The Semantics and Pragmatics of Weak and Strong Polarity Items in Assertions

Manfred Krifka
University of Texas at Austin
IBM Germany Scientific Centre, Heidelberg

1. Semantic Theories of Polarity Items

The central idea behind the standard semantic account of the distribution of negative polarity items (NPIs), which goes back to Fauconnier (1975, 1978) and Ladusaw (1979), is that NPIs occur in downward-entailing (DE) contexts and denote extreme elements among a set of alternatives. A downward-entailing context for α, i.e. an expression $X\alpha Y$, is defined as a context where replacing α with a semantically weaker constituent β yields a stronger expression $X\beta Y$. Linebarger (1980, 1987, 1991) pointed out various problems of this account, in particular that many known NPI contexts are not really DE, like the protasis of conditionals. But Heim (1987) could defend it by showing that the notion of DEness may be suitably restricted: The presence of NPIs signals DEness along a scale specified by the NPI and with respect to a particular position in a sentence. Furthermore, the acceptability conditions of NPIs are dependent on the current common ground of the conversation.

In a recent contribution, Kadmon & Landman (1993) claim that NPIs based on *any* indicate a reduced tolerance to exceptions. For example, a noun phrase like *any potatoes* is licensed only if the widening that it induces creates a stronger statement (their principle C). For example, assume that speaker A asks speaker B (a cook for a group of 50 people):

(1) A: Will there be French fries tonight?
B: No, I don't have potatoes.
A: Not even just a couple of potatoes that I can fry in my room?
B: Sorry, I don't have ANY potatoes.

According to Kadmon & Landman's description, B had the impression that his first answer was misunderstood in a way that *potatoes* is interpreted as ***enough potatoes for the whole group***. In his second answer, the use of *ANY potatoes* indicates that *potatoes* has to be understood in a wider sense than before.

Kadmon & Landman offer interesting and convincing solutions for a range of putative counterexamples to Ladusaw's theory. But there are also problems with their analysis. First, it seems that *any* expresses widening only when it is stressed. Notice that B's first answer in (1) could have been, perhaps even more naturally, *No, I don't have any potatoes*, where it is implausible that

Mandy Harvey and Lynn Santelmann (eds.), *SALT IV* 195-219, Ithaca, N.Y.: Cornell University.

any widening is intended, and that B's second answer requires stress on *ANY*. A second problem is that NPIs based on *any* can be used in contexts where the notion of reduced tolerance to exceptions is at least problematic. For example, we can say, referring to a particular set of numbers: *This set doesn't contain any prime numbers.* It seems implausible that *any prime numbers* induces a semantic widening of the precise concept *prime number* here, or even a contextual widening from "small prime number" to "small or large prime number". Third, a semantic rule like Kadmon & Landman's (C) is problematic for theoretical reasons as it refers in the semantic description of one expression (*any*) to the larger context in which this expression is used, and hence is intrinsically non-compositional. We may grant (C) the status of a descriptive generalization, but the next question should be: At which level is (C) checked, and what is responsible for this checking?

Another recent important contribution to the study of NPIs is Zwarts (1993). Following observations of other authors that not all NPIs are equal, Zwarts identifies three classes of NPIs which he calls "weak", "strong", and "superstrong", and gives an algebraic characterization of the contexts that can host these different types of NPIs.

Weak NPIs, like *need*, *care* and presumably unstressed *any* and *ever* require that the context in which they occur is monotone decreasing, or DE. Phrased in functional terms, a context f is monotone decreasing iff it holds that $X \subseteq Y$ entails $f(Y) \subseteq f(X)$. We find such NPIs, for example, in the scope of quantifiers like *few students* or *less than three students*, which are DE.

(2) a. Few students have ever gone to the library.
    b. Less than three students cared to hand in a paper.
    c. At most five students have gained any financial support.

Strong NPIs, like *any student at all*, or *lift a finger*, *bat an eyelash* etc. need a context that, in addition to being DE, has the property of being "anti-additive". A context f is anti-additive iff $f(X \cup Y) = f(X) \cap f(Y)$, where $\cup$ and $\cap$ are Boolean disjunction and conjunction. A quantifier like *less than three students* does not qualify, whereas a quantifier like *no student* does (cf. 3). Consequently we find contrasts like in (4).

(3) a. Less than three students smoked cigarettes or drank beer. ≠
       Less than three students smoked cigarettes and less than three students drank beer.
    b. No student smoked cigarettes or drank beer. =
       No student smoked cigarettes and no student drank beer.

(4) a. No student {lifted a finger / read any book at all}.
    b. *Less than three students {lifted a finger/read any book at all}.

Superstrong NPIs, for which Zwarts gives the Dutch example *mals* (lit. 'tender, soft') and the English example *one bit*, can only occur in a context that is downward-entailing, anti-additive and satisfies the condition $f(\neg X)=\neg f(X)$, where "$\neg$" expresses generalized negation or complementation; Zwarts calls these contexts "anti-morphic". A quantifier like *no student* does not satisfy this condition, but a quantifier like *John* does (cf. 5). Consequently, we find contrasts as the ones illustrated in (6):

(5) a. No student wasn't happy. ≠ It is not the case that no student was happy.
 b. John wasn't happy. = It is not the case that John was happy.

(6) a John wasn't one bit happy about these facts.
 b. *No linguist was one bit happy about these facts.

Although Zwarts' study is a very important contribution that adds considerable refinement to our understanding of NPIs, it has some empirical problems and leads to new theoretical challenges. First, the distinction between the three classes of polarity items is less clear than suggested by Zwarts. For one thing, contrasts like (4.a) vs. (b) indicate at most a strong tendency. Furthermore, various NPIs classified as weak by Zwarts, like *hurt a fly*, seem to be rather of the strong type. Second, there seems to be an interesting relation between NPI types and stress that Zwarts does not mention and that does not follow straightforwardly from his analysis: As a general rule, weak NPIs are unstressed, whereas strong NPIs attract stress. This can be seen in the contrast between weak *any* and strong *any (whatsoever)* and its Dutch and German equivalents *ook maar iets* and *auch nur irgendetwas*:

(7) a. No child got any presents/ANY presents (whatsoEVer).
 b. Less than three children got any presents/*ANY presents (whatsoEVer).

Third, the conditions of monotone decrease and anti-additivity are not sufficient for Zwarts' purposes, as they are satisfied by a function f that maps every set X to a specific element. One example is the quantifier *zero or more students*, which always yields a true sentence when combined with a VP. However, this quantifier does not license NPIs, neither strong ones nor weak ones.

Another problem is that the class of superstrong NPIs does not seem to be definable in terms of anti-morphicness, or in any algebraic terms for that matter. If it were, we should not find any contrast between the following examples, contrary to the facts:

(8) a. John wasn't one bit happy about these facts.
 b. *It is not the case that John was one bit happy about these facts.

It seems that Zwarts' class of superstrong NPIs are all parts of an idiom that contains an overt negation as the other part, e.g. *NEG...one bit.* I will disregard this class in the present article.

A more general problem that can be addressed to all existing semantic accounts of NPIs is that they are far from an explanative theory of polarity phenomena. Why do NPIs require DE contexts in the first place? Why do strong NPIs in addition require something like anti-additivity? Only when questions such as these are answered within a more general setting can we speak of a satisfying theory of polarity items. This is what I try in this paper. I will propose that the distribution of NPIs can be derived from the interaction between their meaning and the meaning of expressions in which they occur, and certain general pragmatic rules that come with the illocutionary force of the sentence. The theory of polarity items proposed here is an elaboration of ideas presented first in Krifka (1990, 1992a). A more comprehensive version of the theory proposed here is given in Krifka (in preparation).

2. The Semantics of Weak NPI "any"

I will develop the theory I am going to propose with a simple example: licensing of the NPI *anything* in the scope of negation in an assertion. The basic assumptions concerning the semantics of NPIs like *anything* are: (a) NPIs introduce alternatives; and (b) the alternatives induce an ordering relation of semantic specificity, where the NPI itself denotes a most specific element.

According to (a), NPIs resemble items in focus as viewed by focus theories such as Rooth (1985, 1992). I will incorporate alternatives with the help of structured meanings which have been developed to capture the semantic impact of focus (cf. Jacobs 1984, von Stechow 1990). More specifically, I will use triples $\langle B,F,A\rangle$, where B stands for the background, F for the foreground (the polarity item or the item in focus), and A for the set of alternatives to F. The set of alternatives A contains items of the same type of F, but not F itself. Typically, when B is applied to F, we will get a standard meaning B(F).

