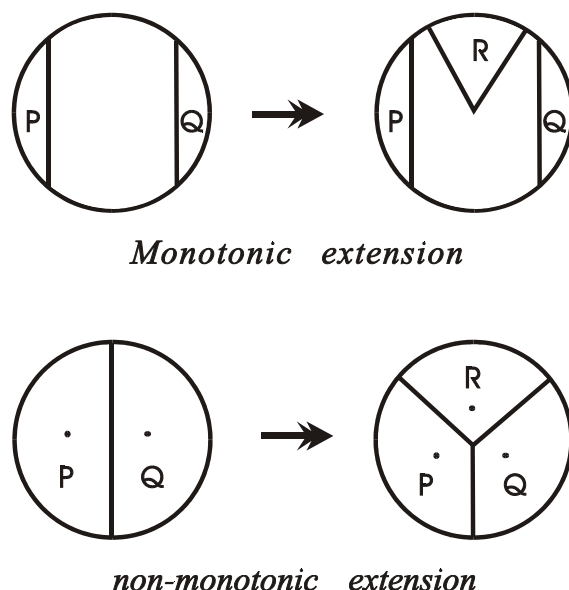


Figure 1: monotonic and non-monotonic extensions of a (lexicalized) system of concepts

2.3 The persistence of anomaly

Lexical semantics has to account for semantic contradictions as **married spinster*, **female bachelor*, **reddish green* and for other types of semantic anomalies as exemplified by the famous **colorless green ideas sleep furiously*. Usually, semantic anomaly of an expression is defined as logical incompatibility of (some part of) the formal translation of the expression taken in union with a given system ' of definitions and/or meaning postulates (e.g. McCawley 1971). Explicating incompatibility in terms of inconsistency and inconsistency in terms of contradictory entailments makes it possible to derive a second order property which I call the *persistence of anomaly*.

The persistence of anomaly comes in two variants: (i) if we add some new axioms to ' , then any former anomaly persists; and (ii) if a (propositional) formula is anomalous, then every other formula that implies it is anomalous as well.⁴ Both varieties seem to be satisfied empirically. It would be very surprising if the anomaly of **married bachelor* could be cancelled by learning the meaning of several new words. Once an anomaly is established it seems to persist when the system is extended. In a similar sense it would be perplexing if the anomaly of the expression **the idea sleeps* did not persist if the expression is made more specific, e.g. **the new idea sleeps*.

It is straightforward that the notion of semantic anomaly can be converted in a notion of pragmatic anomaly if the system ' of axioms is assumed to include other sources of knowledge, such as conceptual and ontological knowledge. Not surprisingly, the persistence of anomaly persists in this case.

3 Beyond the standard view: some inexplicable phenomena

In this section I will present several phenomena which may raise some doubts about the validity of the three principles just sketched. The phenomena suggest that we take a broader perspective on meaning and include various aspects of utterance interpretation. The examples

address the whole spectrum of information shared between lexicon and encyclopedia.

3.1 Challenging the principle of compositionality

In the previous section we have taken adjectives like *red*, *interesting*, or *straight* as intersective adjectives, and I have illustrated how this pretty simple analysis brings together systematicity and compositionality. Unfortunately, the view that a large range of adjectives behaves intersectively has been shown to be questionable. For example, Quine (1960) notes the contrast between *red apple* (red on the outside) and *pink grapefruit* (pink on the inside), and between the different colors denoted by *red* in *red apple* and *red hair*. In a similar vein, Lahav (1989, 1993) argues that an adjective like *brown* doesn't make a simple and fixed contribution to any composite expression in which it appears.

In order for a cow to be brown most of its body's surface should be brown, though not its udders, eyes, or internal organs. A brown crystal, on the other hand, needs to be brown both inside and outside. A brown book is brown if its cover, but not necessarily its inner pages, are mostly brown, while a newspaper is brown only if all its pages are brown. For a potato to be brown it needs to be brown only outside, Furthermore, in order for a cow or a bird to be brown the brown color should be the animal's natural color, since it is regarded as being 'really' brown even if it is painted white all over. A table, on the other hand, is brown even if it is only painted brown and its 'natural' color underneath the paint is, say, yellow. But while a table or a bird are not brown if covered with brown sugar, a cookie is. In short, what is to be brown is different for different types of objects. To be sure, brown objects do have something in common: a salient part that is wholly brownish. But this hardly suffices for an object to count as brown. A significant component of the applicability condition of the predicate 'brown' varies from one linguistic context to another. (Lahav 1993: 76)

Some authors – for example, Keenan (1974), Partee (1984), Lahav (1989, 1993) – conclude from facts of this kind that the *simplistic view* mentioned above must be abolished. As suggested by Montague (1970), Keenan (1974), Kamp (1975) and others, there is a simple solution that addresses such facts in a descriptive way and obeys the principle of compositionality. This solution considers adjectives essentially to be adnominal functors. Such functors, for example, turn the properties expressed by *apple* into those expressed by *red apple*. Of course, such functors have to be defined disjunctively in the manner illustrated in (5):

- (5) RED(X) means roughly the property
- a. of having a red inner volume if X denotes fruits only the inside of which is edible
 - b. of having a red surface if X denotes fruits with edible outside
 - c. of having a functional part that is red if X denotes tools
 - ...

Let us call this view the *functional view*. It should be stressed that the functional view describes the facts mentioned above only by enumeration. Consequently, it doesn't account for any kind of systematicity concerning our competence to deal with adjective-noun combinations in an interesting way. Another (notorious) problem of this view has to do with the treatment of predicatively used adjectives. In that case the adjectives must at least implicitly be supplemented by a noun. Various artificial assumptions are necessary which make such a theory inappropriate (cf. Bierwisch 1989 for more discussion of this point). We may conclude that compositionality doesn't necessarily lead to systematicity.

There is a third view about treating the meanings of adjectives, which I call the *free*

variable view. In a certain sense, this view can be seen as preserving the advantages of both the simplistic as well as the functional view, but as overcoming their shortcomings. The free variable view has been developed in considerable detail in case of gradable adjectives (see for example, Bierwisch 1989, and the references given therein). It is well known that the applicability conditions of restricting adjectives that denote gradable properties, such as *tall*, *high*, *long*, *short*, *quick*, *intelligent* vary depending upon the type of object to which they apply. What is high for a chair is not high for a tower and what is clever for a young child is not clever for an adult. Oversimplifying, I can state the free variable view as follows. Similarly to the first view, the meanings of adjectives are taken to be one-place predicates. But now we assume that these predicates are complex expressions that contain a free variable. Using an extensional language allowing \exists -abstraction, we can represent the adjective *long* (in its contrastive interpretation), for example, as $\exists x \text{ LONG}(x, X)$, denoting the class of objects that are long with regard to a comparison class, which is indicated by the free variable X . At least on the representational level the predicative and the attributive use of adjectives can be treated as in the first view: *The train is long* translates to (after \exists -conversion) $\text{LONG}(t, X)$ and *long train* translates to $\exists x [\text{LONG}(x, X) \vee T(x)]$. In these formulas t is a term denoting a specific train and T refers to the predicate of being a train.

Free variables are the main instrument for forming underspecified lexical representations. To be sure, free variables simply have the status of place holders for more elaborated subpatterns and expressions containing free variables should be explained as representational schemes. Free variables not only stand as place holders for a comparison class X as just indicated. The view can be generalized to include other types of free variables as well, for example a type of variable connected with the specification of the dimension of evaluation in cases of adjectives as *good* and *bad* or a type of variable connected with the determination of the object-dependent spatial dimensions in cases of spatial adjectives as *wide* and *deep*. In what follows, a variety of other kinds of variables will be considered, leading to rather complex types of lexical underspecification.

