Associative Operators

Christopher Tancredi

The University of Tokyo

Department of Language and Information Sciences
Abstract

In this paper, I argue that associative operators such as *even* and *only* are two place operators. These operators require a predicational internal argument and an external argument which can apply to the internal argument. Association with such an operator is analyzed via a Rooth (1992) style semantics applied within the external argument of the operator with one major change -- focus semantic values are generated directly from deaccented expressions, with focused expressions playing no role. The analysis developed overcomes three major shortcomings of previous analyses such as those of Rooth (1985,1992) and Krifka (1992,1993): it accounts for the possibility of association with a non-focused expression, it accounts for the distribution of island effects found with long-distance association, and it explains restrictions on association for operators in clause initial positions.

Keywords: associative operators, focus, deaccenting, *only* / *even*, association with focus

1 Introduction

Since at least as early as Jackendoff (1972), it has been observed that words like *even* and *only* appear to associate semantically with focused expressions in their scope. Rooth (1985,1992), von Stechow (1990), Jacobs (1991), and Krifka (1992,1993) account for such association facts by developing a semantics for interpreting focus, and analyzing *even* and *only* as operators sensitive to the semantic contribution that focus makes to a sentence. The appearance of association with focus falls out as a consequence of this interaction without recourse to a syntactically represented association between the operator and the focus. In this paper, I argue that these
analyses are both too permissive and too restrictive. They are too permissive in that they fail to account for a wide range of constraints on association that appear to be of a syntactic nature. They are too restrictive in that they fail to allow for observed associations with non-focused expressions. I argue that overcoming these shortcomings requires revising both the syntax and semantics of associative operators.

The paper is organized as follows. In section 2 I briefly outline the analyses of Rooth (1992) and Krifka (1992,1993). In section 3 I pose four problems that an analysis of associative operators should account for which cannot be accounted for within these analyses. In section 4, I develop the basic analysis of long distance association between an operator in pre-predicate position and an expression contained in that predicate. In section 5, I extend the analysis to account for the problems outlined in section 3, and to cases in which operators immediately precede phrases other than predicates. In section 6, I briefly consider one remaining problem that the analysis leaves unsolved, giving a speculative suggestion for a direction in which to look to solve it. A summary and conclusions are found in section 7. Finally, in the Appendix, I give a detailed semantic derivation of three cases of association with focus assuming a syntax containing interpretable traces.

2 Previous Analyses

Rooth (1985,1992) develops an analysis of focus related effects on interpretation in which the contribution that focus makes to the interpretation of a sentence comes in the introduction of a type of semantic value distinct from normal semantic values, what Rooth (1992) refers to as a focus semantic value. The basic idea behind the proposal is that focused expressions within a constituent are used in constructing a set of

---

1 For a slightly different approach to association with focus based on Rooth (1985), see Kratzer (1991).
alternatives. These alternatives consist of the maximal set of normal semantic values that can be generated from the relevant constituent by replacing each focus in that constituent with an expression of identical semantic type. Depending on focus assignment and on the constituent targeted for generating alternatives, the sets of alternatives generated by this procedure will differ. An illustration of the focus semantic values that can be generated from a simple SVO sentence with a single focus is illustrated in (1) below. (Following Rooth (1992), I use the symbol $[[ ]]^o$ to indicate the normal semantic value of an expression and the symbol $[[ ]]^f$ to indicate the focus semantic value of an expression.)

(1) a. [Mary saw [JOHN]$_F$]
   b. $[[Mary]]^f = \{[[Mary]]^o\} = \{m\}$
   c. $[[\text{saw}]]^f = \{[[\text{saw}]]^o\} = \{\lambda x\lambda y.\text{saw}(y,x)\}$
   d. $[[[\text{JOHN}]_F]]^f = \{x|\lambda E\}, [[\text{JOHN}]_F]^o = j$
   e. $[[\text{saw} [\text{JOHN}]_F]]^f = (\lambda y.\text{saw}(y,x)|x|\lambda E),$
   \[[[\text{saw} [\text{JOHN}]_F]]^o = \lambda y.\text{saw}(y,j)\]
   f. $[[\text{Mary saw [JOHN]}_F]]^f = \{\text{saw}(m,x)|x|\lambda E\},$
   \[[[\text{Mary saw [JOHN]}_F]]^o = \text{saw}(m,j)\]

In (1b,c), the focus semantic value of an expression lacking any focus is the unit set of its normal semantic value. In (1d), the entire expression being interpreted (viz. John) is focused, and the focus semantic value is the set of all expressions of the same semantic type as that expression. (1e) is the result of semantically combining the sole member of the focus semantic value of saw in (1c) with every member of the focus semantic value of John in (1d) via function application. Similarly, (1f) is generated by combining each expression in the focus semantic value of the VP in (1e) with the sole

---

2 For this reason, the semantics is often referred to as alternative semantics.
member of the focus semantic value of *Mary* in (1b). In a sentence containing no focus sensitive operators, focus has no effect on normal semantic values.

The role that focus semantic values play in interpretation in Rooth (1992) is indirect, mediated obligatorily by the two place presuppositional operator ~. This operator adjoins a free variable to an expression, restricting the value of that variable with the focus semantic value of the expression adjoined to. The restriction can take one of two forms, depending ultimately upon the value assigned to the variable. These are given in (2) (= Rooth’s (40)).

(2) Set case: \( \phi \sim \Gamma \)

presupposes that \( \Gamma \) is a subset of the focus semantic value for \( \phi \) and contains both the ordinary semantic value of \( \phi \) and an element distinct from the ordinary semantic value of \( \phi \)

Individual case: \( \phi \sim \gamma \)

presupposes that \( \gamma \) is an element of the focus semantic value for \( \phi \) distinct from the ordinary semantic value of \( \phi \)

The variable introduced by the operator ~ is taken to be anaphoric, its semantic value deriving from its antecedent. The semantics of the operator ~ given in (2) restricts the potential antecedent for such a variable to an expression that denotes a (set of) semantic value(s) contained in the focus semantic value of the expression \( \phi \) that the operator is adjoined to.

---

3 The characterization given here is informal, though sufficient for the purposes of this paper. See Rooth (1985, 41-60) for a formal recursive definition of focus semantic values within the framework of Montague Grammar. The term *focus semantic value* introduced in Rooth (1992) corresponds to the *p-sets* of Rooth (1985).
Rooth suggests two ways in which association effects can be derived using the operator introduced in (2). In both cases, associative operators like *even* and *only* lexically introduce a free variable $C$. In the first case, the value of $C$ is fixed entirely pragmatically, while in the second it is lexically constrained to being contained in the focus semantic value of the expression to which the operator is adjoined. Rooth (1992) does not give an explicit semantic analysis of either lexical operator, though he does give the semantic interpretation that he assumes for a sentence having *only* adjoined to a VP, which I give in (3) (= Rooth’s (4)).

---

4 Rooth (1992) does not explicitly adopt the semantics for *only* and *even* developed in his dissertation. In his dissertation, he gives a cross-categorial semantics for these operators which takes their primitive function to be operation over a propositional expression. In the later paper, on the other hand, he allows *only* to operate directly over a predicate type expression, as can be seen in (3). This difference is important for identifying the antecedent expression for the variable $C$ introduced by these operators. Given the semantics from his dissertation, this antecedent should be of propositional type, whereas in (3) it will have to be of predicational type. The two analyses can be unified under the VP-internal subject hypothesis by treating the trace of the subject *Mary* in the VP in (3) as a semantic argument of the verb. Under such an assumption, the VP in (3) will be of propositional type, with a free variable subject. The VP can later combine with the overt subject *Mary* by abstracting over the variable introduced by the subject trace and applying the resulting predicate to the interpretation of *Mary*. See Heim (1990) for details, and the Appendix for illustration.