Semantic strength, rendered by "$\subseteq$", is defined for all types based on the truth-value type t as follows: If α, β are of type t, then $\alpha\subseteq\beta$ iff $\alpha \rightarrow \beta$. And if α, β are of type $\langle\sigma,\tau\rangle$, then $\alpha\subseteq\beta$ iff for all γ of type σ: $\alpha(\gamma) \subseteq \beta(\gamma)$. For example, if P, Q are properties (type $\langle s,\langle e,t\rangle\rangle$), then $P\subseteq Q$ iff $\forall i\forall x[P(i)(x) \rightarrow Q(i)(x)]$. Thus, we have **sparrow**$\subseteq$**bird**, as the set of sparrows is a subset of the set of birds in all possible worlds i. As usual I will write $\alpha\subset\beta$ iff $\alpha\subseteq\beta$ and $\neg\beta\subseteq\alpha$, and say that α is "stronger" than β.

Let me introduce an example. The NPI *anything* is analyzed as the following BFA-structure:

(9) *anything*: $\langle$B, **thing**, {P| P$\subset$**thing**}$\rangle$

Here, **thing** is the most general property (a notion that depends on the context and on selectional restrictions in ways that are not accounted for here). The precise nature of the background B is a function of the syntactic position in which *anything* occurs, e.g. as object or subject. The alternatives are a set of properties that are stronger than the most general property, **thing**. The way I have rendered this set, $\{P| P\sqsubset \mathbf{thing}\}$, i.e. the set of all such properties, is clearly too general, as it allows for very strange properties. I intend that P ranges only over standard properties. I am not in a position to define this notion, but one obvious requirement is that standard properties can be expressed in natural language. One important requirement for the set of alternatives is that it is exhaustive in the sense that all the alternatives together make up the foreground:

(10) Exhaustivity requirement: $\cup\{P| P\sqsubset \mathbf{thing}\} = \mathbf{thing}$

We can formulate rules for the semantic composition of meanings that ensure that the information about the foreground and its alternatives are projected to complex expressions, along the lines of Krifka (1992b), which I will not repeat here. These rules will give us BFA representations of the following kind:

(11) *Mary saw anything*:
$\langle \lambda Q\lambda i\exists y[Q_i(y) \wedge \mathbf{saw}_i(\mathbf{m},y)], \mathbf{thing}, \{P|P\sqsubset \mathbf{thing}\}\rangle$

(12) *Mary didn't see anything*:
$\langle \lambda Q\lambda i\neg\exists y[Q_i(y) \wedge \mathbf{saw}_i(\mathbf{m},y)], \mathbf{thing}, \{P|P\sqsubset \mathbf{thing}\}\rangle$

Notice that when we apply B to F we get a standard representation, for example $\lambda i\exists y[\mathbf{thing}_i(y) \wedge \mathbf{saw}_i(\mathbf{Mary},y)]$, the set of worlds i where Mary saw something, for (11).

One fact that will be crucial is that in both cases (11) and (12) we obtained a BFA structure that defines a proposition, B(F), and a set of alternative propositions, $\{p| \exists F'[F'\in A \wedge p=B(F')]\}$. And as we have a certain logical relationship between the foreground F and its alternatives F' (F being weaker than any alternative F'), we have a certain logical relationship between B(F) and its alternatives B(F'). In the case of (11) B(F) is weaker than any alternative proposition B(F'): The set of worlds where Mary saw something or other is a proper superset of every set of worlds where Mary saw something that is described in more specific terms. In the case of (12) B(F) is stronger than any alternative proposition, as the set of worlds where Mary didn't see anything is a proper subset of the set of worlds where Mary didn't see something that is described in more specific terms. Hence we can say that the logical relationship between F and its alternatives is "preserved" in the semantic compositions that lead to (11), but it is "reversed" in the semantic composition with negation that leads to (12). In both cases we may say that the BFA structure is "projected".

So much for the semantic part of the story. The question now is, why is (11) bad, but (12) good? I propose that the reason for this is to be found in pragmatics, in particular, in the felicity conditions for assertions.

3. The Pragmatics of Standard Assertion

Let us adopt the following, rather standard theory of assertions (cf. Stalnaker 1972): The participants of a conversation assume, for every stage of the conversation, a mutually known common ground c. For our purposes we can represent common grounds as sets of possible worlds. If one participant asserts proposition p, and the audience does not object, the current common ground c is restricted to $c \cap p$. We may assume certain felicity conditions, e.g. that $c \cap p \neq c$ (that is, p expresses something that is not yet established), and that $c \cap p \neq \varnothing$ (that is, p does not express something that is taken to be impossible). I will disregard these felicity conditions in what follows. We may stipulate an assertion operator **Assert** that, when applied to a proposition, takes an input common ground c to an output common ground $c \cap p$:

(13) **Assert**(p)(c) = $c \cap p$

What about the assertion of a sentence with a BFA structure? I propose that BFA assertions come with two general felicity conditions: (a) that the speaker has reasons not to assert the propositions that are based on one of the alternatives and would yield a different common ground as output, and (b) that there are such alternatives in the first place:

(14) **Assert**(⟨B,F,A⟩)(c) = $c \cap B(F)$, iff:
a) For all $F' \in A$ such that $c \cap B(F') \neq c \cap B(F)$:
the speaker has reasons not to assert B(F'),
that is, to propose $c \cap B(F')$ as the new common ground.
b) There are $F' \in A$ such that $c \cap B(F') \neq c \cap B(F)$.

If (a) and (b) are not met, the assertion is undefined. But in general the conditions will trigger accomodation of the common ground. Condition (a) states that the speaker has reasons for not asserting alternative propositions B(F'). There are various possible reasons -- the speaker may know that B(F') is false or lack sufficient evidence for it. One typical case has been described as scalar implicature (cf. Gazdar 1979, Levinson 1984). Example:

(15) *Mary earns $2000.*
Implicature: Mary doesn't earn more than $2000.

This implicature arises in the following way. Let us assume that *$2000* introduces a set A of all alternative amounts of money, e.g.

(16) A = {..., **\$1998**, **\$1999**, **\$2001**, **\$2002** ...}

Then the assertion of (15) can be analyzed as follows, using the previously defined assertion operator; from here on I will generally suppress condition (14.b) for simplicity.

(17) $\textbf{Assert}(\langle \lambda Q.\{i| \textbf{earn}_i(\textbf{m},Q)\}, \textbf{\$2000}, A\rangle)(c) = c\cap\{i| \textbf{earn}_i(\textbf{m},\textbf{\$2000})\}$
iff for all $F' \in A$ with $c\cap\{i| \textbf{earn}_i(\textbf{m},F')\} \neq c\cap\{i| \textbf{earn}_i(\textbf{m},\textbf{\$2000})\}$:
Speaker has reasons not to propose $c\cap\{i| \textbf{earn}_i(\textbf{m},F')\}$.

In the current example the proposition asserted and the alternative propositions stand in a relation of semantic strength to each other: *Mary earns \$2000* entails *Mary earns \$n*, for $n<2000$, and is entailed by *Mary earns \$m*, for $2000<m$. In such cases we can distinguish two systematic types of reasons the speaker has if he wants to be both truthful and informative: (i) If $[c\cap B(F)] \subset [c\cap B(F')]$, the reason is that $[c\cap B(F')]$ would be less informative. (ii) If $[c\cap B(F')] \subset [c\cap B(F)]$, the reason is that the speaker lacks sufficient evidence for proposing $[c\cap B(F')]$ as the new common ground. If the speaker does not indicate otherwise -- e.g. by *Mary earns at least \$2000*, or *Mary earns \$2000, and perhaps more* -- the reason is more specifically that the speaker knows that $[c\cap B(F')]$ is false, and the hearer is entitled to draw this inference.

Of course, (i) is (one part of) Grice's maxim of Quantity, and (ii) is Grice's maxim of Quality (cf. Grice 1975). Notice that Quantity reasons are related to weaker propositions, whereas Quality reasons are related to stronger propositions.