Of course, it is not sufficient to postulate underspecified lexical representations and to indicate what the sets of semantically possible specifications of the variables are. In order to grasp natural language interpretation ("conceptual interpretation"), it is also required to provide a proper account of contextual enrichment, explaining how the free variables are instantiated in the appropriate way. Obviously, such a mechanism has to take into consideration various aspects of world and discourse knowledge. We are presented here with a kind of *selection task*: how to select from a set of possibilities an appropriate one where (weak) restrictions are given in the form of world and discourse knowledge.

In some particular cases the instantiation of free variables may be done by using ordinary (monotonic) unification. If that works fine, it may be concluded that the mechanism of contextual enrichment has the feature of compositionality. In other words, the principle of compositionality stated for semantic representations can be transferred to the level of contextually enriched forms. In section 4.3 I will consider some examples that demonstrate that monotonic unification doesn't suffice for contextual enrichment.

There is a variety of other examples that demonstrate that our comprehension capacities have salient non-compositional aspects. The most prominent class of examples may be found within the area of *systematic polysemy*. This term refers to the phenomenon that one lexical unit may be associated with a whole range of senses which are related to each other in a systematic way.⁵ The phenomenon has traditionally been thought intractable, and in fact it is intractable when considered as a problem of lexical semantics in the traditional sense.

There are two central possibilities of how to account for the interpretation of utterances containing polysemous elements. The first possibility – call it the *sense enumeration view* – is to handle polysemy similar to homonymy, i.e. to state separate word senses for a polysemous word in a context-independent way. This view requires a second computational step – a

procedure that eliminates the contextually inappropriate interpretations.

The second possibility – call it the *selective generation view* – is to take systematic polysemy as a generative device that *calculates* the contextually appropriate senses starting from a unique, non-ambiguous meaning representation of the relevant linguistic expression. Given a polysemous lexeme, its meaning representation may either refer to a primary conceptual variant (representing its base sense), or it may be a more abstract unit referring to some form of underspecified structure. In both cases, a unique meaning representation may be calculated for longer expressions in a compositional way. The restricted generative device that has to be postulated for interpreting such expressions, however, lies outside the mode of compositionality.

I will postpone a more detailed illustration of these views until section 4, where some extensions of the standard view are considered. In section 4 and 5, the principal advantage of the selective generation view will be demonstrated and several ways of dealing with the non-compositional aspects of the interpretation will be discussed.

There are a lot of related problems with compositionality that come into mind. They arise in connection with word formation in general (e.g. Aronoff 1976, Bauer 1983) and the interpretation of compounds in particular (e.g. Meyer 1993, Wu 1990). Moreover, the investigation of different kinds of polysemy may be helpful in order to see the ubiquity of the problem (cf. Lakoff's (1987) study on English prepositions and Sweetser's (1990) investigation of English perception verbs). Furthermore, Fabricius-Hansen's (1993) research on how the interpretation of noun-noun compounds is affected by a genitive attribute may raise the same problems in a more complex area.

3.2 Blocking and the non-monotonicity of the lexical system

A general problem that lexical semantics has to address is the phenomenon of (*partial*) *lexical blocking*. This phenomenon has been demonstrated by a number of examples where the appropriate use of a given expression formed by a relatively productive process is restricted by the existence of a more "lexicalized" alternative to this expression. One case in point is due to Householder (1971). The adjective *pale* can be combined with a great many color words: *pale green*, *pale blue*, *pale yellow*. However, the combination *pale red* is limited in a way that the other combinations are not. For some speakers *pale red* is simply anomalous, and for others it picks up whatever part of the pale domain of red *pink* has not preempted. This suggests that the combinability of *pale* is fully or partially blocked by the lexical alternative *pink*.

Another standard example is the phenomenon of blocking in the context of derivational and inflectional morphological processes. Aronoff (1976) has shown that the existence of a simple lexical item can block the formation of an otherwise expected affixally derived form synonymous with it. In particular, the existence of a simple abstract nominal underlying a given *-ous* adjective blocks its nominalization with *-ity*:

- (6) a. curious - curiosity
tenacious - tenacity
- b. furious - *furiousity - fury
fallacious - *fallacity - fallacy

While Aronoff's formulation of blocking has been limited to derivational processes, Kiparsky (1982) notes that blocking may also extend to inflectional processes and he suggests a reformulation of Aronoff's blocking as a subcase of the *Elsewhere Condition* (special rules block general rules in their shared domain). However, Kiparsky cites examples of *partial blocking* in order to show that this formulation is too strong. According to Kiparsky, partial

blocking corresponds to the phenomenon that the special (less productive) affix occurs in some restricted meaning and the general (more productive) affix picks up the remaining meaning (consider examples like *refrigerant* - *refrigerator*, *informant* - *informer*, *contestant* - *contester*). To handle these and other cases Kiparsky (1982) formulates a general condition which he calls *Avoid Synonymy*: "The output of a lexical rule may not be synonymous with an existing lexical item".

Working independently of the Aronoff-Kiparsky line, McCawley (1978) collects a number of further examples demonstrating the phenomenon of partial blocking outside the domain of derivational and inflectional processes. For example, he observes that the distribution of productive causatives (in English, Japanese, German, and other languages) is restricted by the existence of a corresponding lexical causative. Whereas lexical causatives (e.g. (7a)) tend to be restricted in their distribution to the stereotypic causative situation (direct, unmediated causation through physical action), productive (periphrastic) causatives tend to pick up more marked situations of mediated, indirect causation. For example, (7b) could be used appropriately when Black Bart caused the sheriff's gun to backfire by stuffing it with cotton.

- (7) a. Black Bart killed the sheriff
b. Black Bart caused the sheriff to die

The phenomenon of blocking can be taken as evidence demonstrating the apparent non-monotonicity of the lexical system. This becomes pretty clear when we take an ontogenetic perspective on the development of the lexical system. Children overgeneralize at some stage while developing their lexical system. For example, they acquire the productive rule of deriving adjectives with *-able* and apply this rule to produce *washable*, *breakable*, *readable*, but also *seeable* and *hearable*. Only later, after forms like *seeable* and *visible*, *hearable* and *audible* have coexisted for a while, the meanings of the specialized items block the regularly derived forms. Examples of this kind suggest that the development of word meanings cannot be described as a process of accumulating more and more denotational knowledge in a monotonic way. Instead, there are highly non-monotonic stages in lexical development. At the moment, it is not clear whether this ontogenetic feature must be reflected in the logical structure of the mental lexicon. Rather, it is possible that pragmatic factors (such as Gricean rules of conversation) play an important role in determining which possible words are actual and what they really denote (McCawley, 1978, Horn 1984, Dowty 1979; see also section 5).

3.3 The non-persistence of (pragmatic) anomaly

Take the well-known phenomenon of "conceptual grinding", whereby ordinary count nouns acquire a mass noun reading denoting the stuff the individual objects are made of, as in *Fish is on the table* or *Dog is all over the street*. There are several factors that determine whether "grinding" may apply, and, more specific, what kind of "grinding" (meat grinding, fur grinding, universe grinding, ...) may apply. Some of these factors have to do with the conceptual system, while others are language-dependent (cf. Nunberg & Zaenen 1992; Copestake and Briscoe 1995; Leßmöllmann 1996).

One of the language-dependent factors affecting the grinding mechanism is lexical blocking. For example, in English the specialized mass terms *pork*, *beef*, *wood* usually block the grinding mechanism in connection with the count nouns *pig*, *cow*, *tree*. This explains the contrasts given in (8).