5 Rooth follows Horn (1969) in assuming that a sentence containing *only* has a presupposition as well as an assertion. Only Horn’s assertion is given in (3b). I follow Rooth’s practice of ignoring the presupposition where it is not relevant, though it could readily be added by conjoining $VP'(m)$ to (3b). For convincing arguments against the presuppositional analysis of Horn, see Atlas (1991). Atlas’s own semantic treatment of statements containing *only* treat the relation between, e.g., *Only John left* and *John
(3)  
   a. \([S \text{ Mary only VP}]\)
   b. \(\forall P[PeC & P(m) \rightarrow P = VP']\)

The two treatments of the lexically introduced variable \(C\) lead to different representations.\(^6\) Under the first treatment, there is no restriction on interpreting focus and no requirement that the variable \(C\) be identified with any other expression in the sentence, making possible any of the representations in (4a-c). Under the second treatment, the value of \(C\) is identified as a lexical property of \textit{only} with a variable introduced by the operator \(\sim\) obligatorily adjoined to the expression in the immediate scope of \textit{only}, as in (4d).

(4)

\[
\begin{array}{cccc}
\text{a.} & \text{VP} & \text{b.} & \text{VP} \\
\text{only(C)} & \text{VP} & \text{only(C)} & \text{VP} \\
\text{c.} & \text{VP} & \text{only(C)} & \text{VP} \\
\text{d.} & \text{VP} & \text{only(C)} & \text{VP} \\
\text{VP} & \sim P_2 & \text{VP} & \sim P_1 & \text{VP} & \sim C
\end{array}
\]

The two representations in (4c,d) give rise to association between \textit{only} and any focus contained within the lower VP which is not in the scope of another occurrence of the operator \(\sim\) within that VP. This can be illustrated with the LF representation in (5).

(5) \([S \text{ Mary only(C)} [VP [VP saw JOHN_F] \sim X]]\)

By the semantics for \(\sim\) given in (2), the value of \(X\) is restricted to being a member or subset of the focus semantic value of the VP \textit{saw JOHN}. The focus semantic value of \textit{left} as an entailment, not a presupposition. Translating Atlas's analysis into a compositional semantics, his semantics for \textit{only} is as follows:

\[
\text{i. only} = \lambda Q \lambda P[\exists R[R \subseteq C & R(Q)] & \forall S[(S \subseteq C & S(Q)) \rightarrow S = P]]
\]

\(^6\) As Rooth argues, the relevant representations can be given either as LF representations or as semantic representations. Rooth adopts the former possibility, so I will do so as well.
this VP is the set \( \{ \lambda y. \text{saw}(y,x) | x \in E \} \). Identifying \( X \) with \( C \) (either as a lexical property of *only* (4d)) or through optional coindexing ((4c)) results in the interpretation given in (6a) with the restriction on \( C \) given in (6b).

\[
(6) \quad \begin{align*}
& \text{a.} \quad \forall P [[P \in C \land P(m)] \rightarrow P = \lambda y. \text{saw}(y,j)] \\
& \text{b.} \quad (C \subseteq \{ \lambda y. \text{saw}(y,x) | x \in E \})
\end{align*}
\]

Given appropriate additional pragmatic restrictions on \( C \), (6) gives the intuitively correct truth conditions for the sentence represented in (5).

Krifka (1992,1993), while adopting a different framework, proposes an analysis of *only* which is in many respects similar to that of Rooth. Like Rooth, Krifka attributes the appearance of association with focus to the interpretation of focus within the scope of an operator which is sensitive to the focus structure of a sentence. In particular, following von Stechow (1982,1990) and Jacobs (1991), Krifka uses focus to split sentences into focus-background structures \(<B,F>\), with the normal interpretation of a sentence given by applying the background to the focus (\(= B(F)\)). *Only* applied to one of these structures will yield truth provided that the background applies truthfully to the focus, and that there is no alternative to the focus such that the background applies truthfully to it. Since the semantic frameworks within which Rooth’s Krifka’s analyses are embedded are sufficiently distinct, I will not spell out the details of the latter analysis here. However, given the similarities between the two analyses, each of the problems posed below are equally problematic for both of the analyses.

3 Problems

This section poses a series of problems for the above analyses. The first problem we saw briefly in the previous section -- the problem of allowing for association with non-focused expressions in special cases without thereby making the explanation of association with focus vacuous. The second problem is the problem of
accounting for association with a single focus in a context in which there are two (or more) foci which can potentially be associated with an operator. While the above analyses can handle such cases in principle, these associations exhibit island-like effects which do not fall out from these analyses. The third problem is that of restricting association between clause initial occurrences of *even* and *only* and foci contained within those sentences. Both of the above analyses in principle allow for such an operator to associate with any focused expression contained in the clause it precedes, although typically the associate of such an operator is confined to (a sub-constituent of) the first maximal projection within that clause.

3.1 Association with Non-focused Constituents

Examples in which association is possible with a non-focused expression pose a *prima facie* problem for previous analyses, as acknowledged by Rooth. (*Small italics* indicates deaccenting: cf. Tancredi (1992).)

(7) John kissed Mary. In fact, *he ONLY kissed Mary*.

In (7), everything with which *only* could possibly be associated is deaccented, and yet the sentence is perfectly acceptable. In fact, *only* in (7) can be associated with any of the three constituents in its scope, *kissed, Mary, or kissed Mary*, as shown by the felicity of the following rejoinders:

(8) a. He didn’t TALK to her. Of course, he kissed SUE TOO.
    b. He didn’t kiss SUE. Of course, he TALKED to Sue.
    c. He didn’t do anything else.

In order to account for these association possibilities, Rooth/Krifka could argue against appearances that the relevant associate of *only* is focused, offering an alternative analysis of the connection between focus and accent which allows for a focused expression to surface as deaccented. Rooth has the additional option of allowing association with non-focused expressions, and offering an alternative explanation for
why association with focus is “practically obligatory” when there is no other competing
motivation for focus. Neither alternative, however, is viable within the confines of the
relevant analyses.

An argument for maintaining the assumption that focus is a necessary
requirement for association might be based on the following minimal variants of (7).

(9)  a. John kissed Mary. In fact, he ONLY kissed her.

(9a) differs from (7) in containing a deaccented pronoun in place of the deaccented
name. This difference appears to be unimportant for the semantics of the sentence,
(9a) having the exact same range of potential truth conditions as (7) and thus giving rise
to a felicitous discourse when followed by any one of the rejoinders in (8). (9b)
differs from (9a) in that not only is the pronoun deaccented but it has been further
reduced phonologically by deletion of the initial consonant. This difference is
interpretationally significant. Association of only with the reduced pronoun is
impossible, making the rejoinder in (8b) infelicitous. This fact would follow directly
from Rooth’s analysis if it were assumed that merely deaccented expressions can, but
fully reduced pronouns cannot, bear some feature F implicated in association with an
operator.7,8

7 Following general assumptions in the literature, I am at this point taking association to be indicated
by substitutability in toto of the associate in generating contrast sets. The formal status of this
assumption will be called into question below, where I will argue that there is no formal relation of
association which correlates with substitutability in this sense.

8 In a pre-published version of Rooth (1992), similar facts and their significance for his analysis were
examined, though Rooth did not give a specific analysis of how the contrast between merely deaccented
pronouns and fully reduced pronouns arises.
Formalizing an analysis along these lines is relatively straightforward. One need only posit distinct features for identifying focus and for connecting discourse via (de)accenting, allowing both features to independently affect the assignment of pitch accents.\(^9\)\(^{10}\) Though technically feasible however, such an analysis comes at the price of an independent means of identifying focused constituents. The presence of a pitch accent could no longer be a necessary consequence of a constituent’s being focused. While reducibility of a pronoun serves to distinguish focused pronouns from non-

\(^9\) For example, assume that the syntax contains two distinct features, \([-\pm F(\text{ocus})]\) as employed by Rooth, and \([-\pm A(\text{naphoric})]\) to replace Tancredi’s \([-\pm F]\) (the latter terminology suggested indirectly by considerations in Williams (1995)). The phonological effects observed in the examples above could be accounted for by the following phonological rules, adopting the formalism of Halle and Vergnaud (1986).