The configuration we find with scalar implicatures is an important subcase of the general assertion rule. This warrants the introduction of a special operator, **ScalAssert**. Its triggering condition is that the proposition actually asserted and the the alternative assertions are informationally ordered with respect to each other. And it conveys the implicature that all propositions that are semantically stronger than the proposition made are negated.

(18) $\textbf{Assert}(\langle B,F,A\rangle)(c) = \textbf{ScalAssert}(\langle B,F,A\rangle)(c)$,
if for all $F' \in A$: $[c\cap B(F')] \subseteq [c\cap B(F)]$ or $[c\cap B(F)] \subseteq [c\cap B(F')]$

(19) $\textbf{ScalAssert}(\langle B,F,A\rangle)(c) =$
$\{i \in c | i \in B(F) \wedge \neg\exists F' \in A[[c\cap B(F')] \subset [c\cap B(F)] \wedge i \in B(F')]\}$

Let us apply this view of assertion to our NPI examples. They clearly satisfy the condition for scalar implicatures. For the ungrammatical example (11) we get the following result:

(20) $\textbf{ScalAssert}(\langle \lambda Q \lambda i \exists y[Q_i(y) \wedge \textbf{saw}_i(m,y)], \textbf{thing}, \{P| P \sqsubset \textbf{thing}\}\rangle)(c)$
$= \{i \in c| \exists y[\textbf{thing}_i(y) \wedge \textbf{saw}_i(m,y)] \wedge$
$\neg\exists P \sqsubset \textbf{thing}[\{i \in c| \exists y[P_i(y) \wedge \textbf{saw}_i(m,y)]\} \subset \{i \in c| \exists y[\textbf{thing}_i(y) \wedge$
$\textbf{saw}_i(m,y)]\} \wedge \exists y[P_i(y) \wedge \textbf{saw}_i(m,y)]]]\}$

Notice that the first conjunct -- that Mary saw a **thing** -- and the second conjunct -- that there is no P, P⊏**thing**, such that Mary saw a P -- contradict each other for every common ground c. Whenever Mary saw some x that is a **thing**, x will fall at least under some property P that is defined more narrowly. Technically, every input common ground c will be reduced to the empty set. For the grammatical example (12) we get the following result:

(21) $\textbf{ScalAssert}(\langle \lambda Q \lambda i \exists y[Q_i(y) \wedge \textbf{saw}_i(m,y)], \textbf{thing}, \{P| P \sqsubset \textbf{thing}\}\rangle)(c)$
$= \{i \in c| \neg\exists y[\textbf{thing}_i(y) \wedge \textbf{saw}_i(m,y)] \wedge$
$\neg\exists P \sqsubset \textbf{thing}[\{i \in c| \neg\exists y[P_i(y) \wedge \textbf{saw}_i(m,y)]\} \subset$
$\{i \in c| \neg\exists y[\textbf{thing}_i(y) \wedge \textbf{saw}_i(m,y)]\} \wedge \neg\exists y[P_i(y) \wedge \textbf{saw}_i(m,y)]]]\}$

The first conjunct restricts the common ground c to those worlds i for which Mary didn't see a **thing**. The second conjunct is trivially satisfied here, as it holds for no P, P⊏**thing**, that the proposition that Mary didn't see a P is stronger than the proposition that Mary didn't see a **thing**. The difference between our two examples is that in (11) the proposition B(F) is at least as weak as any alternative proposition, whereas in (12) B(F) is at least as strong as any alternative.

It is important to realize the nature of this explanation for the distribution of NPIs. A sentence like (11) is not simply bad because it would express a very general meaning. There are sentences that do that without being ungrammatical, namely tautologies like *War is war*. Rather, (11) is bad because it expresses a sentence in which what is said systematically contradicts what is implicated. The assertion made by (11) says that Mary saw something, but the implicatures deny that Mary saw anything in particular. The explanation why (11) is bad may become clearer when we contrast it with the following sentence, which is good although it expresses the same proposition as (11):

(22) Mary saw something.
$\lambda i \exists y[\textbf{thing}_i(y) \wedge \textbf{saw}_i(m,y)]$

In contrast to *anything* in (11), *something* in (22) does not introduce any alternatives and hence does not induce any alternative-related implicatures. This is at odds with a common analysis that says that *something* is a positive polarity item, which should work like an NPI except for the nature of the scale. However, I contend that NPs based on *some* are not polarity items at all. The observation about the scope differences in cases like *Mary didn't see anyone* (¬∃) and *Mary didn't see someone* (∃¬) that have been adduced for the positive polarity status of *someone* should rather be explained as a paradigmatic effect induced by Grice's principle of ambiguity avoidance: In case a speaker wants to express the $\neg\exists$ reading the unambiguous form containing *anyone* is preferred. It might very well be that this paradigmatic effect is so strong that it is virtually grammaticalized.

4. Strong NPIs and Emphatic Assertions

In the preceding sections we have derived the basic facts about the distribution of the weak NPI *anything*. What about the distribution of strong NPIs? Let us take stressed *anything* or *anything at all* as an example. There is an important difference between the weak and the strong use of *anything*:

(23) Mary didn't get anything for her birthday.
(24) Mary didn't get ANYthing (at ALL) for her birthday.

(23) just says that Mary got nothing; (24) stresses the fact that Mary didn't even get some minor present for her birthday. This seems to be a fairly consistent property of stressed *anything* and other expressions based on *any*. Kadmon & Landman (1993), who generally investigate stressed *any*, give a wide variety of examples and argue that they involve widening of the extension of the noun meaning to include borderline cases.

To capture cases like (24) we have to assume a slightly different interpretation of *anything* that highlights the special role of borderline cases, and a special type of assertion that carries the implicature expressed by the word *even* in the paraphrase. I propose the following BFA structure for the meaning of strong *anything*:

(25) *ANYthing*: $\langle$B, **thing**, {P| P$\sqsubset$**thing** $\wedge$ $\neg$**min**(P)}$\rangle$

Here, **min** is a second-order property that identifies properties that are applicable to "minor" entities of a certain dimension (which is left unexpressed here). For example, in (24) the relevant dimension is the class of birthday presents; a Porsche would rank high in that dimension, whereas piece of chewing gum would rank low and probably be considered minor.

One important requirement for the BFA-structure in (25) is that the alternatives are non-exhaustive (cf. 26). This is because **thing** can be applied to minor objects to which no predicate P can be applied. I propose that non-exhaustivity is the distinguishing semantic property for strong NPIs.

(26) Non-exhaustivity requirement: $\cup$\{P| P$\sqsubset$**thing** $\wedge$ $\neg$**min**(P)\} $\subset$ **thing**

Let us come now to the type of assertion we found in (24). I claim that it is the same type of assertion that we find in the following examples:

(27) Mary knows every place on earth. She has (even) been to BORneo!

(28) People expected that John would win the election, followed by Bill, with Mary as a distant third. But then the election was won by MARY.

The function of emphatic focus is to indicate that the proposition that is actually asserted is *prima facie* a particularly unlikely one with respect to the alternatives. This meaning component can be made explicit with particles like *even*. Emphatic assertions are related to what Fauconnier (1975) called "quantificational superlatives". Assuming that Albert Schweitzer is a prototypical example of a trustworthy person, (29) expresses that John would distrust everyone.

(29) John would distrust Albert SCHWEITzer!

We may assume that emphatic assertion is due to a particular illocutionary operator, **EmphAssert**, which is related to strong stress and can be defined as follows, where $p <_c q$ expresses that within the common ground c the proposition p is less probable than the proposition q.

(30) **EmphAssert**($\langle B,F,A\rangle$)(c) = $c \cap B(F)$, iff
a) For all $F' \in A$: $c \cap B(F) <_c c \cap B(F')$
b) $c \cap B(F) <_c \cap\{c \cap B(F') | F' \in A\}$

Felicity condition (a) says that the assertion actually made, $c \cap B(F)$, is less likely in c than any alternative assertion $c \cap B(F')$. In our example (29) it is less likely that John would distrust Albert Schweitzer than that he would distrust any other person. Condition (b) says that the assertion actually made is less likely in c than the conjunction of all the alternative assertions. For our example, the common ground c must support the possibility that John would distrust all other persons but still he wouldn't distrust Albert Schweitzer. Only then the proposition that John would distrust Albert Schweitzer is a truly exceptional and unlikely one. Notice that the two conditions (30.a) and (b) are logically independent of each other. In particular, (a) does not entail (b), as the common ground c could contain the information that although Albert Schweitzer is the most trustworthy person, if someone distrusts every other person, then he distrusts Albert Schweitzer as well, and hence the left-hand side and the right-hand side of (b) would be equally likely. And (b) does not entail (a), as it might be that it is less probable that John distrusts Albert Schweitzer than that John distrusts all other persons together, but still there is one person (say, Mother Teresa) such that the propositions that John distrusts Albert Schweitzer and the proposition that John distrusts Mother Teresa are equally unlikely. Only (a) and (b) together guarantee the extreme status of B(F) with respect to the B(F').