- (8) a. I ate pork/?pig
b. Some persons are forbidden to eat beef/?cow
c. The table is made of wood/?tree

The important point is the observation that blocking is not absolute, but may be canceled under special contextual conditions. That is, we find cases of *deblocking*. Nunberg & Zaenen (1992) consider the following example:

- (9) Hindus are forbidden to eat cow/?beef

They argue that "what makes *beef* odd here is that the interdiction concerns the status of the animal as a whole, and not simply its meat. That is, Hindus are forbidden to eat beef only because it is cow-stuff." (Nunberg & Zaenen 1992: 391). Examples of this kind strongly suggest that the blocking phenomenon is pragmatic in nature. Furthermore, these examples suggest that (pragmatic) anomaly does not necessarily persist when specific contextual information is added. Copestake & Briscoe (1995) provide further examples that substantiate this claim.

In section 2.3 I introduced a second variant of the notion of persistent anomaly. It concerns the specificity of linguistic information, and less that of contextual information. There is a variety of examples showing that this variant of the persistence of (pragmatic) anomaly likewise must fail (cf. Nunberg & Zaenen 1992):

- (10) a. This wine is particularly good with ?mammal/lamb
 b. ?mammal/canine is healthy food
 c. She likes to wear ?mammal/?sheep/angora

4 Some extensions of the standard view

In this section I will consider some approaches that go beyond the aspects of meaning typically investigated by a contrastive analysis of lexemes within the standard view. These approaches deal with the meaning of words within concrete conceptual and contextual settings, and they can be seen as different ways of closing the gap between lexical semantics and pragmatics. In the discussion I will concentrate on the problems and phenomena described above, and I will offer a critique of these proposals. It goes without saying that this discussion has to be necessarily unbalanced, and doesn't pretend to provide a comprehensive impression of the work under discussion. Further, the order of presentation is determined exclusively by didactic considerations and does not intend to reflect the historical development of the ideas presented.

4.1 Context-dependent semantics

In the late 70's a renewed interest in the formal treatment of indexical expressions (like *I, you, he, here, now, that, that book*, etc.) within model-theoretic semantics can be observed, inspired primarily by the work of Montague (e.g. Montague 1970). The basic idea was to overcome the fallacies of the traditional possible-world semantics *à la* Kripke by introducing aspects of context into formal semantics. As a result of these efforts, something like a classical theory of context-dependency originated.⁶

Within this theory, the connection between meaning and extension is established in two steps. The meaning (or the *character*) f'' of an expression " (in a model M) is a two-place function of *context* (utterance situation) and *index* (possible world). Applying the character f'' to a context c , the intension $f''_{<c>}$ of " in this context results. The intension itself can be understood as a function, which applied to a index w results in the extension $f''_{<c>}<w>$.

So-called *Kaplan contexts* c include a specification of factors characterizing the speech situation, such as the agent c_{ag} (speaker), the audience c_{aud} , the time of utterance c_T , the place

of utterance c_p , and a characterization of the reference situation c_w (the world of utterance). Formally, they can be considered 5-tuples $c = \langle c_{ag}, c_{aud}, c_T, c_p, c_w \rangle$. As an example let's consider the semantic interpretation of the deictic expressions *I* and *you*.

- (11) a. $fI_n \langle c \rangle \langle w \rangle = c_{ag}$
 b. $fyou_n \langle c \rangle \langle w \rangle = c_{aud}$

The characters defined in (11) are functions whose values vary only with context. With regard to the index they are constant functions, like rigid designators. This explains that deictic expressions, when embedded in intensional contexts, behave very similar to proper names.

It is straightforward that a Kaplan context can be augmented by including further components into the list of contextual elements. Before I consider some examples of interesting augmentations, I want to comment about the nature of compositionality, the monotonicity of the lexical system, and the persistence of anomaly. Clearly, within context-dependent semantics, the principle of compositionality is required to apply to characters. In the case of descriptive expressions, where the characters don't really depend on context, the principle of compositionality can be transferred to the level of intensions. However, compositionality with respect to intensions may be violated when true context-dependencies come into play. Since the apparent violations of compositionality discussed in section 3.1 don't concern characters, but rather intensions (and extensions), the challenge is to deal with the relevant facts by considering the context-dependency of the expressions involved. The important question is whether a systematic and explanatory solution may be found in this way.

Similarly, it can be argued that the persistence of anomaly only applies in case of context-independent expressions. The introduction of true context-dependencies may abolish the persistence of anomaly, and this mechanism may be used to describe the phenomenon of deblocking considered in section 3.3.

With respect to the violation of the monotonicity feature of the lexical system, exemplified by the blocking phenomenon in section 3.2, I cannot see a real possibility of treating the problems by using the framework of context-dependent semantics. Of course, it would be possible to augment the context by a component c_{lex} characterizing a whole lexical system. Blocking then might be described as resulting from the existence of a certain lexical item within the lexical system c_{lex} . Of course, this approach would be purely stipulative, and, fortunately, nobody has made a proposal in this direction. Instead, another pragmatic mechanism has been highly recommended in order to deal with the blocking phenomenon: the mechanism of conversational implicature (see section 3.2 and section 5).

Let's now consider two examples that demonstrate how context-dependent semantics may explain violations of compositionality at the intensional level. First, consider the phenomenon of predicate transfer (Nunberg 1979, Sag 1981, Nunberg 1995), exemplified by examples as the following:

- (12) a. The ham sandwich is sitting at table 9. (Preferred Interpretation: *The one who ordered a ham sandwich is sitting at table 9*)
 b. There are five ham sandwiches sitting at table 9. (Preferred Interpretation: *There are five people who ordered ham sandwich sitting at table 9*)
 c. Every ham sandwich at the table is a woman. (Preferred Interpretation: *Everyone who ordered a ham sandwich is a woman*).

Sag (1981) and Nunberg (1995) assume that the intension of the head noun (*ham sandwich*) has to be transferred to another property in order to get the intended (Nunbergian)

interpretation (preferentially to the property of being the orderer of the ham sandwich). Sag (1981) proposes to augment Kaplan contexts by adding a sense transfer function, c_{ST} , which maps one-place predicate senses to one-place predicate senses. Sag's interpretation of a predicate symbol P deviates from the standard interpretation (13a) and is presented in (13b).

- (13) a. $fP_{\#} \langle c \rangle = I(P)$, where $I(P)$ designates the intension of P
 b. $fP_{\#} \langle c \rangle = c_{ST}(I(P))$

We obtain the new, transferred intension of P by applying c_{ST} to the intension of P. According to this view, different contexts may trigger different transfers, and the selection of the "appropriate" context is crucial for determining the preferred (intended) interpretation. Consider the following contexts in which the head noun *ham sandwich* may be interpreted:

- (14) a. $c_{ST}^0(I(\textit{ham sandwich})) = I(\textit{ham sandwich})$
 b. $c_{ST}^1(I(\textit{ham sandwich})) = I(\textit{orderer of the ham sandwich})$
 c. $c_{ST}^2(I(\textit{ham sandwich})) = I(\textit{customer of the ham sandwich})$
 d. $c_{ST}^3(I(\textit{ham sandwich})) = I(\textit{son of the cook of the ham sandwich})$

The context c^0 leaves the intension of the head noun unaffected. The intensions of the sentences in (12) in this context would suffer from sort conflicts and therefore should be excluded. Straightforwardly, more plausible results of comprehension correspond to the intensions in c^1 or c^2 (*the orderer / the customer of the ham sandwich is sitting at table 9*). The intensions in c^3 (*the son of the cook of the ham sandwich is sitting at table 9*) is completely improbable.