(i) \[ +F \rightarrow \text{assign pitch accent (PA) on the basis of metrical grid prominence} \]
\[ -F \rightarrow \text{erase all } ^*\text{’s from metrical grid} \]
\[ +A \rightarrow \text{erase all } ^*\text{’s from metrical grid/delete PAs} \]
\[ -A \rightarrow \text{do nothing} \]

Since the \([-\pm F]\)-related rules appear to affect segmental phonology (leading to the reduction of /h/ to \(\emptyset\) above), they would have to apply early. The \([-\pm A]\)-related rules do not have such effects, and so should be ordered after stress-related phonological reductions occur, thereby ensuring that they will apply after the \([-\pm F]\)-related rules. On the assumption that intonational contour is determined by pitch accents together with boundary tones (cf. Pierrehumbert (1980)), a flat intonation for the deaccented expressions in both (7) and (9) would be a natural outcome of the rules given in (i). The ambiguity of potential associates for only would also follow, since it would be impossible to determine based upon pitch accent assignment alone whether an expression bearing the feature \([+A]\) had been marked \([+F]\) as well or whether it had been left unspecified for the feature \(F\).

\(^{10}\) A related point is made in Williams (1995).
focused pronouns in (9), few other types of expression exhibit a similar contrast in pronunciation. If other tests could be employed to pick out a given constituent as a focus, this would only be a minor inconvenience. However, it is doubtful whether there are any other tests which consistently identify an expression as a focus for the purpose of association with an operator such as even or only. As will be demonstrated directly, neither pragmatic tests such as Chomsky’s (1971) natural response test nor syntactic constructions such as clefts, pseudo-clefts or Heavy NP Shift succeed in doing so.

3.1.1 The Natural Response Test

The natural response test as originally formulated by Chomsky (1971) is an attempt to correlate pitch accent location with identification of potential foci. The central assumption of the test is that in an answer a to a wh-question q, that part of a that corresponds to the questioned part of q must be focused in order for a to constitute a natural response to q. Pitch accent location in a is taken to restrict the possible assignments of focus within a, a constituent being a potential focus only if it contains an expression bearing a pitch accent in a particular location. Under the analysis being considered, pitch accent assignment cannot be a necessary consequence of an expression’s being focused since association is possible with expressions not bearing a pitch accent. Thus, if the natural response test is to be used for identifying associable foci, the correlation between pitch accent location and focus assignment will have to be

11 Chomsky’s original analysis takes the location to be determined by the Nuclear Stress Rule, which confines pitch accents to the right most (accentable) expression in a constituent. This analysis has come under heavy attack, most forcefully by Selkirk (1984) who argues that linear order plays no role in locating pitch accents, but that argumenthood does play a crucial role. Since the details of pitch accent location are tangential to our present concerns, I ignore these details here.
discarded. This leaves the possibility that the part of an answer to a question \( q \) which corresponds to the questioned part of \( q \) is always identified as a focus.\(^{12}\) This would make the expression *fly to Paris* qualify as a focus in both \( B_1 \) and in \( B_2 \) in the discourse in (10), since it is this constituent that corresponds to what is being questioned in the respective questions in \( A_1 \) and \( A_2 \).

\[
\begin{align*}
(10) & \quad A_1: \text{ What is John going to do tomorrow?} \\
& \quad B_1: \text{ He’s going to fly to Paris.} \\
& \quad A_2: \text{ What is Bill going to do tomorrow?} \\
& \quad B_2: \text{ HE’s going to fly to Paris (too).} \\
& \quad A_3: \text{ What is Tom going to do tomorrow?} \\
& \quad B_3: \text{ HE’s going to SAIL to Paris.}
\end{align*}
\]

By parity of reasoning, *sail to Paris* in \( B_3 \) will also be identified as a focus.

If we take this version of the natural response test as identifying potential foci, it follows that the foci in the answers should be able to associate with a focus sensitive operator like *only*. For the first two responses to \( A \), this prediction is correct -- in place of \( B_1 \) one could as easily respond with \( B_1’ \), and similarly in place of \( B_2 \) one could respond with \( B_2’ \) below, with the VP in either case taken as the associate of *only*.

\[
\begin{align*}
(11) & \quad B_1’: \text{ He’s only going to fly to Páris} \\
& \quad B_2’: \text{ HE’s only going to fly to Paris (too)} \\
& \quad B_3’: \text{ HE’s only going to SAIL to Paris}
\end{align*}
\]

However, this analysis further predicts that \( B_3’ \) should be possible as a natural response to \( A_3 \) in (10), with *only* associated with the VP *sail to Paris*. This prediction is not borne out. While it is possible for *fly to Paris* in \( B_1’ \) or \( B_2’ \) to be taken as contrasting with *drive to Brussels*, it is not similarly possible for *sail to Paris* in \( B_3’ \) to be taken as

\[\text{Von Stechow and Uhmann (1986) trace this basic idea back to Hermann Paul (1898, 283).}\]
so contrasting. Since the possibility of such association is guaranteed under an analysis which (i) identifies as focus that part of a natural response to a question which corresponds to what is being asked in the question, and which (ii) takes focus to be a sufficient condition for association with an operator such as *only*, the fact that such association is impossible in $B_3'$ shows that at least one of these two parts of the analysis must be incorrect. If we choose to maintain that association is obligatorily with focused expressions, then we are forced to abandon the natural response test as a test for focushood.

3.1.2 Constructional Focus

A parallel argument can be made against using syntactic constructions to identify foci for the purposes of association. Since the argument for any individual construction can be straightforwardly reconstructed from that for any of the other constructions, I consider here only the case of clefts. Suppose that an expression that is clefted is a syntactically identified focus. Given the above analyses of association with focus, we thus predict that this expression can uniformly constitute the associate of a focus sensitive operator like *only*. However, in cases parallel to $B_3'$ in (11), such association is impossible, as illustrated in (12).

(12) A: Did you invite Tom’s father to your graduation party?
B: No, it’s only JOHN’S father that I invited.

Were association with the entire clefted constituent possible, B’s response in (12) would be interpretable as implying that B invited exactly one person -- John’s father -- to the party. B’s response has no such implication, however. It rather implies that the only person whose father B invited to the party is John, leaving open the possibility of his having invited other non-fathers. Thus for the same reason that the natural response test could not be used to identify foci, syntactic identification of focus as well cannot be employed as an independent means of identifying expressions that can
associate with a focus sensitive operator. Without independent means of identifying focused expressions, however, an analysis which reduces association with operators like *even* and *only* to interpretation of focus within the scope of such operators loses all explanatory force, becoming no more than a stipulation of the facts it was designed to explain.\(^{13,14}\)

### 3.1.3 Rooth’s “Strong” Analysis

The prospects for accounting for association with an operator like *only* and *even* by strictly requiring focus on the associate look grim at best. This still leaves Rooth’s “strong” analysis as a possibility to consider. That analysis, recall, takes association with focus to be mediated by two independent variables, one introduced lexically by *even or only* (C above) and the other introduced by the focus interpretation operator ~. Association with focus is derived by identifying these two variables pragmatically in a

\(^{13}\) If we take the argument of this section to show that association need not be with a focused expression, as I believe we should, then an explanation is required for why reduction of a pronoun should make it an impossible target of association. A solution to this problem can be given under the movement analysis of association developed below if it is assumed that reduced pronouns are syntactic verbal clitics. Assuming that clitics are bare heads, the impossibility of association with a cliticized pronoun can be accounted for by only allowing maximal projections to move to the specifier position of an operator such as *only*.