Now, a probability relation like $<_c$ is related to semantic strength in the following way: If p and q are comparable in their strength (i.e. we have either $p \subseteq q$ or $q \subseteq p$), and furthermore $p <_c q$, then also $p \subset q$. That is, if p is less likely than q in c, then c allows for q-worlds that are not p-worlds, but not vice versa. Hence (30) amounts to the following condition for BFA-structures when the proposition expressed and its alternatives are related by semantic strength:

(31) If for all $F' \in A$: $c \cap B(F') \subseteq c \cap B(F)$ or $c \cap B(F) \subseteq c \cap B(F')$:
EmphAssert($\langle B,F,A \rangle$)(c) = $c \cap B(F)$ iff
a) For all $F' \in A$: $c \cap B(F) \subset c \cap B(F')$
b) $c \cap B(F) \subset \cap\{c \cap B(F') | F' \in A\}$

The felicity condition (a) says that the proposition actually asserted, $c \cap B(F)$, must be stronger than every alternative proposition $c \cap B(F')$. And condition (b) says that that proposition must be stronger than the conjunction of all the alternative propositions.

If the alternatives are generated by a NPI the proposition expressed and its alternatives are indeed related by semantic strength, and hence emphatic assertion amounts to (31). It turns out that a sentence like (32.a) is indeed a good emphatic assertion, in contrast to sentences like (32.b).

(32) a. Mary didn't get ANYthing.
b. *Mary got ANYthing.

Sentence (32.a) will yield the following BFA-structure:

(32')a. $\langle \lambda Q \lambda i \neg \exists y[Q_i(y) \wedge \mathbf{get}_i(\mathbf{m},y)], \mathbf{thing}, \{P | P \sqsubset \mathbf{thing} \wedge \neg \mathbf{min}(P)\} \rangle$

Applying **EmphAssert** will get us a good result for common grounds c if the following conditions are satisfied: (a) For all $P \sqsubset \mathbf{thing}$ with $\neg\mathbf{min}(P)$ it holds that $\{i \in c | \neg \exists y[\mathbf{thing}_i(y) \wedge \mathbf{get}_i(\mathbf{m},y)]\} \subset \{i \in c | \neg \exists y[P_i(y) \wedge \mathbf{get}_i(\mathbf{m},y)]\}$, that is, the proposition that Mary didn't get a **thing** is not only as strong as, but stronger than any proposition that Mary didn't get some non-minor P, $P \subset \mathbf{thing}$. (b) It holds that $\{i \in c | \neg \exists y[\mathbf{thing}_i(y) \wedge \mathbf{get}_i(\mathbf{m},y)]\} \subset \cap\{\{i \in c | \neg \exists y[P_i(y) \wedge \mathbf{get}_i(\mathbf{m},y)]\} | P \sqsubset \mathbf{thing} \wedge \neg \mathbf{min}(P)\}$, that is, the proposition that Mary didn't get a **thing** is stronger than the conjunction of the propositions that Mary didn't get some non-minor P, $P \subset \mathbf{thing}$. Conditions (a) and (b) are satisfied for common grounds c that contain the information that it is *prima facie* less likely that Mary didn't get something including minor things than that Mary didn't get something excluding minor things. In other words, c must support the expectation that Mary got at least something minor, if not more. This is indeed the case for all common grounds in which a sentence like (32.a) is felicitous.

Sentence (32.b), on the other hand, will obviously lead to conditions that cannot be satisfied when emphatically asserted. In particular, condition (a) would amount to the requirement that for all $P \sqsubset \mathbf{thing}$, $\neg\mathbf{min}(P)$ it holds that $\{i \in c | \exists y[\mathbf{thing}_i(y) \wedge \mathbf{get}_i(\mathbf{m},y)]\} \subset \{i \in c | \exists y[P_i(y) \wedge \mathbf{get}_i(\mathbf{m},y)]\}$, the proposition that Mary got a **thing** is stronger than the proposition that Mary got a P, where $P \sqsubset \mathbf{thing}$. This is a contradiction.

5. The Distribution of Weak and Strong NPIs Compared

One important question at this point is whether the semantics and pragmatics of assertions with weak and strong NPIs developed above captures the facts about their respective distribution, as discussed by Zwarts (1993).

Let me first point out some differences between the theory proposed here and the one of Zwarts. A difference of minor importance, due to my attempt to simplify matters, is that where Zwarts effectively formulates conditions for all alternatives of an NPI, I restrict myself to conditions that just affect the NPI itself in its relation to the alternatives. A more relevant point is that in assuming an intensional representation, I have sets of worlds where Zwarts just has less articulate truth values. Also, where Zwarts assumes that the semantic relations that characterize the distribution of polarity items hold in general, I assume that they may hold just for suitable common grounds, and hence that NPIs may select or accomodate their common grounds. Another important distinction is that anti-additivity is replaced by emphatic assertion as the crucial property for strong NPI contexts. In the current theory the algebraic property that is required by emphatic assertion is "strict decrease": If $X \subset Y$, then $f(Y) \sqsubset f(X)$. The conditions of anti-additivity and strict decrease are not directly comparable; one is not a logical consequence of the other. But remember that anti-additivity is problematic, as shown in section (1) with quantifiers like *either zero or more than zero students*; strict decrease doesn't run into this problem.

Of course, I will have to show that Zwarts' central observation is captured, namely that strong NPIs in emphatic assertions are problematic in the scope of determiners like *less than three girls*, but fine in the scope of determiners like *no girl*. Let us first discuss the following contrast:

(33) a. Less than three children got anything.
b. *Less than three children got ANYthing (at ALL).

In the present account, (33.a) is a standard (scalar) assertion with a weak NPI *anything*, whereas (33.b) is an emphatic assertion with a strong NPI *ANYthing at ALL*. The theory developed so far predicts that (a) is good and (b) is bad. As for (33.a) we get the following representation according to (33):

(33')a.
$$\begin{aligned}
&\mathbf{ScalAssert}(\langle \lambda Q \lambda i[\#\{x|\ \exists y[\mathbf{child}_i(x) \wedge Q_i(y) \wedge \mathbf{got}_i(x,y)]\}<3], \\
&\quad \mathbf{thing},\ \{P|\ P \sqsubset \mathbf{thing}\}\rangle(c) \\
&= \{i \in c|\ \#\{x|\ \exists y[\mathbf{child}_i(x) \wedge \mathbf{thing}_i(y) \wedge \mathbf{got}_i(x,y)]\}<3 \wedge \\
&\quad \neg\exists P \sqsubset \mathbf{thing}[\{i \in c|\ \#\{x|\ \exists y[\mathbf{child}_i(x) \wedge P_i(y) \wedge \mathbf{got}_i(x,y)]\}<3\} \subset \\
&\qquad \{i \in c|\ \#\{x|\ \exists y[\mathbf{child}_i(x) \wedge \mathbf{thing}_i(y) \wedge \mathbf{got}_i(x,y)]\}<3\} \\
&\qquad\quad \wedge (...)]\}
\end{aligned}$$

This assertion is felicitous with respect to many comon grounds c. The first conjunct reduces c to those worlds i in which less than three children got a

thing. The second conjunct is trivially satisfied, as there is no P such that the set of worlds in which less than three children got a P is a proper subset of the set of worlds in which less than three children got a **thing**, P being a proper subset of **thing**. -- As for (33.b) we arrive at the following representation, according to (31):

(33')b. $\mathbf{EmphAssert}(\langle\langle\lambda Q\lambda i[\#\{x|\ \exists y[\mathbf{child}_i(x) \wedge Q_i(y) \wedge \mathbf{got}_i(x,y)]\}<3],$
$\mathbf{thing},\ \{P|\ P\sqsubset\mathbf{thing} \wedge \neg\mathbf{min}(P)\}\rangle\rangle(c)$
$= \{i\in c|\ \#\{x|\ \exists y[\mathbf{child}_i(x) \wedge \mathbf{thing}_i(y) \wedge \mathbf{got}_i(x,y)]\}<3\}$, provided that
a) $\forall P\sqsubset\mathbf{thing},\neg\mathbf{min}(P)$: $\{i\in c|\#\{x|\exists y[\mathbf{child}_i(x) \wedge \mathbf{thing}_i(y) \wedge \mathbf{got}_i(x,y)]\}<3\}$
$\subset \{i\in c|\ \#\{x|\ \exists y[\mathbf{child}_i(x) \wedge P_i(y) \wedge \mathbf{got}_i(x,y)]\}<3\}$
b) (...)