At this point it becomes pretty clear – at least for the phenomenon of predicate transfer – that the classical theory of context-dependency provides no real explanation of the phenomenon. The theory simply doesn't give any hints of how to separate the adequate from the less adequate transfers. "Which sense-transfer can be affected by $c_{ST}(P)$ is again to be explicated by pragmatic theory" (Sag 1981: 286). This means that it needs an independently stated "pragmatic theory" in order to decide the question whether an explanation of the phenomenon may be found in this way.⁷

Consider next the indexical theory of systematic polysemy proposed by Bartsch (1989). In a nutshell, Bartsch proposes to augment Kaplan contexts by adding a *thematic dimension* c_{them} , which determines "what the text is about, in the sense of, to which goal of the speaker or hearer this part of the text is directed" (Bartsch 1989: 1). The lexical material Bartsch investigates are adjectives like *good*, *strong*, *satisfactory* in English and *flink* in Dutch which she calls *thematically weakly determined expressions*. All these expressions require a specification as to which aspect of qualification they apply. For example, *flink* in Dutch expresses something like "strong under aspect X" where X refers to a specific thematic dimension d which Bartsch (1989: 2) exemplifies by

- $d_{1,1}$: degree of readiness to get into possible adverse situations for the sake of something good.
 $d_{1,2}$: degree of endurance in adverse situations
 d_3 : size of volume or circumference
 d_4 : degree of physical ability and strength

There is a series of adjectives in Dutch which are equivalent with *flink* in specific contexts, such as *dapper* ('brave'), *volhardened* ('enduring' or 'persistent'), *dik* ('big'), *sterk* ('strong') (see table 1).

thematic dimension		flink	dapper	volhardened	dik	sterk
risk taking	d _{1,1}	●	●			
endurance	d _{1,2}	●		●		
circumference/vol.	d ₃	●			●	
physical strength	d ₄	●				●

Table 1: Dutch adjectives which are equivalent with *flink* in specific thematic dimensions

Simplifying matters, the characters associated with these adjectives may approximately be defined as in (15). As a consequence, the equivalences illustrated in table 1 may be derived from these entries.

- (15) a. $f\text{flink}_n\langle c \rangle$ = the property of being strong under aspect c_{them} , (undefined for $c_{\text{them}} \in \{d_{1,1}, d_{1,2}, \dots\}$)
- b. $f\text{dapper}_n\langle c \rangle$ = the property of being strong under aspect $c_{\text{them}} = d_{1,1}$ (undefined for $c_{\text{them}} \dots d_{1,1}$)
- c. $f\text{volhardened}_n\langle c \rangle$ = the property of being strong under aspect $c_{\text{them}} = d_{1,2}$ (undefined for $c_{\text{them}} \dots d_{1,2}$)
- d. $f\text{dik}_n\langle c \rangle$ = the property of being strong under aspect $c_{\text{them}} = d_3$ (undefined for $c_{\text{them}} \dots d_3$)
- e. $f\text{sterk}_n\langle c \rangle$ = the property of being strong under aspect $c_{\text{them}} = d_4$ (undefined for $c_{\text{them}} \dots d_4$)

It is obvious that we can list the families of senses related to particular lexical items when we use context-dependent semantics in the way illustrated. However, as in the case discussed before, there remains a series of questions which can be answered only with respect to a proper pragmatic theory. These questions concern the nature of the thematic dimension, the problem of blocking, and the problem of restricting the possible sense families in a systematic way (for some ideas of what such restrictions might look like, cf. Lehrer 1978).⁸

4.2 Two-level semantics

In a series of papers, Bierwisch has developed a conception which is known as *two-level semantics* (e.g. Bierwisch 1983, 1989). This approach can be discussed under two perspectives. First, there is a broader perspective that directs our attention to the leitmotif of the conception. Second, there is a narrower and more tangible perspective that directs our attention to the proposed mechanisms and details of knowledge representation (insofar as they are essential to the whole approach).

Let's first adopt the broader perspective. I guess it is correct to say that two-level

semantics is the representational counterpart of the classical theory of context-dependency. As context-dependent semantics discriminates between *character* and *sense*, two-level semantics makes a difference between (the representation of) linguistic meaning (called *semantic representation*) and (the representation of) utterance meaning (called *conceptual representation*). Conceptual representations result from semantic representations by evaluating them with regard to a particular (representation of a) context. The question whether the two kinds of representation really correspond to different levels (in the sense Generative Grammar differentiates between different levels of representation) has proven to be very difficult to decide. Fortunately, this question seems not to be essential to the approach. For example, Jackendoff (1983) claims that semantic representation and conceptual representation belong to the same level.

At the beginning of section 4.1 I considered context-dependent semantics under a broad perspective, and I made some general claims concerning the nature of compositionality, the monotonicity of the lexical system, and the persistence of anomaly. These claims can be straightforwardly transferred to two-level semantics.

Next, let's adopt the narrower perspective. In Bierwisch (1983, 1989) and Lang (1989) we find many proposals which deserve our critical attention. Some of these proposals, such as the use of monotonic unification and the idea of type and sort coercion for calculating conceptual interpretations, may also be found in the work of other authors (e.g. Partee & Rooth 1983, Klein & Sag 1985, Jackendoff 1983). Most of these ideas were picked up and refined by Pustejovsky. I will postpone a critical discussion of these ideas until the next subsection.

An important problem in the research field of systematic polysemy concerns the question of how to constrain the possible senses that are associated with a polysemous lexical expression. Whereas context-dependent semantics appears to relegate such constraints to pragmatics (cf. Sag 1981, Nunberg 1995, Bartsch 1989), Bierwisch (1983) has his eyes on the idea of treating such restrictions semantically. He explicitly considers the restriction problem in connection with words like *institute*, *school*, *university*, *government*, *parliament*, and alike. For these nouns, Bierwisch has proposed semantic entries of the following general form:

$$(16) \quad \exists x [\text{PURPOSE}(x,w) \vee \text{CC}(w)]$$

"PURPOSE" is a semantic prime, "x" a bound variable and "w" a free variable that refers to a conceptual complex to which the condition CC (a predicate constant) applies. It is this semantic condition which discriminates school from university, parliament from government, and so on. In the case of *school*, CC is LEARNING_&_TEACHING (Bierwisch 1983: 86). This leads us to the following semantic entry for *school*:

$$(17) \quad \exists x [\text{PURPOSE}(x,w) \vee \text{LEARNING_}\&_ \text{TEACHING}(w)]$$

Bierwisch (1983: 88) stresses that the semantic entry for *school* is underspecified with regard to the level of conceptually salient senses. He proposes several functions or "templates" (Bierwisch 1983: 87):

$$(18) \quad \begin{array}{l} \text{a.} \quad \exists P \exists x [\text{INSTITUTION}(x) \vee P(x)] \\ \text{b.} \quad \exists P \exists x [\text{BUILDING}(x) \vee P(x)] \\ \text{c.} \quad \exists P \exists x [\text{PROCESS}(x) \vee P(x)] \end{array}$$

Applying these \exists -expressions to the semantic entry (17) for *school*, we get the following representations identifying three conceptual variants for *school*, the institution-, building-,

and process-reading:

- (19) a. $\exists x$ [PURPOSE(x,w) \vee LEARNING_&_TEACHING(w) \vee INSTIT(x)]
b. $\exists x$ [PURPOSE(x,w) \vee LEARNING_&_TEACHING(w) \vee BUILDING(x)]
c. $\exists x$ [PURPOSE(x,w) \vee LEARNING_&_TEACHING(w) \vee PROCESS(x)]

The uniform semantic entry of *school* thus comes to be interpreted as a kind of institution, a kind of building, or a kind of process. For some institution words, however, the range of interpretations is more restricted. Bierwisch compares *Regierung* (English *government*) and *Parlament* (*parliament*). Whereas the latter may have both the institution and the building interpretation (in German and English), the former lacks the building interpretation (cf. Bierwisch 1983: 83):

- (20) a. Das Parlament hat die Frage bereits entschieden.
The parliament has already come to a decision on the issue.
b. Das Parlament liegt am Stadtrand.
The parliament is situated on the outskirts of the city.
- (21) a. Die Regierung hat die Frage bereits entschieden.
The government has already come to a decision on the issue.
b. ?Die Regierung liegt am Stadtrand.
?The government is situated on the outskirts of the city.