\(^{14}\) If association with a non-focused expression is possible, as I argue here, then the term *association with focus* should be abandoned along with any analysis based on the assumption that focus is a requirement for association. This includes the event-semantics based analysis of association developed by Bonomi and Casalegno (1993). The present observations are consistent with the analysis of Williams (1995) according to which focus structure plays a role only in anaphoric connections (in the sense of Wasow (1979)), and not in association with operators.
configuration like that in (4c). The problem this analysis faces is that the number of potential alternatives to the identification given in (4c) is unconstrained. Amongst other possibilities that the analysis leaves open is the possibility of identifying the variable introduced by only, for example, with another variable from a different sentence. If this were possible, then the two sentences in (13) should constitute a coherent context initial, self-contained discourse, contrary to fact.

(13)

A: John [[kissed MARY_F]~X]
B: #Bill only(C) KISSED_F Sue

By the semantics for ~, X in (13a) is restricted to denoting either an element of or a subset of the focus semantic value of the VP it is adjoined to, namely kissed MARY. Given the semantics of only, identifying X with C should be possible if the interpretation of the VP kissed Sue is included in the value of X. Under such circumstances, the interpretation assigned to (13b) will be the following:

(14)

a. \( \forall P[[P \in C \& P(b)] \rightarrow P = \lambda y.\text{kissed}(y,s)] \)

b. \( C \subseteq \{\lambda y.\text{kissed}(y,x)|x \in E\} \)

This is exactly the interpretation in which only appears to associate with Sue. In the second sentence in (13), however, association of only with Sue is not possible.\(^{15}\)

It could be objected that the argument just given against Rooth’s “strong” proposal requires that the focus on kissed in (13b) be ignored. While this focus is indeed ignored, and obligatorily so for the example considered, the objection carries no

---

\(^{15}\) It is of course possible to further enrich the context of (13) so that the sentence in (13b) becomes acceptable. However, this would be to miss the point of the example. The context given in the example provides an antecedent for the variable C introduced by only, identification with which should be sufficient to generate an interpretation in which only appears to associate with Sue without any further contextual enrichment, but this is impossible.
weight for two reasons. First, Rooth’s analysis nowhere requires that focus be interpreted. Second, even if we require that focus always be interpreted, the argument given can be reconstructed by expanding the discourse in (13) to that in (15).

(15) a. Tom kissed Sue.
   b. John [[kissed MARY_F]~X]
   c. Then he [[HIT_F]~Y] Mary
   d. #Bill only(C) [[KISSED_F]~Z] Sue.

Interpreting the focus on kissed at the level of the verb in (15d) will not affect the normal semantic value of that sentence, given earlier in (14). Furthermore, the presuppositions of the three occurrences of the operator ~ can be satisfied by identifying Z with the verb hit in (c) and Y with the verb kissed in (b) under the Individual case clause of (2), and by identifying X with the focus semantic value of the VP kissed Mary under the Set case clause. Again, the appearance of association between only and Sue is predicted to be possible in (15d) by equating C with X, and again without further enrichment of the context it is not. Allowing for association with non-focused expressions via the mechanisms available under the strong version of Rooth’s analysis thus leaves us without an explanation for when such associations are possible and when they are not.

3.2 Multiple Foci without Multiple Association

Consistent with the above observations is the hypothesis that pitch accent assignment is one determinant of focus assignment but not the only one, i.e. that pitch accents are assigned only to expressions which are themselves foci or which are contained in foci. Since accent location is the primary means by which Rooth and Krifka identify focused expressions, I will adopt the assumption in this section that pitch accents are assigned only to (or within) foci. Two plausible variants of this assumption can be entertained, one in which each pitch accent determines an
independent focus, and one in which a single focus is capable of bearing multiple pitch accents. To simplify discussion, I will focus primarily on the former variant. Under the plausible assumption that foci are syntactic constituents, applying the arguments of this section to the other variant is straightforward.

The sentences that will be considered in this section all contain a single occurrence of even or only with multiple foci in its scope, as in (16).

(16)  John/he only MET SUE

Depending on the context in which the sentence is embedded, (16) can naturally be assigned any of three interpretations: one in which only is associated with both met and Sue ((17a)), one in which it is associated with met alone ((17b)), and one in which it is associated with Sue alone ((17c)). (Intended associates are underlined.)

(17)  a. [A: Did John pick up anyone at the party?
          B: No,] he only MET SUE.

   b. [John met, spoke with and got to know a lot of people at the party.
          However,] he only MET SUE.

   c. [John watched Sue, Mary and Alice at the party. However,] he
          only MET SUE.

Accounting for these three readings under Rooth’s analysis can be accomplished straightforwardly with the following LF representations.16

---

16 I restrict discussion to representations in which the variable introduced by even/only is syntactically identified with the variable introduced by the ~ operator adjoined to the expression in the immediate scope of even/only. A similar analysis could be developed within Krifka’s framework by allowing the background B in a focus-background structure <B,F> to itself contain a focus-background structure. I leave it to the reader to verify that such an analysis would face the same problem as that considered in the text.
(18)  
   a.  He only(C_i) [[MET_F SUE_F]~X_i]  
   b.  He only(C_i) [[MET_F [SUE_F~Y_j]]~X_i]  
   c.  He only(C_i) [[[MET_F~Y_j] SUE_F]~X_i]  

The desired interpretations follow from Rooth’s assumption (p.95) that the focus semantic value of an expression A~Y is identical to the normal semantic value of A. Given this assumption, the focus semantic values of the VP sisters of only in (18a-c) will be the sets given in (19a-c) respectively.  

(19)  
   a.  \{\lambda y. R(y,x) | R\in ME_{ce} < e t> \} \& x\in ME_c  
   b.  \{\lambda y. R(y,s) | R\in ME_{ce} < e t> \}  
   c.  \{\lambda y. met(y,x) | x\in ME_c \}  

Identifying the various occurrences of X_i (and thereby those of C_i) in (18) with pragmatically determined subsets of these expressions as restricted by the semantics of ~ given in (2) automatically generates the desired associations in (18b,c) and can readily generate the desired multiple association in (18a) as well.  

While this analysis accounts for the general phenomenon of non-association with associable foci illustrated in (16) and (17), the analysis can be extended arbitrarily. That this is a problem can be seen by examining the following similar examples.  

---  

17 This latter association is not automatic, since nothing in the semantics of ~ requires that the pragmatically determined contrast set contain elements contrasting with respect to each focus in the immediate scope of an occurrence of ~. The set \{\lambda y. met(y,s), \lambda y. met(y,m)\} thus satisfies the presupposition of ~ in (18a), although if this were the relevant pragmatically determined set it would generate a reading in which the intuitive association would be with the object NP alone. This additional pragmatic means of generating single associations with multiple foci faces the same problems as the analysis examined in the text. I will not consider the alternative further.
(20) a. ??John only left before he MET SUE
   (cf. ??Sue, John left before he met)
b. ??John only knows the man who LIKES SUE
   (cf. ??Sue, John knows the man who likes)
c. *John only knows who LEFT to SMOKE
   (cf. *To smoke, John knows [who left t])
d. *John only said that to WATCH GOLF is a waste
   (cf. *Golf, John said that to watch is a waste)

In (20), we see that association with one focused expression skipping over another is subject to island-like constraints of the same kind that restrict syntactic movement like topicalization. Such island effects cannot be explained under Rooth’s analysis, since representations parallel to (18c) can be derived for each of the examples in (20) without violating any known grammatical constraints:

(21) a. John only(C_i) [[left before he [MET_{F-Y}] SUE_{F-X}]]
b. John only(C_i) [[knows the man who [LIKES_{F-Y}] SUE_{F-X}]]
c. John only(C_i) [[knows who [LEFT_{F-Y}] to SMOKE_{F-X}]]
d. John only(C_i) [[said that [to WATCH_{F-Y} GOLF is a waste]_{F-X}]]

These representations generate readings in which only should appear to associate with the second foci (Sue in (a,b), (to) smoke in (c) and golf in (d)). Patently, however, the representations in (21) do not involve any obligatory movement to relate the focused expressions with only\(^{18}\), and therefore no island violations are predicted to surface.\(^{19}\)

---

18 More precisely, they do not involve any obligatory movement beyond whatever movement would be necessary (and permitted) in the absence of association.