It turns out that condition (a) is violated in this case. To see this, we have to distinguish between three cases:

(i) Assume first that in the worlds i in c, either no child got anything, or three or more children got something non-minor. In this case we would have equality between the two sets compared in (a). Hence such a common ground c can be excluded. Informally, one would not utter (33.b) if it were already established that either no child got anything or three or more children got something.

(ii) Assume now that the condition in (i) does not apply, i.e., there are worlds i in which only one child or two children got something, but all that the children got in i is something minor. For all such i it will also hold that less than three children (as a matter of fact, no child) got something that falls under an alternative non-minor property P. Again, we would end up with equality, and such a common ground c would be disallowed.

(iii) Assume now that conditions (i) and (ii) do not apply, i.e, there are worlds i in which one child or two children got something that is non-minor, but it is not the case that three or more children got something. This is clearly the most natural case. We then can construct a set that contains exactly what the children that got something non-minor in i got in i. Call this set G_i. We can do this for every world i, and we can construct a property G that maps every world i to G_i. Clearly we have $G\sqsubset\mathbf{thing}$ in all natural models, as there will be objects that no child got in some i. Furthermore G is non-minor, according to our assumption. Also G can be expressed in natural language, e.g. by the phrase *what the children got*, or perhaps *what the children got that is worth talking about* (to exlude the "minor" gifts). But note that we have, due to the construction of G, $\{i\in c|\ \#\{x|\exists y[\mathbf{child}_i(x) \wedge \mathbf{thing}_i(y) \wedge \mathbf{got}_i(x,y)]\}<3\} = \{i\in c|\ \#\{x|\ \exists y[\mathbf{child}_i(x) \wedge G_i(y) \wedge \mathbf{got}_i(x,y)]\}<3\}$. What this means is that the assertion based on **thing** is not stronger than the assertion based on G. Informally, *Less than three children got anything* and *Less than three children got what they got* will give us the same proposition. Hence a felicity condition of emphatic assertion is violated: There are alternative propositions that are as strong as the proposition that is asserted.

Together, (i), (ii) and (iii) show that there are no common grounds c that could satisfy the felicity condition of emphatic assertions (33'.b), and hence (33.b) is bad. Let us contrast (33.b) with an example that involves an anti-additive quantifier, *no child*, and which is good (34). The corresponding felicity condition for this case is given in (35).

(34) No child got ANYthing at ALL.

(35) $\forall P \sqsubset \mathbf{thing}, \neg\mathbf{min}(P)$: $\{i \in c | \#\{x | \exists y[\mathbf{child}_i(x) \wedge \mathbf{thing}_i(y) \wedge \mathbf{got}_i(x,y)]\}=0\}$
$\subset \{i \in c | \#\{x | \exists y[\mathbf{child}_i(x) \wedge P_i(y) \wedge \mathbf{got}_i(x,y)]\}=0\}$

There are natural common grounds c that satisfy this condition. In particular, we cannot construct a natural property like G in the previous case, as it is explicitly denied, for every world i, that there are children that got something in i. To see this, we may try to construct such a property as follows: Let H_i be the set of (non-minor) entities that no child got in i, and let H be the function that maps every world i to H_i. If the common ground c contains at least some worlds in which some children got something, then we have $H \sqsubset \mathbf{thing}$, but $\{i \in c | \#\{x | \exists y[\mathbf{child}_i(x) \wedge \mathbf{thing}_i(y) \wedge \mathbf{got}_i(x,y)]\}=0\} = \{i \in c | \#\{x | \exists y[\mathbf{child}_i(x) \wedge H_i(y) \wedge \mathbf{got}_i(x,y)]\}=0\}$. But notice that H is a rather curious property that should be excluded as an alternative to **thing**. For one thing, H is defined negatively, which should be possible only with respect to a fixed domain of discourse; a phrase like *what the children didn't get* is well-formed only if the context provides a definite set of things. Furthermore, notice that it holds for all worlds i in the resulting common ground that $H_i = \mathbf{thing}_i$, as for every such i the things no child got is the set of all things. Hence, with respect to the resulting common ground, H should not count as a proper alternative to **thing**. We can discard H as an alternative by explicitly requiring that emphatic assertions, or perhaps assertions in general, are felicitous only under the following condition:

(36) **EmphAssert**($\langle$B,F,A$\rangle$)(c) is felicitous only if
there is no $F' \in A$ with $\{F_i | i \in c\} = \{F'_i | i \in c\}$

That is, emphatic assertion requires that the extension of the foreground does not collapse with the extension of any alternative. In other words, the foreground must remain an extreme semantic entity.

Another structural difference between Zwarts' theory and the one developed here is that Zwarts just gave a semantic characterization of the contexts that host weak vs. strong NPIs, whereas I tried to give in addition a semantic characterization of weak and strong NPIs themselves, in terms of exhaustivity. According to Zwarts' observations we should then expect that exhaustive NPIs cannot occur in emphatic assertions, and that non-exhaustive NPIs cannot occur in standard assertions.

As for the first of these claims, notice that if we have an exhaustive NPI with meaning F and set of alternatives A, where $F = \cup A$, then it follows for any common ground c and downward-entailing background B that $c \cap B(F) = \{c \cap B(F') | F' \in A\}$, and this violates felicity condition (31.b) for emphatic assertions. This can be illustrated with the following example:

(37) John didn't eat anything.

Assume that *anything* is exhaustive. For specificity, assume that selectional restrictions require that the foreground is the property **edible.thing**, and assume two alternatives **meat** and **vegetable** such that **edible.thing** = **meat** $\cup$ **vegetable**. Then clearly the proposition that John didn't eat an **edible.thing** is equal to the proposition that John didn't eat **meat** and John didn't eat **vegetable**, for every common ground. Hence, if (37) is an emphatic assertion, condition (31.b) would be violated. If it is just a standard assertion, (37) is of course fine.

What about strong, non-exhaustive NPIs in standard assertions? The facts are perhaps subtle, but observe that NPIs like *anything at all*, or perhaps clearer *lift a finger*, lead to problematic results if they are not emphatically stressed. The theory developed so far does not predict this, as the requirements for standard assertions are so weak that non-exhaustive NPIs clearly satisfy them. In particular, if we have an exhaustive NPI with meaning F and alternatives A then it will hold for all common grounds and downward-entailing backgrounds B that for all $F' \in A$, $c \cap B(F) \subseteq c \cap B(F')$.

I would like to suggest that non-exhaustive NPIs in standard assertions are disfavored because one crucial property of non-exhaustive NPIs, namely that their foreground is a truly extreme element with respect to the alternatives, does not get exploited in standard assertions. Standard assertions of a BFA structure $\langle B,F,A \rangle$ allow for alternatives F' such that $c \cap B(F) = c \cap B(F')$. That is, they allow that the foreground proposition and certain alternative propositions collapse into one. This should be disallowed for non-exhaustive NPIs; the foreground of non-exhaustive NPIs should always play a unique role. We may assume that the motivation for that phenomenon is pragmatic: If a speaker introduces "extreme" polarity items then he must make appropriate use of this feature. However, it is unclear to me how to enforce this for non-exhaustive NPIs short of stipulating a general requirement for semantic compositions that they preserve the unique role of the foreground.

6. Idiomatic Polarity Items that Denote Small or Large Entities

In the previous sections we have discussed the general outline of the proposed theory with one particular example, *anything*. In this section I will discuss one very characteristic type of polarity items, namely expressions that denote small entities of a certain sort.

(38) a. John didn't drink a drop (of alcohol) for two days.
b. Mary didn't utter {a word / a syllable}.
c. John doesn't have a red cent.