Here we are confronted with the restriction problem of polysemy. Bierwisch solves it by stipulating a corresponding constraint in the lexicon, giving *Regierung* a more restricted representation than *Parlament*:

- (22) a. Parlament ² $\exists x$ [PURPOSE(x,w) \vee CC_{parliament}(w)]
b. Regierung ² $\exists x$ [PURPOSE(x,w) \vee INSTITUTION(x) \vee CC_{government}(w)]

Using (22b) as the semantic entry for *Regierung* excludes the templates (18b,c) from being applied, for applying them would result in sortal incorrectness. Generally speaking, Bierwisch's restrictions on interpretation are determined exclusively by the lexical system of grammar and certain conditions on sortal correctness. As a consequence, the anomaly of utterances like (21b) comes out as a semantic anomaly.

The view to treat the restriction problem as a purely linguistic problem has been criticized by various authors (e.g., Meyer 1994, Taylor 1994, Blutner 1995). Taylor (1994), for example, argues that the different restrictions for *Parlament* and *Regierung* are

closely linked to conceptual knowledge of what a parliament and a government actually are. A parliament is primarily a legislative institution, whose members are housed in a specially dedicated building; while a government is primarily a group of people with executive authority, but who do not necessarily or typically congregate in a special building to carry out their duties. (Taylor 1994: 16).

A proper way to check the view whether conceptual knowledge may restrict the range of polysemous variants might be to consider the influence of "social-cultural" factors on the realization of polysemy. A nice illustration is provided by the way people in Munich and Saarbrücken use these words. Contrary to the normal situation just mentioned, in Munich and Saarbrücken the government typically congregates in a special building that is well-known to the people. Surprising only for advocates seeing the restrictions on polysemy as "rein sprachlich", it turns out that utterances like

- (23) ?Die Regierung liegt nicht weit vom Stadtzentrum.
 ?The government is situated not far from the center of the city.

are not deviant for most people in Munich and Saarbrücken.⁹

If this line of argumentation is correct, then it can be concluded that the restriction problem must be solved by finding a systematic explanation of pragmatic anomalies within a proper pragmatic setting.

4.3 Generative lexicon

In section 3.1 I mentioned two different views on how to handle the interpretation of polysemous expressions: the *sense enumeration view* and the *selective generation view*. Pustejovsky's disapproval with the sense enumeration analysis of polysemy led him to his theory of the *generative lexicon* (cf. Pustejovsky 1989, 1991, 1993, 1995), which may be seen as a particular variant of the selective generation view. According to Pustejovsky, sense enumeration lexicons simply miss the fact that the different senses of a polysemous expression are semantically related. Moreover, the process of sense selection on the basis of various contextual factors becomes computationally undesirable, particularly when it has to account for longer phrases involving different sources of polysemy.

One of Pustejovsky's typical examples concerns the ambiguity and context dependence of adjectives such as *fast* and *slow*, where the interpretation of the adjective varies depending on the noun being modified (cf. Pustejovsky & Bogurajev 1993).

- (24) a. a fast car [one that moves quickly]
 b. a fast typist [a person that performs the act of typing quickly]
 c. a fast book [one that can be read in a short time]
 d. a fast driver [one who drives quickly]

With regard to these examples, it can be argued that the four different interpretations of *fast* can all be derived from a single word meaning, and there is no need for enumerating the different senses (cf. Pustejovsky & Bogurajev 1993, Pustejovsky 1995). The basic idea is the following. The adjective modifies a specific conceptual component connected with the noun, namely its purpose or function. With regard to this component, the adjective seems to make an uniform contribution: it qualifies this component (the act of moving, typing, reading or driving) in a specific and predictable way.

In order to illustrate this idea more precisely, let us calculate the interpretation of the expression *fast car*. In (25a) the semantic analysis of the noun *car* (its *qualia structure*) is sketched in some relevant aspects. The analysis states that the concept related to cars is characterized (besides other things) by a *telic role* (purpose or function) that qualifies a situation *s* associated with cars as a moving process. The semantic analysis of the adjective *fast* given in (b) expresses that it affects the telic role only. From a technical point of view, the free variables *s* and *s'* introduce elements of underspecification into the lexical representations of *car* and *fast*. In (c) the expressions given in (a) and (b) are combined by the intersection operation, and in (d) the resulting interpretation (*a car that moves quickly*) is obtained by unifying the free variables.

- (25) a. *car*: $\exists x$ [CAR(x)∧TELIC(x,s)∧MOVE(s)∧...]
 b. *fast*: $\exists x$ [TELIC(x,s')∧FAST(s')]
 c. *fast car*: $\exists x$ [CAR(x)∧TELIC(x,s)∧MOVE(s)∧
 TELIC(x,s')∧FAST(s')∧...]

d. unification ² $\exists x$ [CAR(x)∨TELIC(x,s)∨MOVE(s)∨FAST(s)∨...]

It is straightforward to extend the analysis to the other cases given in (24). At first glance, this kind of analysis seems to work well for the examples under discussion. However, there is a problem. Clearly, the analysis establishes a kind of inferential relationship, namely the inference from *a fast car* to *a car that moves quickly*, or from *a fast book* to *a book that can be read in a short time*. Since the analysis rests on non-defeasible lexical information and the operation of monotonic unification, these inferences come out as strictly necessary entailments. However, from an intuitive point of view, such inferences are defeasible, hence not strictly necessary, as shown by the following example for contextual canceling.¹⁰

(26) Yesterday, my friend had some trouble with his wife, and she throw his books out the window. Unfortunately, I was struck by a fast book. [preferentially, one that moved quickly]

Another problem of the account becomes visible, when we try to generalize the account to other types of adjectives, e.g. to example color and taste adjectives. Suppose that we want to describe that a red apple is one whose peel is red (but not necessarily its inside), and a red grapefruit is one having a red inside (but not necessarily a red peel). According to the account just sketched, we can try to describe this by assuming an application condition for *red* saying that a salient part of the object (with regard to color) is wholly reddish. Furthermore, we have to characterize the noun *apple* with respect to its mereological structure. Perhaps Pustejovsky's *constitutive qualia* could be (mis)used for this purpose, and we could postulate that the salient part of an apple is its peel and the salient part of a grapefruit is its inside. However, what counts as a salient part with regard to color is not necessarily salient with regard to other aspects. What counts as the salient part of an apple with regard to taste, for example, seems to be the inside and not the peel. Consequently, what is needed is a mechanism for assigning, manipulating and comparing saliencies. I think it is not unfair to say that monotonic unification is a completely unsuitable mechanism in this connection.