19 A minimal variation of Rooth’s analysis could be considered in which absence of association with an associable focus were derived by obligatorily raising the non-associated focus outside the scope of the
3.3 Further Restrictions on Association

A further problem for Rooth and Krifka arises from restrictions on the associate of a clause initial occurrence of an operator. In (22), the associate of *even* can only be *John, and not saw, Mary, saw Mary, or the whole sentence, regardless of whether the verb and/or object is focused.

(22) Even John saw Mary.

relevant operator. Syntactic objections to the required movement aside, such an analysis fails straightforwardly since it would allow for the LF raised focus to move into the scope of a higher operator and ultimately be associated with it. This would give rise to a pattern of crossed (rather than nested) associations, which have been observed by Tancredi (1991a,b) to be impossible. An example illustrating this impossibility is given in (i), with co-superscripting in (ia) indicating intended associations, the LF representation that would generate such associations given in (ib), and the interpretation that would result from such associations given in (ic).

(i) [Mary claimed that John even heard NANCY. However,]
   a. #She only\(^1\) claimed that he even\(^1\) SAW\(^1\) SUE\(^1\).
   b. [She only claimed that [ SAW\(_k\) [he even\(_k\) SUE\(_k\)]]]
   c. (Only seeing did she claim he did to even Sue.)

(Since examples involving multiple associations become very complex, it is necessary to exercise care in isolating intended interpretations. Here, as with many of the examples throughout this paper, it is possible to assign the string of words in (a) at least two legitimate interpretations, one in which *only* is associated with *Sue* and *even* with *saw* (= Only Sue did she claim that John even saw) and one in which *even* is associated with *saw* and *only* with some constituent containing *even saw* but excluding *Sue* (e.g. Sue, she claimed only [that he even saw\(_l\)]). Such interpretations are expected under Rooth’s analysis. They are also, however, irrelevant.)
If *even* in (22) can have scope over IP, however, then this restriction on the associate of *even* cannot be accounted for. (22) is in fact part of a much larger paradigm. Just as *even* in (22) is restricted to taking the subject as its associate, so too every occurrence of *even* and *only* in (23) is restricted to taking (some expression(s) contained in) the underlined constituent to its immediate right as its associate, regardless of what other expressions may be focused.

(23)  

a. Even *that* John left surprised Mary.  

b. Even *the man* Mary invited Bill insulted.  

c. Even *who* Mary likes has Bill asked.  

d. Only *to save his life* would Tom ever lie.  

e. Only *what John said* does Bill know.  

f. John saw only/even Mary’s mother leave the bar.  
g. I consider only/even *good students* respectable.

The gravity of the problem can best be seen by considering (23c). In this sentence, an embedded CP (CP₂ in (24) below) has been fronted, presumably occupying the Spec position of the matrix CP (CP₁ in (24)). To capture the fact that *even* in this sentence can be associated with any constituent contained in CP₂, it is necessary under both Rooth’s and Krifka’s analyses to assume that *even* c-commands CP₂. Since *even* precedes the WH-expression in the Spec position of the fronted CP, in order for such a c-command relation to obtain it is effectively necessary for *even* to either be adjoined to CP₂ itself or to the matrix CP₁. That is, the syntactic structure of this sentence will have to be identical in relevant respects to one of the two structures given below.
We could capture the fact that *even* is required to associate with (an expression contained in) CP₂ under either analysis if (24b) could be admitted as a well-formed syntactic representation while (24a) is not. However, it is difficult to see how such a restriction can be stated. Clearly, adjunction to CP cannot be completely barred, or the baby goes out with the bath water. Furthermore, although barring adjunction to a matrix CP would account for the case at hand, such a stipulation would do nothing to account for examples like (23f,g) in which *only/even* precedes a non-CP complement of a verb, and nor would it explain the original problematic example in (22), where the possibility of *only* being adjoined to IP would additionally need to be precluded.

4 The General Solution

I turn now to solutions to the problems posed above. The problem posed by (20) strongly suggests that association with an operator like *even* or *only* involves syntactic movement. I account for this fact by requiring structural sisterhood between
such an operator and a phrase containing its associate at some level of representation.\textsuperscript{20} In the terminology of the Extended Standard Theory, this relation could either derive from D- to S-structure movement of a focus sensitive operator, or from S-structure to LF movement of the associate of such an operator. These two alternatives are illustrated schematically in (25) for a sentence containing the operator only.

\begin{align*}
(25) \quad &a. \quad \ldots \left[ \ldots \left[ \alpha \right. \ldots \right] \ldots \right. \rightarrow \left. \ldots \left[ \ldots \left[ t \alpha \right. \ldots \right] \ldots \right. \quad \text{(D-S)} \\
&b. \quad \ldots \left[ \ldots \alpha_j \ldots \right] \ldots \rightarrow \left. \ldots \left[ \ldots \alpha_j [\ldots t_j \ldots] \ldots \right. \quad \text{(S-LF)}
\end{align*}

Either analysis will account straightforwardly for the possibility of non-multiple association of only with multiple foci in its scope, as can be illustrated with (17c).

Recall that there, only was seen to be able to associate with a direct object NP across a focused verb. Allowing for association to be mediated via movement in the manner sketched in (25), this is exactly what one would expect. The relevant LF representations for that example under the interpretation in question would be those given in (26).

\begin{align*}
(26) \quad &a. \quad \text{He} \left[ \text{VP only}_j \left[ \text{VP MET} \left[ t_i \text{ SUE} \right] \right] \right] \\
&b. \quad \text{He} \left[ \text{VP only SUE}_j \left[ \text{VP MET} t_i \right] \right]
\end{align*}

\textsuperscript{20} A related assumption is found in the early generative literature on the subject (cf. Anderson 1972). The assumption made here differs in one crucial respect, however. For Anderson, the sisterhood relation is required to hold between the operator and the intuitive associate (typically a focused expression). I, however, allow for the possibility that the sister of the operator merely contain the intuitive associate. The difference will become crucial for explaining the full distribution of island effects with association. I assume that an expression contains itself. Thus an account of the type generated under Anderson’s analysis will in principle be available as a special case under the present analysis, provided the required movement satisfies syntactic constraints.
While a semantics still needs to be given which interprets these structures in the correct way, as we will see below this can be done straightforwardly. In what follows, I will somewhat arbitrarily choose the analysis involving LF movement of the associate of only, though at present I see little empirical way of distinguishing the two analyses.

Before refining the analysis so that it can handle the problems encountered in section 3, I first show how the analysis can deal with the objection to a movement based analysis raised by Rooth (1985) that one does not uniformly find island effects with long distance association in cases in which one might expect to find them. Examples illustrating this lack of island effects are given below. ((a) and (b) are adapted from Rooth (1985), (c) from Tancredi (1990a).)

(27)  a. [You can do a lot of things with bananas:] John even knows a guy who SMOKES bananas.
    b. John even has the idea that HE is tall for a Watusi.
    c. John only knows the man who invited Mary because she’s a LINGUIST.