Take *a drop* as an example. In its NPI use it applies to minimal liquid quantities, that is, to semantic atoms, and its alternative predicates apply to bigger liquid quantities. We can make this more precise as follows. Assume that $\sqsubset$ expresses the proper part relation; $x \sqsubset_i y$ says that x is a proper part of y at index i.

(39) *a drop*: $\langle \lambda Q.Q, \mathbf{drop}, \mathbf{drop}^A \rangle$, where
$\mathbf{drop} = \lambda i.\{x | \mathbf{liquid}_i(x) \wedge \neg\exists y[y \sqsubset_i x]\}$, and
$\mathbf{drop}^A$ is a set that satisfies the following requirements:
1. $\forall i \forall x[\mathbf{liquid}_i(x) \rightarrow \exists P[P \in \mathbf{drop}^A \wedge P_i(x)]]$
2. $\forall i \forall P \forall x[P \in \mathbf{drop}^A \wedge P_i(x) \rightarrow \mathbf{liquid}_i(x)]$
3. $\forall i \forall P \forall P'[P \in \mathbf{drop}^A \wedge P' \in \mathbf{drop}^A \wedge P \neq P' \rightarrow \neg\exists x[P_i(x) \wedge P'_i(x)]]$

In prose, **drop** is a property that refers to all minimal quantities of liquid, that is, to all quantities of liquid x that do not contain proper parts. The set of alternatives, $\mathbf{drop}^A$, is such that (1) for each index i, if x is a quantity of liquid, then there is some property P that applies to x, (2) for each index i and property P, P applies only to quantities of liquid, and (3) the properties P are disjoint. Conditions (1)-(3) are necessary requirements that may be refined, for example by requiring that each alternative property applies to quantities of liquid of a certain size. I am aware that conditions (1)-(3) do not define a unique $\mathbf{drop}^A$, but I will not be more specific here as any set of properties that satisfies them will do for our purposes.

Other NPIs of this type can be analyzed in a similar fashion. For example, *a word* is based on minimal utterances, *a red cent* is based on minimal amounts of money, *lift a finger* is based on minimal amounts of labor, and *bat an eye* is based on mimimal reactions to threatening events. It is obvious that these expressions have to be understood in their non-literal meaning: They are idiomatic expressions that denote bottom elements of certain ontological sorts.

Now, observe that NPIs like *a drop* and their ilk are not directly based on informativity under the reconstruction given above. However, they lead to alternative assertions based on informativity under a certain plausible assumption (cf. also Fauconnier 1980). It is perhaps best to discuss this using an example:

(40) a. *Mary drank a drop.
$\langle \lambda Q.\{i | \exists y[Q_i(y) \wedge \mathbf{drank}_i(\mathbf{m},y)]\}, \mathbf{drop}, \mathbf{drop}^A \rangle$

b. Mary didn't drink a drop.
$\langle \lambda Q.\{i | \neg\exists y[Q_i(y) \wedge \mathbf{drank}_i(\mathbf{m},y)]\}, \mathbf{drop}, \mathbf{drop}^A \rangle$

We want to derive that (40.a) is bad as an assertion, whereas (40.b) is good. We can do so under the plausible assumption that if someone drinks something, he drinks every part of it. Let us call this principle, in general, "involvement of parts" (41). A corollary to this principle is (42): If someone drinks some quantity of liquid, he also drinks minimal quantities, as every quantity of liquid will contain minimal quantities.

(41) $\forall i \forall x \forall y \forall z[\mathbf{drink}_i(x,y) \wedge z \sqsubset_i y \rightarrow \mathbf{drink}_i(x,z)]$

(42) $\forall i \forall x \forall y[\mathbf{drink}_i(x,y) \wedge \mathbf{liquid}_i(y) \rightarrow \exists z[\mathbf{drop}_i(z) \wedge \mathbf{drink}_i(x,z)]]$

A second principle is that the predicate **drop** applies to liquid quantities of an idealized small size. We can capture this by requiring of natural common grounds c that the proposition that someone drank just a minimal quantity of liquid should always be less probable than that someone drank a more substantial quantitiy of liquid. Let us call this the "principle of extremity":

(43) For all natural common grounds c:
$\{i \mid \forall x \forall y[\mathbf{drink}_i(x,y) \wedge \mathbf{drop}_i(y) \wedge \neg \exists z[y \sqsubset_i z \wedge \mathbf{drink}(x,z)]]\} <_c$
$\{i \mid \forall x \forall y[\mathbf{drink}_i(x,y) \wedge \mathbf{drop}_i(y) \wedge \exists z[y \sqsubset_i z \wedge \mathbf{drink}(x,z)]]\}$

Let us come back to examples (40.a,b) in the light of these principles. First note that the NPIs in question are all strong; they bear heavy stress and can easily be combined with *even*. Hence we should assume emphatic assertion. In (40.a), the proposition asserted with respect to the input common ground c, $\{i \in c \mid \exists y[\mathbf{drop}_i(y) \wedge \mathbf{drank}_i(\mathbf{m},y)]\}$, is at most as strong as any alternative assertion $\{i \in c \mid \exists y[P_i(y) \wedge \mathbf{drank}_i(\mathbf{m},y)]\}$, $P \in \mathbf{drop}^A$, according to involvement of parts (41), and in fact weaker if c is a natural common ground according to extremity (43). This directly contradicts condition (31.a). In (40.b), the proposition asserted, $\{i \in c \mid \neg \exists y[\mathbf{drop}_i(y) \wedge \mathbf{drank}_i(\mathbf{m},y)]\}$, is truly stronger than any alternative assertion $\{i \in c \mid \neg \exists y[P_i(y) \wedge \mathbf{drank}_i(\mathbf{m},y)]\}$, $P \in \mathbf{drop}^A$ for every natural common ground c due to extremity, which abides by condition (31.a).

The principle of extremity has an interesting consequence. Without it it should be possible to use a sentence like *Mary drank a drop* to express that Mary drank only a minimal amount. This may even be possible in hyperbolic figures of speech. The principle of extremity, however, excludes that, as it would hold in the output common ground that the probability that Mary just drank a drop is 1, whereas the probability that Mary drank more than a drop is 0.

Other NPIs of this type, like *lift a finger* or *a red cent*, can be explained in a similar way. Interestingly, there are a few NPIs that are based on predicates that denote "large" entities:

(44) a. Wild horses couldn't drag me in there.
b. We will not know the truth {in weeks / in a million years}.

The basic reasoning is quite similar to the former case. For example, *in weeks* and *in a million years* refers to a time that is maximally distant in the future with respect to a given context. We assume a general default rule that, if a person knows something at a time t, then he knows it at any time t' later than t. Then the claim that we will not know it at time that is maximally distant in the future is stronger than the claim that we will not know it to some other time. In addition we have the extremity principle, which says here that it is less likely that we will know the truth only at the most distant future time, than that we know the truth already at some earlier time. This is the setting that results in good emphatic assertions.

It should be immediately obvious that NPIs based on small or large entities are not exhaustive, and hence strong. Take the case *a drop*; if **drop** applies just to minimal liquid quantities and all the alternatives in $\mathbf{drop}^A$ apply to bigger liquid quantities, then we have $\mathbf{drop} \neq \cap\mathbf{drop}$, and even $\mathbf{drop} \cap \cup\mathbf{drop}^A = \varnothing$. And when we take larger expressions that contain *a drop*, like *drink a drop*, then we find due to involvement of parts and extremity that for every natural context c, $\lambda i{\in}c\lambda x\exists y[\mathbf{drop}_i \wedge \mathbf{drink}_i(x,y)] \subset \cup\{\lambda i{\in}c\lambda x\exists y[P_i \wedge \mathbf{drink}_i(x,y)] | P{\in}\mathbf{drop}^A\}$, as those worlds in which someone just drank a drop are considered most unlikely.

The theory developed above can be applied to positive polarity items (PPIs), as in the following case:

(45) a. John has TONS of money.
b. *John doesn't have tons of money.
[o.k. as a denial of (a) or with contrastive focus on *tons*]

The expression *tons of* forms PPIs. For example, *tons of money* applies to maximal amounts of money, i.e. amounts of money that are higher than some very high threshold value, and its alternatives are properties that apply to smaller amounts of money. We can assume involvement of parts: If John owns x, John also owns the parts of x. Furthermore, we can assume extremity: For every natural context c it is more likely that someone has a less than maximal amount of money, than a maximal amount of money. Then the proposition that John owns a maximal amount of money is stronger than any proposition that John owns some other amount. According to the by now familiar scheme, this makes (45.a) a good assertion. On the other hand, the proposition that John doesn't own a maximal amount of money is weaker than the proposition that John doesn't own some other amount, and hence (45.b) is a bad assertion.