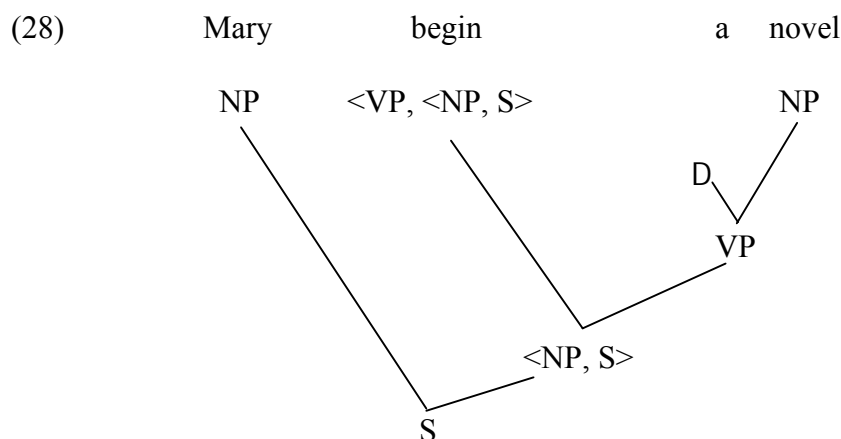
Most of this criticism also applies to two-level semantics, because this approach makes extensive use of (some variant of) monotonic unification as well. Although the two-level semantics makes a careful distinction between lexical and encyclopedic information – I see that as an advantage over Pustejovsky's account – this doesn't help very much as soon as it uses the very same mechanism of monotonic unification. Paradoxically, the general claim made by two-level semantics – that the principle of compositionality cannot be transferred to the level of utterance interpretation – conflicts with the specific proposals made for calculating utterance meanings.

Let's next consider the case of *logical polysemy*, another typical example which Pustejovsky uses to argue against the sense enumeration view. The phenomenon of logical polysemy brings to the foreground some new ideas and mechanisms of the "generative capacity" of the lexicon. Pustejovsky (1989, 1991, 1993, 1995) considers examples such as those illustrated in (27) and argues that it would seem arbitrary to create separate word senses for a lexical item just because it can participate in distinct syntactic realizations.

(27) a. Mary began to read a novel
b. Mary began to write a novel
c. Mary began a novel

The type for *begin* in (27a,b) is <VP,<NP,S>> and appears to be <NP,<NP,S>> in (27c). Pustejovsky suggests that it is sufficient to assume one basic type, namely <VP,<NP,S>>, and that the well-formed construction (27c) is the result of *coercing* the complement (the NP

a novel) to another type. In general, type coercion is realized by "a semantic operation that converts an argument to the type which is expected by a function, where it would otherwise result in a type error" (Pustejovsky 1993: 83). Type coercion leads to the derivation tree shown in (28) for (27c).



Here D denotes a shifting-operator. In its most general form, this shifting operator is called the *relate*-operator. It has the following form (when applied to the semantic representation of *a novel*):

$$(29) \quad D(A \text{ NOVEL}) = \lambda x \lambda y [P[P(A \text{ NOVEL})(x)](y)]$$

Using this operator, the combinatorial derivation shown in (28) leads to the result (30) (after performing several conversions explained in Pustejovsky (1993: 86)). This expression leaves the relation between JOHN and A NOVEL underspecified (the existential quantifier should not be taken too literally).

$$(30) \quad \text{BEGIN}(\lambda y [P[P(A \text{ NOVEL})(\text{JOHN})]])(\text{JOHN})$$

Pustejovsky uses such underspecified forms only for the interpretation of *contextually dependent* cases of (27c). Such a case can be exemplified by the following question-answer pair:

- (31) What about Mary's restoring?
He began the novel.

For the usual, so-called *contextually independent* interpretation of (27c), where *write* or *read* stand for the intended relations, Pustejovsky (1989, 1991, 1993) suggests another mechanism. This mechanism doesn't make use of the general *relate*-operator (29). The idea is to make use of a system of basic roles that characterize the semantics of nominals, the *qualia structure*. For the present purposes, these roles can be defined as operators that affect the semantic content of the NP. Two of these operators, the telic role and the agentive role, are given in (32):

- (32) a. $Q_T(A \text{ NOVEL}) = \lambda x \text{ READ}(A \text{ NOVEL})(x)$
b. $Q_A(A \text{ NOVEL}) = \lambda x \text{ WRITE}(A \text{ NOVEL})(x)$

In a certain sense, these operations may be seen as default realizations of the "underspecified"

operator D and we may make use of the general doctrine to follow default options before applying stricter options, in case the former can be applied consistently. By applying the operators (32a,b), the expressions (33a,b) result; they conform to the interpretations of (27a,b).

- (33) a. BEGIN([READ(A NOVEL)(JOHN)])(JOHN)
 b. BEGIN([WRITE(A NOVEL)(JOHN)])(JOHN)

Pustejovsky (1991) tries to illustrate the restrictiveness of this mechanism by considering the qualia structure of the noun *dictionary*, which lacks a realization of the telic role, and by considering the noun *rock*, which lacks a realization of both the telic role and the agentive role. Consequently, the distribution presented in (27) falls out rather naturally.

- (34) a. Mary began a dictionary (Agentive)
 b. ? Mary began a dictionary (Telic)
 c. ?? Mary began a rock

However, the approach loses much of its initial fascination and becomes rather questionable when confronted with examples like the following (borrowed from Fodor & Lepore, 1998):

- (35) a. John began a car
 b. John wants a dictionary

The predictions Pustejovsky's account makes (due to the corresponding qualia structures of *car* and *dictionary*) are that (35a) means *John began to drive a car*, and (35b) means *John wants to write a dictionary*. Both predictions clearly are wrong.

This problem of the *restrictiveness* of the coercion mechanism is only one problem that is connected with Pustejovsky's account. Another one looks like a technical problem and is perhaps avoidable. The problem is connected with the apparent inflation of shifting operations. Certainly we need the information provided by the telic and agentive role of nouns like *novel* that express two salient and highly context-independent properties of novels: that they are typically created by the process of writing and that their purpose is for reading. But why double these elements of stereotypic knowledge by stipulating extra shifting-operations that express exactly the same information?

The third point of criticism is connected with a substantial trait of natural language processing systems. Motivated by the *combinatorial explosion puzzle*, recent work on underspecification and semantic interpretation (e.g. Alshawi & Crouch 1992; van Deemter & Peters 1996) has stressed the monotonicity property of language processing. The idea is to eliminate non-monotonic operations involving loss of information and destructive operations of semantic representations and "to provide a model for semantic interpretation that is fully monotonic in both linguistic and contextual aspects of interpretation" (Alshawi & Crouch 1992: 32). The coercion view isn't in principle in conflict with this idea. However, the insufficient restrictiveness of the coercion mechanism and the need to stipulate additional checking mechanisms diminishes the use of monotonic processing and makes it very difficult to generate the right things immediately.

Copetake & Briscoe (1995: 30 ff) point out other problems with Pustejovsky's analysis of "logical polysemy" stemming from the possibility of co-predication. Furthermore, Pustejovsky's account is problematic when it comes to deal with the phenomena of blocking and deblocking considered in section 3.2 and 3.3.

Taken together, all these problems suggest that it is more promising to look for an alternative view. This alternative need not conform to the *sense enumeration view* (as Fodor

& Lepore (1998) seem to suggest), but it may be another variant of the *selective generation view*. The main idea of the selective generation view, I think, is basically correct: there are non-arbitrary, systematic connections between the different senses of polysemous expressions that we have to account for – simply enumerating the different senses is not enough. What is wrong with the particular approach to the selective generation view favored by Pustejovsky and others, I claim, is the idea to deviate from compositionality in a *minimal* way. This attitude is clearly reflected within the coercion view, which is summarized here.