---

21 Rooth raises two other objections to a movement based analysis. Neither of these is convincing, however. The first is that a D- to S-structure operator movement analysis cannot account for the possibility of multiple association. While this is true of a version of such an analysis which requires the relevant operators to be base generated as sisters to their intuitive associates, it does not argue against an analysis in which this sisterhood requirement does not hold, and it furthermore leaves the LF movement analysis untouched. Rooth’s other argument against a movement based analysis is that such an analysis fails to capture the presumed necessary connection between focus and association. We have already seen, however, that focus is not required on the associate of an operator like only, and so this objection carries little weight.
In each example, movement of the expression written in capital letters to the focus sensitive operator would violate standard constraints on movement, and yet association between the operator and the focused expression is in all cases intuitively possible.

In order to see that this objection does not refute a movement based analysis, consider the argument in detail. The argument goes as follows:

(i) Assume that association with focus requires movement of focus to the associated operator.

(ii) Take the foci in (27a-c) to be the words *smokes*, *he*, and *linguist* respectively.

(iii) LF movement of these expressions to *only* will violate Subjacency (27a), the principle responsible for *that*-t effects (27b), or Subjacency together with the ECP (27c), and so should be blocked.

(iv) The sentences are acceptable.

Therefore,

(v) Association does not require movement between the surface position of the associate and that of the operator. (i.e. reject (i).)

This argument only establishes that association cannot be done exclusively by movement of a focus to an operator. The argument leaves open the possibility of association being derived from movement to an operator of a constituent containing a focus rather than from movement of the focus itself. Though Rooth succeeds in refuting one class of movement based analyses of association, i.e. those based upon the assumption in (i), he does not succeed in refuting all movement based analyses.22

22 This class of analyses, in particular the analysis of Andersen (1972), was Rooth’s intended target, and in this respect the argument makes its point. Without a mechanism for generating associations long distance such as that proposed by Rooth, a movement based analysis of the type I am proposing could not
The evidence in favor of the assumption in (i) comes from consideration of the expressions which are intuitively felt to make up the relevant contrast set over which only is taken to operate in (27). On one reading for each of these sentences, it is possible to have members of this contrast set restricted to propositions which differ only in what fills the position of the phonologically accented word. On this reading of (27a), for example, the set of alternatives would potentially include those propositions indicated in (28a), but not any of those in (28b).

(28)  
  a. John knows a guy who eats bananas.  
       John knows a guy who wears bananas.  
       John knows a guy who smokes bananas.  
  b. John knows a guy who juggles pears.  
       John knows a woman from Brazil.  
       John can find you a singing baboon.

These facts are taken to bear on the question of what formally associates with only since it is assumed that the entire associate, however it is determined, can be substituted for in toto in generating the relevant contrast set. If this associate in (27a) were the VP smokes bananas, then it is presumed that the first sentence in (28b) would thereby be admitted into the contrast set, whereas if the associate were either the object NP with its restrictive relative clause or the matrix VP, the second and third sentences in (28b) respectively would be expected to be in the contrast set, counter to fact.

While the facts illustrated are clear, their explanation falls well short of being necessary. In particular, there is no reason one need assume that syntactic association of a given constituent with a focus sensitive operator licenses substitution of that be entertained. In this respect, Rooth’s analysis, though not itself movement based, provides the necessary basis for developing an adequate movement based analysis.
constituent *in toto* in generating the contrast set over which *only* operates. Suppose we
drop that assumption, and substitute for it the following.

(29) If an operator like *only* or *even* is syntactically associated with a
constituent \( x \), then the contrast set for \( x \) is (i) of the same semantic type
as \( x \), and (ii) a subset of the focus semantic value of \( x \).

Adopting this modification makes it possible for *syntactic* association in (27a-c) to be
with constituents other than the focused words alone without thereby licensing the
inclusion of unwanted alternatives in the relevant contrast sets. I illustrate this
analysis with the example in (27a). Assuming the syntactic associate of *even* in that
sentence to be the NP *a man who SMOKEs bananas*, and assuming furthermore that the
associate raises to the operator at LF, the LF representation of (27a) will be (30).

(30) \([\text{John } [[\text{even}(C_k) \ [\text{a man who } \text{SMOKEs}]]_E \ \text{bananas}]_I \sim X_k] \ \text{knows} \ t_j] \]

Alternatives are generated not from the VP to which *even* is adjoined at S-structure, but
rather from the NP moved to *even* at LF. Taking smokes to be the only focused
constituent within this NP, the relevant contrast set will contain expressions of the form
*a man who \( R \) bananas*, where \( R \) is of the same semantic type as smokes. The technical
task that remains is to supply a semantics for *even* which combines (i) the normal
semantic value of its syntactic associate, (ii) the focus semantic value of its syntactic
associate, and (iii) the normal semantic value of the remainder of the sentence in such a
way as to generate an interpretation for (30) equivalent to that in (31).

(31) \( \exists_p [C(p) \ \& \ \sim p \ \& \ p \neq \phi \ \& \ \text{unlikely'(\phi')}] \ \& \ \phi \)
where \( \phi = \exists_x [\text{man}(x) \ \& \ \text{smoke}_e(x, \text{bananas}) \ \& \ \text{knows}(j, x)], \) and \( C(p) \) is
true iff \( p \) is in the set of propositions derivable from \( \phi \) by substituting
members of the focus semantic value of \( \text{smoke}_e \) in for that expression in
\( \phi \).
We can do this by modifying Rooth’s (1985) semantics for even as in (32), and combining this with an analysis of association parallel to (4d) which identifies the variable introduced by an operator with the variable introduced by ~ on the expression adjoined to the operator. I include parallel semantics for only as a two place operator for future reference (though see footnote 4 for an alternative).

(32) \[
\text{even: } \lambda Q \lambda P[P(Q) \land \exists R[R(Q) \land R \subseteq C \land R \neq P] \land \text{unlikely’ } P(Q)] \\
\text{only: } \lambda Q \lambda P[P(Q) \land \forall R[[R(Q) \land R \subseteq C] \rightarrow R = P]]
\]

Assuming standard rules for quantifying into VP, the desired intuitive association of even with smokes in (30) can be derived as illustrated in detail below.

\[
\begin{align*}
\text{NP: } & \text{a man who SMOKES bananas} \\
\text{VP: } & \lambda x[\exists y[\text{man}(x) \land \text{SMOKE}(\text{bananas},x) \land P(y)]] (=\text{smoke’}) \land \text{know } t \\
\text{OP: } & \lambda P \lambda Q \lambda P(Q) \\
\text{NP: } & \text{(same as NP below)} \\
\text{OP: } & \lambda Q \lambda P \lambda Q.P(Q) \\
\text{mSb’}(\lambda x.\text{know}(x,j)) = \exists y[\text{man}(x) \land \text{smoke}(\text{bananas},x) \land \text{know}(x,j)] \\
X (\subseteq C) \in \{\psi: \exists R[\psi = \lambda P[\exists x[\text{man}(x) \land R(\text{bananas},x) \land P(x)]]]\}
\end{align*}
\]

The solution just sketched analyzes association as an instance of movement.

The objection that island effects are not observed in (27a) is answered by identifying the constituent that moves as one whose movement should not give rise to island effects.
Syntactic association for a given operator is not directly with a focus but rather with whatever expression is raised to the operator. Intuitive association is derived by a Rooth-like semantics restricting the value of a variable C lexically introduced by an operator. The main difference at this point between the current proposal and the proposals of Rooth and Krifka is that the constituent which constrains the variable is here taken to be not the VP in the scope of the operator but the expression which moves to the operator at LF. An exactly parallel analysis applies straightforwardly to the other examples in (27) accounting for the absence of island violations in these examples as well.

5 Applications and Extensions

We have seen that the problems which Rooth poses for a movement based analysis of association can be overcome provided that the syntactic associate of an operator like only or even is not restricted to focused constituents. In this section I show that the movement based analysis developed can also overcome the problems outlined in section 3.

5.1 Association with Non-focused Expressions

If we are to maintain that association with an operator such as only involves comparison with a set of alternatives, and if this set of alternatives is derived from the focus semantic value of the expression syntactically associated with the operator, then in order to account for the possibility of association with non-focused expressions as in (7) (repeated here), it is necessary to be able to generate the relevant set of alternatives in the absence of focus.