7. The Locus of Exploitation of Polarity Items

Under the semantico-pragmatic account of polarity items we would expect that polarity items under more than one licensing operator show a flip-flop behavior. This is indeed attested. Baker (1970) pointed it out for PPIs with examples of the following kind:

(46) a. I would rather be in Montpellier.
b. ??I wouldn't rather be in Montpellier.
c. There isn't anyone in the camp who wouldn't rather be in Montpellier.

Sentence (46.b) is acceptable only if the concept of "would rather be in Montpellier" has been mentioned before; typically, either *I* or *wouldn't* are stressed in these cases. -- Schmerling (1971) showed that we find a similar "flip-flop" behavior with NPIs:

(47) a. *There was someone who did a thing to help.
b. There was no one who did a thing to help.
c. *There was no one who didn't do a thing to help.

These grammaticality judgements can be immediately explanined from the semantics of licensers. As with the complement law in standard Boolean interpretation, which states the equivalence of $\neg\neg\Phi$ and Φ, we can derive that application of two DE operators creates an upward entailing context.

However, there are cases where an NPI occurs in the scope of two licensing operators, which seems to be a true paradox for any semantic theory of polarity items. Hoeksema (1986) discusses cases of NPIs in the protasis of conditionals like (48), and Dowty (1994) presents cases of NPIs in the scope of downward-entailing adverbial quantifiers (cf. 49):

(48) a. If he knows anything about logic, he will know Modus Ponens.
b. If he doesn't know anything about logic, he will not know M.P.

(49) a. She very rarely eats anything at all for lunch.
b. She very rarely doesn't eat anything at all for lunch.

Ladusaw (1979) was aware of these facts: The implementation of his theory requires that an NPI be licensed by one downward-entailing operator; once licensed, it will stay licensed. Dowty (1994) suggests a distinction between semantic licensing based on downward-entailingness, and syntactic licensing that suppresses the flip-flop behavior of semantic licensing. But the solutions that have been presented for doubly-licensed NPIs are problematic for the semantico-pragmatic account of polarity items as they work with various principles that are extraneous to the idea that polarity items are used to express relatively "strong" propositions.

The phenomenon of doubly-licensed polarity items can be explained within the theory developed here if we allow for a more flexible way how the semantic contribution of polarity items is pragmatically exploited. Independent evidence for flexible exploitation comes from cases like the following one:

(50) The student who had not read anything gave improvised answers.

According to the theory developed so far, (50) would be analyzed as follows: The NPI *anything* introduces alternatives in the usual way. These alternatives are projected in semantic compositions, and the negation in the relative clause reverses the specificity ordering. The assertion operator then makes use of the resulting alternatives:

(50') $\mathbf{Assert}(\langle \lambda Q \lambda i.\mathbf{gave.improvised.answers}_i(\iota x[\mathbf{student}_i(x) \wedge \neg\exists y[\mathbf{read}_i(x,y) \wedge Q_i(y)]]), \mathbf{thing}, \{P | P \sqsubset \mathbf{thing}\}\rangle$

But notice that the definite NP does not project the semantic specificity relation between the foreground **thing** and its alternatives. For example, if John is the student who had not read anything, then replacing **thing** by some alternative P, $P \sqsubset \mathbf{thing}$ will either give us the same proposition, or it will result in a presupposition failure (if there is another student who did read something but not P). Hence (50') cannot be an adequate representation of (50).

Obviously the NPI in (50) is licensed locally in its clause. Assuming that the alternatives introduced by polarity items are always exploited by illocutionary operators we have to assume that such operators can occur in embedded clauses:

(50") **Assert**[The student [(**Scal**)**Assert** [who had not read anything]] gave improvised answers]

It is the downstairs (**Scal**)**Assert** operator that makes use of the alternatives introduced by the NPI. In doing so this operator will neutralize these alternatives, making them unavailable for the upstairs **Assert** operator.

In order to implement this idea we would have to develop a framework in which illocutionary operators are part of the semantic recursion. This could be done within a dynamic framework in which semantic representations are functions from input information states to output states. For reasons of space, I will not do this here; see Krifka (in prep.) for a version.

The cases of doubly-licensed polarity items can be explained in a similar way. Our examples (48) and (49) get analyses along the following lines:

(48')a. **ScalAssert**[If he knows anything about logic, he will know MP]
b. **Assert**[if **ScalAssert**[he doesn't know anything about logic] he will not know MP]

(49')a. **ScalAssert**[few s (s is a lunch-situation)(Mary eats anything at s)]
b. **Assert**[few s (s is a lunch-situation) (**ScalAssert**[Mary doesn't eat anything at s])]

Notice that in each case the NPI is licensed: In (48'.a) and (49'.a) it is licensed globally through the semantics of the main operator (the protasis of conditional sentence and the nuclear scope of the adverbial quantifier *rarely*, which corresponds to *few*), and in (48'.b) and (49'.b) it is licenensed locally in its clause.

One obvious question at this point is: Where can polarity items be exploited? I suggest that they can always be exploited at the level of the clause. In the case of (48.b) the polarity item is exploited at the level of the protasis of a conditional, which is a syntactic clause. In the case of (49.b) it is exploited at the level of the nuclear scope of an adverbial quantifier, which is clause-like for semantic reasons (cf. e.g. Heim 1982). This predicts that examples like (46.b) and (47.c) should be grammatical as well, as the polarity items may be licensed locally. In seems to me that the grammaticality judgements for these sentences given in the literature are indeed questionable. They may be due to the fact that sentences (a), (b) and (c) are presented one after another and a certain interpretation -- the one with a single, wide-scope illocutionary operator -- is kept constant for every sentence.

Another, related question is: What forces the assumption of operators that make use of alternatives? I think that the general principle is that a sentence must end up as being pragmatically well-formed. Consider the following cases:

(51) a. **ScalAssert**[Mary rarely eats anything for lunch]
b. **Assert**[Mary rarely **ScalAssert**[doesn't eat anything] for lunch]
c. ***ScalAssert**[Mary rarely doesn't eat anything for lunch]
d. ***ScalAssert**[Mary rarely **ScalAssert**[doesn't eat anything] for lunch]]

As we have seen, (51.a,b) are pragmatically well-formed. (51.c) is bad because there is no information state that would satisfy the requirements of **ScalAssert**. And (51.d) is bad as the NPI alternatives, so to speak, are already "used up" by the first **ScalAssert** operator.

There is one important relation between the locus of exploitation of alternatives and accent marking. Following Jacobs (1991), we can assume that the focus that is associated with the highest focus-sensitive operator, that is, the illocutionary operator over the sentence, is marked by the main stress in the sentence. Assuming that the NPI is in focus, which is regularly the case with emphatic assertions, we would assume that the NPI can have the main stress in (86.a), but not in (86.b). This is indeed the case:

(51')a. Mary rarely eats ANYthing for lunch.
b. *Mary rarely doesn't eat ANYthing for lunch.

8. Locality Restrictions

One type of phenomenon that has been discussed as showing that polarity items are licensed syntactically are the various locality restrictions that have been observed, especially by Linebarger. In this section I will show that a semantic treatment of locality phenomena seems feasible as well.

Certain cases that have been described as showing syntactic island effects for NPIs can be traced back to the failure of certain semantic constructions to project BFA structures properly. Take for example the contrast between the following sentences which shows that definite NPs, but not indefinite (non-specific) NPs impose restrictions for licensing of NPIs:

(52) a. Mary never goes out with men who have any problems.
b. *Mary never goes out with the man who has any problems.