(36) **The Coercion View**

- a. Every lexical unit determines a primary conceptual variant which can be grasped as its (literal) meaning.
- b. The combinatorial system of language determines how the lexical units are combined into larger units (phrases, sentences).
- c. There is a system of type and sortal restrictions which determines whether the resulting structures are well-formed.
- d. There is a generative device (called type/sort coercion) that tries to overcome type or sortal conflicts that may arise by strict application of the combinatorial system of language. The coercion device is triggered (only) by type or sort violations.

5. Semantic underspecification and pragmatic strengthening

Unlike the other sections of this paper, the following contains more an intimation of new opportunities than a survey of completed research. What I will consider in this section is a variant of the *selective generation view* which may be called the *radical underspecification view*. This view sharply contrasts with the coercion view. It is more radically founded on underspecified representations, and makes use of a pragmatic mechanism of contextual enrichment.

(37) **The Radical Underspecification View**

- a. Every lexical unit determines an underspecified representation (i.e. a representation that may contain, for example, place holders and restrictions for individual and relational concepts)
- b. The combinatorial system of language determines how lexical units are combined into larger units (phrases, sentences).
- c. There is a system of type and sortal restrictions which determines whether structures of a certain degree of (under)specification are well-formed.
- d. There is a mechanism of contextual enrichment (pragmatic strengthening based on contextual and encyclopedic knowledge).

This view of radical underspecification shares some ideas with the two-level semantics: (i) the distinction between lexicon and encyclopedia, i.e. between semantics and pragmatics is taken as an important one, (ii) the features of compositionality, monotonicity, and (perhaps) persistence of anomaly, are taken as crucial characteristics marking out the domain of semantics.

However, in contrast to Bierwisch's two-level semantics and Pustejovsky's generative lexicon, the present view disregards monotonic unification and type/sort coercion as mechanisms of contextual enrichment. Instead, it explores alternative proposals – proposals stressing open-ended default inference on real world knowledge. Here is a collection of

candidates that may provide a suitable mechanism for the contextual enrichment of underspecified representations:

- Defaults as rules for filling in information gaps (see various papers in van Deemer & Peters, 1995)
- Discourse interpretation based on a default conditional logic (e.g. Lascarides & Asher 1993)
- Persistent Default-Unification (Lascarides, Asher, Briscoe, & Copestake 1995, Copestake & Briscoe 1995)
- Weighted abduction (Hobbs et al. 1993)
- Conversational implicature and lexical pragmatics (Blutner, Leßmöllmann, & van der Sandt 1995, Blutner 1998)

In the rest of this paper, I will refer to the last-mentioned account only, and I will outline how this account may solve some of the problems stated before. The details of the solutions are beyond the scope of this paper because it would require a detailed discussion of the proposed account to conversational implicature.

Using the idea of weighted abduction (Hobbs et al. 1993), the approach of *lexical pragmatics* has many similarities with Hobbs' account seeing conceptual interpretation as abduction, i.e. as "inference to the best explanation". The problem with Hobbs' account is that it can account neither for blocking nor for the non-persistence of anomaly (for details see Blutner, to appear). In the lexical pragmatics account abduction is only one component embedded in a more comprehensive architecture that seeks to explicate the notion of conversational implicature.

For Griceans, conversational implicatures are those non-truth-functional aspects of utterance interpretation which are conveyed by virtue of the assumption that the speaker and the hearer are obeying the *cooperative principle of conversation*, and, more specifically, various *conversational maxims: maxims of quantity, quality, relation and manner*. While the notion of conversational implicature doesn't seem hard to grasp intuitively, it has proven difficult to define precisely. An important step in reducing and explicating the Gricean framework has been made by Atlas and Levinson (1981) and Horn (1984). Taking Quantity as starting point they distinguish between two principles, the Q-principle and the I-principle (termed R-principle by Horn 1984). Simple but informal formulations of these principles are as follows:

Q-principle:

Say as much as you can (given I) (Horn 1984: 13).

Do not provide a statement that is informationally weaker than your knowledge of the world allows, unless providing a stronger statement would contravene the I-principle (Levinson 1987: 401).

I-principle:

Say no more than you must (given Q) (Horn 1984: 13).

Say as little as necessary, i.e. produce the minimal linguistic information sufficient to achieve your communicational ends (bearing the Q-principle in mind) (Levinson 1987: 402)

Obviously, the Q-principle corresponds to the first part of Grice's quantity maxim (*make your contribution as informative as required*), while it can be argued that the countervailing I-principle collects the second part of the quantity maxim (*do not make your contribution more informative than is required*), the maxim of relation and possibly all the manner maxims. As Horn (1984) seeks to demonstrate, the two principles can be seen as representing two competing forces, one force of *unification* minimizing the Speaker's effort (I-principle), and

one force of *diversification* minimizing the Auditor's effort (Q-principle).

I guess that the proper treatment of conversational implicature crucially depends on the proper formulation of the Q- and the I-principle. The present explication rests on the assumption that the semantic description $\text{sem}(\text{"})$ of an utterance " is an underspecified representation determining a whole range of possible enrichments m , one of which covers the intended content m_{intend} . The idea of abductive specification may be used to define in which case m is a possible enrichment of $\text{sem}(\text{"})$: $\langle \text{"}, m \rangle$ is called a *possible enrichment pair* (short, *pep*) iff m is an abductive specification of $\text{sem}(\text{"})$ that can be generated by means of general world and discourse knowledge. Weighted abduction gives for each possible enrichment pair a cost value $\underline{c}(\text{"}, m)$ that reflects the "proof" cost for deriving m from $\text{sem}(\text{"})$. Roughly, this cost is correlated with the *surprise* the particular enrichment m has for an agent confronted with the underspecified representation $\text{sem}(\text{"})$.

The Q- and the I-principle can be seen as conditions constraining possible enrichment pairs $\langle \text{sem}(\text{"}), m \rangle$:

- (38) a. $\langle \text{"}, m \rangle$ satisfies the Q-principle iff $\langle \text{"}, m \rangle$ is a pep and there is no other pep $\langle \text{"}', m' \rangle$ [satisfying the I-principle] such that $\underline{c}(\text{"}', m') < \underline{c}(\text{"}, m)$.
 b. $\langle \text{"}, m \rangle$ satisfies the I-principle iff $\langle \text{"}, m \rangle$ is a pep and there is no other pep $\langle \text{"}', m' \rangle$ [satisfying the Q-principle] such that $\underline{c}(\text{"}', m') < \underline{c}(\text{"}, m)$.

In this (rather symmetrical) formulation, the Q- and the I-principle constrain the peps in two different ways. The I-principle constrains them by selecting the *minimal surprising* enrichments [provided Q has been satisfied], and the Q-principle constrains them by blocking those enrichments which can be grasped more economically by an alternative linguistic input $\text{"}'$ [provided I has been satisfied].

It is not difficult to see that the Q-principle carries the main burden in explaining the blocking effects discussed in section 3.2. The additions put in brackets were introduced to explain the "division of pragmatic labor" (Horn 1984): the use of marked expressions – when a corresponding unmarked expression is available – tends to be interpreted as conveying a marked message. (Recall, for example, the case of productive causatives, as illustrated in (7)).¹¹

Now I informally introduce the notion of *common ground*, an information state containing all the propositions shared by several participants, including general world and discourse knowledge. The important definitions now can be stated as follows:

- (39) a. A pep $\langle \text{"}, m \rangle$ is called *pragmatically licensed* (in a common ground cg) iff $\langle \text{"}, m \rangle$ satisfies the Q- and the I-principle and m is consistent with cg .
 b. An utterance " is called *pragmatically anomalous* (in cg) iff there is no pragmatically licensed pep $\langle \text{"}, m \rangle$.
 c. A proposition p is called a *conversational implicature* of " (in cg) iff p is a classical consequence of $cg \setminus m$ for each m of a pragmatically licensed pep $\langle \text{"}, m \rangle$.