(7) John saw Mary. In fact, he ONLY saw Mary.

Taking the Focus Related Topic (FRT) of an expression \( \phi \) to be the set of maximal semantic objects obtained by combining thematically combinable non-focused
expressions within $\phi$ (cf. Tancredi (1992,1995)),\textsuperscript{23} an appropriate contrast set for $\phi$ can be generated by identifying its focus semantic value as the set of all expressions $\psi$ having the same semantic type as $\phi$ which can be formed by applying some function to the FRT of $\phi$.$\textsuperscript{24}$

\begin{align*}
(33) & \quad [\phi]^f = \{ \psi : \exists f(\psi = f(\text{FRT}(\phi)) \} \text{ & } [\text{type}(\psi) = \text{type}(\phi)]
\end{align*}

(restriction: all elements in the set FRT($\phi$) occur non-trivially in $f(\text{FRT}(\phi))$)

The formalization in (33) will give rise to an apparent association with deaccented expressions whenever the syntactic associate of an operator is entirely deaccented. Association with Mary in (7), for example, will derive from the representation in (34).

\begin{align*}
(34) & \quad he [[\text{only Mary-X}][\text{saw } t_1]]
\end{align*}

Adjoining the operator $\sim X$ to Mary will as always restrict the value of $X$ to a subset of the focus semantic value of Mary. Since Mary is deaccented, the focus semantic value of Mary will be a set consisting of the interpretations of all expressions of the same semantic type as Mary which can be semantically constructed out of the interpretation of Mary. If definite and indefinite NPs are taken to be of the same semantic type as names, this set will include the referents of all singular definite and indefinite NPs containing Mary as a sub-constituent, which will make the focus semantic value co-extensive with the set of all individuals. The semantics for only then singles the interpretation of Mary out of this set as the only member which can combine truthfully

\textsuperscript{23} In previous formulations of the notion of Focus Related Topic, I included in the FRT variables in place of all expressions whose presence is required by the selectional properties of some deaccented expression (but not in place of non-selected focused expressions). Such variables, however, do no substantive work, and hence have been omitted here.

\textsuperscript{24} Using background structures from Krifka (1992) in place of FRTs will derive the same results.
with the rest of the sentence. Far from generating a tautology as do the analyses of Rooth and Krifka, the semantics developed here correctly allows for an associative reading.

The explanation given for (7) requires only that the syntactic associate of the operator be entirely deaccented, and is independent of the focus properties of the remainder of the sentence. Thus, the explanation can be straightforwardly applied to Rooth’s example given in (35a) as well. 25

(35) a. People who grow rice generally only EAT rice
b. ... [only rice ~X] [EAT t]

The most natural interpretation of this sentence can be accounted for by raising the deaccented object rice to only at LF, as in (35b). Within the semantics, only will then compare rice’ with alternatives of the form f(rice’). Given appropriate pragmatic restrictions, the contrast set will be equivalent to things (or food or grains) other than rice. Whether the focus on eat is interpreted separately is then immaterial to the question of association.

While it is possible to account for association with non-focused expressions under the present analysis, note that such association is not predicted to be unrestricted. Association by the mechanism illustrated above with a deaccented expression x is only possible if x can be raised to the relevant operator at LF. If the desired associate is separated from the operator by a syntactic island containing one or more focused expressions, then such association is predicted to be impossible for the same reason that association with a focused expression in the identical location is impossible. We thus predict that the same set of facts used to illustrate the syntactic nature of association in

25 Rooth analyzes this example as involving focus on rice, observing however that this focus surfaces not as a pitch accent, as with other instances of focus, but in the form of lengthening.
section 3.2 should be duplicatable with deaccented expressions in place of the associated foci. As can be seen in (36), where the relevant sentence is embedded in a context which should facilitate association with the deaccented expression, this prediction is borne out.

(36)  
   a. A: I hear that John left before he saw only SUE.
      B: No, but ??he did only leave before he MET Sue.
   b. A: I hear that John knows the man who kissed only SUE.
      B: No, but *he does only know the man who LIKES Sue.
   c. A: Does John only know who came to SMOKE?
      B: No, but *he does only know who LEFT to smoke.
   d. A: So, John only said that to play GOLF is a waste, did he?
      B: No, but *he did only say that to WATCH golf is a waste.

In none of these examples is it possible for the intuitive associate of only to consist entirely of the deaccented expression, as predicted.26

---

26 As pointed out by a reviewer, when a deaccented expression $x$ is contained in an island and separated from an operator by a focus that is outside of that island, then association with $x$ is predicted to be possible. To see why, consider the following discourse:

(i) A: John met some men who smokes bananas.
    B: John only KNOWS men who smoke bananas.

(ii) John [[only [men who smoke bananas]]] [KNOWS t]

The analysis proposed in this paper generates a contrast set for only by applying some function $f$ to the syntactic associate of only when this associate is entirely deaccented, as it is here. This means that the contrast set will consist of individuals identifiable as $f([men who smoke bananas])$ for some function $f$. For some value of $f$, this will equal [[men who eat bananas]]. Using this value of $f$, B’s statement in (i)
5.2 Island Sensitivity

The analysis developed in section 4 accounts for the several readings available in (16) (repeated here) by allowing for any of three expressions to raise to only at LF.

(16) John/he only MET Sue.

As noted earlier, the intuitive associate of only can be any of the expressions met, Sue, or met Sue. The present analysis accounts for these intuitive associations by allowing the syntactic associate of only to be either the VP met Sue, the NP Sue, or the VP met t, with Sue raised to some position outside the VP. Candidate LF representations are given in (33), where I implicitly assume that the constituent that moves to only must be a maximal projection.27,28

is predicted to entail that John doesn’t know men who EAT bananas, generating an implied contrast between smoke and eat. I am uncertain at present whether this is a desirable consequence of the theory, the judgments being extremely subtle, though I believe that the prediction is in fact borne out, if only marginally.

27 It is a priori possible to allow non-maximal projections to move to an operator like only at LF. However, there appears to be little empirical motivation to do so, and if the suggestion in footnote 13 of accounting for the non-associability of fully reduced pronouns by analyzing these as clitics is on the right track there are good empirical reasons not to. In the case of (16), all relevant readings are readily accounted for without allowing for such a possibility. The same is true of the minimal variant of (16) in which the object NP Sue is deaccented, i.e.

(i) John only MET Sue

Here, the possible intuitive associates for only are the verb met and the object NP Sue. The former is generated by LF representations identical to (37a,c) except in having Sue deaccented, and the latter is generated by the counterpart of (37b) with a deaccented Sue. Since deaccented expressions do not get replaced in generating contrast sets when the syntactic associate contains a focus, taking the syntactic
(37)  a. John \([\text{only}(C_k) \ [\text{VP} \ \text{MET} \ SUE \tilde{t}_i \sim X_k] \ t_i] \]

b. John \([\text{only}(C_k) \ SUE \tilde{t}_i \sim X_k] \ [\text{VP} \ \text{MET} \ t_i]] \]

associate of only to be the VP in this example will properly account for the intuitive association between
only and the verb met. The details of generating contrast sets will be taken up in the next section.

28 One readily finds examples which look like they argue against a movement based analysis of
association, though upon closer inspection they can be seen to be compatible with the analysis developed
here. One such example is the sentence in (i).

(i) He only knows MARY’s MOTHER.

In this example, independent association is possible with either Mary (in the context “John knows
everybody’s father, but (i)”) or with mother (in the context “John knows both parents of most of his
friends, but (i)”). Neither of these potential associates is capable of independent overt syntactic
movement, as seen by the unacceptability of the examples in (ii).