This contrast can be explained by the current theory because the definite NP in (52.b) does not project the BFA-structure introduced by the NPI, whereas the nonspecific NP in (a) does. For (b) we would get the following BFA-structure:

(52')a. $\langle \lambda Q \lambda i \neg[\mathbf{go.out.with}_i(\mathbf{m}, \iota x \exists y[\mathbf{man}_i(x) \wedge Q_i(y) \wedge \mathbf{have}_i(x,y)])],$
$\mathbf{problem}, \{P | P \subset \mathbf{problem}\}\rangle$

In order for the definite NP to refer there must be a unique man that has problems. But notice that strengthening **problem** to some P, P⊂**problem**, would either pick out the same man, if that man has problem P, or lead to a non-referring description, if he does not have problem P (cf. our discussion of example 50). Hence no alternative P can ever lead to a stronger proposition. This is different in (52.b):

(52')a. $\langle \lambda Q \lambda i \neg \exists x \exists y[\mathbf{go.out.with}_i(\mathbf{m},x) \wedge \mathbf{man}_i(x) \wedge Q_i(y) \wedge \mathbf{have}_i(x,y)],$
$\mathbf{problem}, \{P | P \subset \mathbf{problem}\}\rangle$

Note that in this case choosing stronger alternatives may lead to a stronger overall proposition; for example, the set of worlds in which Mary doesn't go out with men with a specific problem Q may be a subset of the set of worlds in which Mary doesn't go out with men with some problem or other.

Another contrast that seems to call for a syntactic account is illustrated with the following pair of examples that illustrates the difference between so-called bridge verbs and non-bridge verbs:

(53) a. Mary didn't think that John had any problems.
b. ??Mary didn't shout that John had any problems.

This contrast can be explained by assuming that non-bridge verbs like *shout* are essentially quotational in their basic use and hence embed a structure that contains an illocutionary operator. If the embedded structure contains an NPI that is still unexploited, this illocutinary operator must be **ScalAssert**. Hence the cases (53.a,b) are analyzed as follows:

(53')a. ScalAssert[Mary didn't think that John had any problems]
   b. Assert[Mary didn't shout that ScalAssert[John had any problems]]

We can derive that (53.b) is bad as follows: The non-bridge verb *shout*, being quotational, enforces the presence of some illocutionary operator on the embedded sentence. In (53.b), this operator is applied to a BFA structure induced by a polarity item, hence it must be ScalAssert, but the pragmatic requirements for ScalAssert are evidently not satisfied.

9. Conclusion

Let us come to a conclusion. In this article I have tried to show that we can arrive at an explanatory theory of the distribution of polarity items within a framework that claims (a) that polarity items introduce alternatives that lead to an informativity relation with respect to the meanings of the polarity items themselves and their alternatives at the common ground at which they are evaluated; and (b) that illocutionary operators make crucial use of this information. Polarity items then are just a special case of other constructions that introduce alternatives, like expressions in focus and expressions that are part of a linguistic scale and introduce scalar implicatures. In particular, I have argued that one can distinguish between weak and strong polarity items in purely algebraic terms (exhaustivity vs. non-exhaustivity), and that emphatic assertion selects for the property exhibited by strong polarity items.

For an evaluation of the theory developed here we would have to extend our investigations into three directions: (1) We would have to discuss hundreds of polarity items, both positive and negative, to find out whether the analysis as expressions that introduce alternatives is feasible. (2) We would have to analyze scores of semantic compositions that either block or project the alternative orderings introduced by polarity items, and in the latter case, may reverse their order. And (3) we would have to discuss various other illocutionary forces besides scalar assertion and emphatic assertion that may exploit the alternatives introduced by polarity items, such as questions and directives. Krifka (in preparation) looks at a wider range of polarity items and at other types of illocutionary forces, such as exhaustive assertions, information questions, and rhetorical questions, with promising results.

Endnotes

* Research leading to this paper was carried out while the author was a visiting scholar at the *Arbeitsgruppe Strukturelle Grammatik der Max-Planck-Gesellschaft an der Humboldt Universität* in Berlin. I wish to express thanks to the audiences there, at a talk at the University of Massachusetts at Amherst in November 1993, and at the conference SALT 4 ("Semantics and Linguistic Theory") at the University of Rochester in May 1994. In particular, I would

like to thank Gene Rohrbaugh and Jack Hoeksema for helpful suggestions concerning the content and the presentation of this paper. Financial support was provided by the *Max Planck Gesellschaft* and the *IBM Germany Scientific Centre*, Heidelberg. A more comprehensive version of this paper is Krifka (in prep.).

Reference

Baker, C. L. (1970). Double Negatives. *Linguistic Inquiry* 1, 16-189.

Dowty, David. (1994). The Role of Negative Polarity and Concord Marking in Natural Language Reasoning. Talk at SALT 4, University of Rochester.

Fauconnier, G. (1975). Polarity and the Scale Principle. *Chicago Linguistic Society* 11, 188-199.

Fauconnier, G. (1978). Implication Reversal in a Natural Language. In F. Guenthner & S. Schmidt (eds.), *Formal Semantics and Pragmatics for Natural Languages*, 289-301. Dordrecht: Reidel.

Fauconnier, G. (1980). Pragmatic Entailment and Questions. In J. R. Searle, F. Kiefer, & M. Bierwisch (eds.), *Speech Act Theory and Pragmatics*, 57-69. Dordrecht: Reidel.

Gazdar, G. (1979). *Pragmatics: Implicature, Presuposition and Logical Form.* New York: Academic Press.

Grice, P. (1975). Logic and Conversation. In *Syntax and Semantics 3: Speech Acts*, 41-58. New York: Academic Press.

Heim, I. (1982). *The Semantics of Definite and Indefinite Noun Phrases.* Ph.D. dissertation, University of Massachusetts at Amherst.

Heim, I. (1987). A Note on Negative Polarity and Downward Entailingness. *NELS* 14, 98-107.

Hoeksema, J. (1986). Monotonicity Phenomena in Natural Language. *Linguistic Analysis* 16, 25-40.

Jacobs, J. (1984). Funktionale Satzperspektive und Illokutionssemantik. *Linguistische Berichte* 91, 25-89.

Jacobs, J. (1991). Focus Ambiguities. *Journal of Semantics* 8, 1-36.

Kadmon, N., & Landman, F. (1993). "Any". *Linguistics & Philosophy* 16.

Krifka, M. (1990). Polarity Phenomena and Alternative Semantics. In M. Stokhof & L. Torenvliet (eds.), *Proceedings of the 7th Amsterdam Colloquium* 277-302. Amsterdam: ITLI.

Krifka, M. (1992). Some Remarks on Polarity Items. In D. Zaefferer (ed.), *Semantic Universals and Universal Semantics*, 150-189. Berlin: Foris.

Krifka, M. (1992b). A Compositional Framework for Multiple Focus Constructions. In J. Jacobs (ed.), *Informationsstruktur und Grammatik. Sonderheft 4 der Linguistischen Berichte.* Opladen: Westdeutscher Verlag. (Prelimary version in the proceedings of SALT I).

Krifka, M. (1993). Focus and Presupposition in Dynamic Interpretation. *Journal of Semantics* 10.

Krifka, M. (in prep.). The Semantics and Pragmatics of Polarity Items.

Ladusaw, W. (1979). *Polarity Sensitivity as Inherent Scope Relations*. Ph.D. Dissertation, University of Texas at Austin.

Ladusaw, B. (1992). Expressing Negation. In C. Barker & D. Dowty (eds.), *Proceedings of SALT II*. Columbus: Dept. of Linguistics, University of Ohio.

Levinson, S. C. (1984). *Pragmatics*. Cambridge University Press. Cambridge.

Linebarger, M. C. (1980). *The Grammar of Negative Polarity*. Ph.D. Dissertation, MIT. Cambridge, MA.

Linebarger, M. C. (1987). Negative Polarity and Grammatical Representation. *Linguistics and Philosophy* 10, 325-387.

Linebarger, M. (1991). Negative polarity as linguistic evidence. *Chicago Linguistic Society* 27-II*: Papers from the parasession on negation.*

Rooth, M. E. (1985). *Association with Focus*. Ph.D.-Dissertation, University of Massachusetts at Amherst.

Rooth, M. (1992). A Theory of Focus Interpretation. *Natural Language Semantics* 1, 75-116.

Stalnaker, R. C. (1972). Pragmatics. In D. Davidson & G. Harman (eds.), *Semantics of Natural Language*, 380-397. Dordrecht: North-Holland.

Stechow, A. v. (1990). Focusing and Backgrounding Operators. In W. Abraham (ed.), *Discourse Particles*, 37-84. Amsterdam: John Benjamins.

Zwarts, F. (1993). Three Types of Polarity. Ms., University of Groningen.