What follows is a brief illustration how this framework can be used to solve two of Quine's puzzles concerning the pragmatics of adjectives (see section 3.1). The first one concerns the observation that the (preferred) interpretation of adjective noun combinations seems to affect different parts of the subject term in cases like (40a,b). The second puzzle has to do with the explanation of pragmatic anomalies in examples like (40c), where it is very difficult to get the interpretation (40d).

- (40) a. The apple is red [interpretation: its peel is red]
 b. The apple is sweet [interpretation: its pulp is sweet]
 c. ?The tractor is pumped up.
 d. The tires of the tractor are pumped up

In order to sketch how the mechanism solves the first puzzle let us concentrate on example (40a). Input of the analysis is an underspecified representation expressing that a certain part of the apple is red (roughly: APPLE(d)vPART(d,x)vCOLOR(x,u)vu=RED). The specification of the relevant part(s) is guided by parameters of subjective probability (cue validity, diagnostic value). For example, it is plausible to assume that the color of the peel is more diagnostic for classifying apples than the color of other apple parts (such as the color of the pulp). From this assumption it can be derived that the *red peel*-enrichment is the cost minimal enrichment. Consequently, the I-principle selects the *red peel*-enrichment (and blocks the *red pulp*-interpretation). It follows the proposition expressing that the peel of the apple is red is a conversational implicature of (40a) (but not the proposition expressing that the pulp of the apple is red). In the case of (40b) analogous considerations give the *sweet pulp*-enrichment as the preferred interpretation.

Next, what about the pragmatic anomaly in cases like (40c), which contrast with examples like (40d) which are acceptable? Surely, the underspecified semantics of (40c) (saying that some part of the tractor is pumped up) isn't inconsistent with usual background knowledge. If it were, the sentence (40d) should be deviant in the same way. Consequently, the pragmatic anomaly of (40c) must be explained in another way. I think it follows from the fact that those parts of tractors that may be pumped on (the tires) are only marginally diagnostic for classifying tractors. If this is correct, then the *pumped up tires*-enrichment is blocked by enrichments that refer to more salient parts (such as the motor or the coachwork). However, the latter enrichments suffer from sort conflicts and therefore come out as not pragmatically licensed (cf. definition (39a)). In summary, a kind of garden path effect brings about that (40c) is pragmatically anomalous.

It is important to see that the present notion of anomaly isn't persistent in general. The anomaly can be canceled under special contextual conditions. For example, suppose the situation in a garage where we find tractors whose tires are pumped up and tractors whose tires are not. In this situation sentence (40c) sounds fine (explanation: the pressure state of the tires in this situation may be highly diagnostic for classifying tractors).

Let's content ourselves with these suggestions regarding the non-compositional aspects of conceptual interpretation, the phenomenon of blocking and the non-persistence of pragmatic anomaly. Blutner (1998) extends the approach to analyze the corresponding effects in case of systematic polysemy. Again, it is the pragmatic mechanism that carries the main burden in explaining restrictions on interpretation.

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Endnotes

1. A perfect number is a natural number that is identical to the sum of its proper divisors; e.g. $6 = 1+2+3$ or $28 = 1+2+4+7+14$.
2. Within a deductive system a consequence relation $G4$ is defined. ' $G4 N$ ' explicates the notion of a logical consequence: the formula N (of a particular formal language $\langle \rangle$) is a logical consequence of the set of premisses ' $\langle \rangle$ '. For the present purpose it isn't essential to consider the details of constructing the consequence relation. What is essential, however, is to remember what Tarski stated quite generally as some minimal requirements which a deductive consequence relation $G4$ must fulfill if it is to be a truly logical notion:

A logical consequence relation $G4$ has to satisfy the following principles (here ' $\langle \rangle$ ' and ' $\langle \rangle$ ' range over sets of formulas and N over isolated formulas of $\langle \rangle$):

- | | | |
|----|---------------|---|
| a. | REFLEXIVITY: | ' $G4$ ' |
| b. | CUT: | if ' $G4$ ' $\langle \rangle$ ' and ' $\langle \rangle$ $G4 N$ ', then ' $G4 N$ ' |
| c. | MONOTONICITY: | if ' $G4 N$ ', then ' $\langle \rangle$ $G4 N$ ' |

The most important characteristic is MONOTONICITY. Informally, this principle states that the old theorems remain valid when the system ' $\langle \rangle$ ' of axioms (definitions, meaning postulates, factual knowledge) has been augmented by adding some new axioms.

3. The non-monotonic system I have in mind corresponds to the so called *Voronoi tessellation* defining a partitioning of some (abstract) space in terms of a given set of prototypes. The construction stipulates that the element x belongs to the same category as the closed prototype of the given set of prototypes. It is evident that previously defined categories may change when we add new prototypes. (For more details and for the cognitive significance of this construction, see Gärdenfors 2000)

The example may also be used for demonstrating that it is not the notion of decomposition per se that

leads to the non-monotonicity of the system. This results from the fact that we define prototypes in terms of certain (binary or continuous) features.

4. Again, it is the classical, deductive character of the entailment relation that leads to this conclusion.
5. Unfortunately, the term *systematic polysemy* covers a whole family of empirically different subphenomena for which no unified terminology is available. Expressions as *open and closed polysemy* (Deane 1988), *conceptual specification* and *conceptual shift* (Bierwisch 1983), *sense modulation* and *sense change* (Cruse 1986), *constructional polysemy* and *sense extension* (Copestake and Briscoe 1995) may be convenient to indicate a rough outline of the classification.
6. At this place, it is possible only to give a rough outline of the formal skeleton of this theory. For motivation, explanation, and discussion, I refer to the original literature, e.g. Kaplan (1978, 1979), and to a review article by Zimmermann (1991).
7. Sag (1981) doesn't give any hints about the intended kind of "pragmatic theory". Nunberg (1979, 1995) discusses different factors like familiarity, accessibility, and probabilistic parameters like cue validity and noteworthiness that seem to affect predicate transfer. He makes clear that it is such non-representational factors that substantiate a general pragmatic theory of contextual selection.
8. Of course, this doesn't mean that context-dependent semantics is useless in the domain under discussion. As Bartsch (1989) has shown, context-dependent semantics may be a proper framework for analyzing thematic operators (such as *in every respect*), restrictions in term-interpretation (*John, as a teacher, is good*), and sentential adverbials (such as *as far as his health is concerned, John is alright*). However, as Bartsch herself admits, questions about the correctness of texts, about the establishment of thematic dimensions, about the restricted interpretations of polysemic expressions, and so on can be answered only with respect to an adequate pragmatic background theory.
9. In a similar vein, Taylor (1984: 16) argues that the contrast between German *Palast* and English *palace* seems to reflect facts of a "social-cultural" nature: "The institution reading of *palace* is surely sanctioned by the fact that speakers of (British) English are citizens of a still extant monarchy, while the absence of an institution reading of *Palast* follows from the fact that for German speakers a "palace", probably, is no more than just another kind of historical monument."
10. For a similar argument, cf. Fodor & Lepore (1998).
11. For an extensive discussion of this point, see Blutner (1998).