(ii)  a. *Mother, he knows Mary’s

    b. *Mary(’s), he knows (’s) mother

While this looks initially problematic, it does not tell against the analysis developed unless the badness of
the examples in (ii) can be shown to derive from violations of movement constraints. In the case of (iib),
this is questionable (cf. Chomsky (1995)). Regardless of whether syntactic constraints on movement are
violated in this example, the movement will never be possible overtly for independent reasons.
Assuming Abney’s DP hypothesis and analyzing the possessive bound morpheme ’s as a D0 head,
movement of Mary+’s would constitute movement of a non-constituent. Leaving the ’s behind would
overcome this problem, but would run into problems at PF, where the bound morpheme’s presumably
needs to be licensed by being attached to the expression in its Spec position. Since this Spec position
would be empty, there would be nothing there for the ’s to attach to. Since this latter problem is
restricted to the PF component, it would not block movement at LF. Thus, if this is the only problem
with (iib), then an analysis which allows LF movement of Mary in (i) should be unproblematic.
c. \[\text{SUE}_j \left[ \text{John} \left[ \left( \text{only(C)} \right) \left\{ \text{MET}_t \right\} \neg \text{X}_k \right] t_i \right] \]

This analysis will account for the existence of island effects in the examples considered earlier in (20) (repeated below as (38)) provided that the LF representations required for generating the relevant associations necessitate movement of the associated focus alone to \textit{only}, i.e. if the LF representations required for generating the desired interpretation for these examples can be restricted to those in (39).

(38)  

a. ??John only left before he MET SUE  
b. *John only knows the man who LIKES SUE  
c. *John only knows who LEFT to SMOKE  
d. *John only said that to WATCH GOLF is a waste

(39)  

a. John \left[ \left( \text{only(C)} \right) \text{SUE}_i \neg \text{X} \right] \left[ \text{VP left before he MET } t_i \right] \]  
b. John \left[ \left( \text{only(C)} \right) \text{SUE}_i \neg \text{X} \right] \left[ \text{VP knows the man who LIKES } t_i \right] \]  
c. John \left[ \left( \text{only(C)} \right) \text{SMOKE}_i \neg \text{X} \right] \left[ \text{VP knows who LEFT } t_i \right] \]  
d. John \left[ \left( \text{only(C)} \right) \text{GOLF}_i \neg \text{X} \right] \left[ \text{VP said that to WATCH } t_i \text{ is a waste} \right] \]

In the present case, we have a straightforward reason for making such a restriction -- if the other focus is included in the syntactic associate of \textit{only}, it will be within the scope of the operator \(\neg \text{X}\), and will thus appear to associate with \textit{only}. Though this will result in a legitimate derivation, it will be one in which association is with both foci, and not the desired single association interpretation.

I used the examples in (38) to argue that Rooth’s analysis is not in itself sufficient to account for restrictions on association. That left open the possibility of modifying the analysis by adding movement and identifying the expression which generates contrast sets as the moved expression, as I have done here. However, this is not enough. Since Rooth’s analysis allows for embedded interpretation of focus, simply adding movement to the analysis makes it possible to generate LF representations for the sentences in (34) which give rise to the intuitive associations I
have claimed not to be possible. The representations that produce these associations are given in (40).

\[(40)\]
\[\begin{align*}
\text{a. } & \text{John }[[\text{only}(C_k) [\text{VP left before he } [\text{MET } t_j] \sim Y \text{ SUE}_i \sim X_k] ] t_j] \\
\text{b. } & \text{John }[[\text{only}(C_k) [\text{VP knows the man who } [\text{LIKES } t_j] \sim Y \text{ SUE}_i ] \sim X_k] ] t_j] \\
\text{c. } & \text{John }[[\text{only}(C_k) [\text{VP knows who } [\text{LEFT}] \sim Y \text{ to SMOKE}]_i \sim X_k] ] t_j] \\
\text{d. } & \text{John }[[\text{only}(C_k) [\text{VP said that GOLF}_i [\text{to WATCH } t_j] \sim Y \text{ is a } \\
\text{waste}]_j \sim X_k] ] t_j]
\end{align*}\]

In these representations, the non-associated focus is moved together with the associated focus. Non-association with a focus is derived in the same manner in which it was derived earlier for Rooth’s analysis, i.e. by interpreting its focus independently (here via the operator \(\sim Y\)). To exclude this possibility, I stipulate that no focus can be interpreted within another interpreted focus. I formalize this as a filter in (41).

\[(41)\] *[\ldots[\ldots] \sim Y\ldots] \sim X]

Since each of the examples in (40) violates this filter, those LF representations will not be admitted.29

---

29 Though this account is stipulative, I leave it as such without further justification. Various authors have argued for the need to allow embedded focus in treating a wide range of focus related effects, though none convincingly. (Cf. in particular Selkirk (1984)) The present analysis makes the necessary distinctions that embedded foci are intended to explain by separating interpretation of focus from identification of focus, following Rooth.
5.3 Clause Initial Operators

We are now ready to address the question of how to restrict association possibilities in order to account for the paradigm of examples considered earlier in (22) and (23), repeated here.

(22) Even John saw Mary.

(23)  
a. Even that John left surprised Mary.
b. Even the man Mary invited Bill insulted.
c. Even who Mary likes has Bill asked.
d. Only to save his life would Tom ever lie.
e. Only what John said does Bill know.
f. John saw only/even Mary’s mother leave the bar.
g. I consider only/even good students respectable.

The problem these examples posed, it will be recalled, is that the associate of even/only can only be (a sub-constituent of) the underlined expression in each of the examples, and yet it would appear necessary from a purely structural point of view to allow structures in which the c-command domain of the operators extends beyond the underlined expressions. This is a problem for Rooth and Krifka because their semantics make it possible in principle for an operator such as even or only to associate with any expression in its c-command domain.

To explain the data in (22) and (23), I start by adopting the semantics for even and only given in (32). This semantics requires that even and only take two syntactic arguments, the semantic interpretation of one of which applies to that of the other to yield an expression of type $t$. I take the second argument to be restricted to
predicates, and both arguments to be obligatory. To facilitate discussion, I refer to the former argument as the *functional* argument (since it is applies to the other argument as a function) and the latter as the *predicational* argument (since it is semantically restricted to being a predicate). The predicational argument I analyze as the internal syntactic argument of *even/only*, and the functional argument as the external argument. Given these assumptions, the explanation for the paradigm in (22) and (23) can be given as follows. First, assume that *only* and *even* form a constituent with expressions on their right in this paradigm. This allows minimally for two possible expressions with which the operator could form a constituent -- the underlined expression, and the constituent constituted of everything to the operator’s right.

Neither expression is predicational, and hence neither could be analyzed as the internal argument of *even/only*. The examples will only be acceptable, then, if that expression can be analyzed as its external, functional argument. In the cases in which the relevant

How to technically implement the idea that *only* selects a predicate remains a challenge. If the analysis is to be extended to occurrences of *only* within an NP, then the notion of predicate will have to include the head noun in NPs like *an only red shirt*. These NPs exhibit many of the same properties found in the examples in (23). In particular, *only* can be associated with *red* but not with *shirt*. Allowing a head noun to satisfy the predicational argument of *only*, however, leaves us without an immediate explanation for why *only* cannot occur immediately prior to *shirt* to produce the NP *a red only shirt* having the interpretation *a red *x* such that *x* is only a *shirt*. For reasons of time, I have to leave this question for future research.

It is of course also possible for the operator to be adjoined to any left-most sub-constituent of the underlined expression, though I will ignore this possibility throughout. What is crucial for explaining the paradigm is only that the maximal constituent to the right of the operator not be the expression adjoined to.
expression is the underlined expression, such an analysis is possible. In the cases in which the relevant constituent consists of everything to the right of the operator, on the other hand, it is not.

To see why this is so, consider the two possibilities for adjunction in (22). The underlined expression John is a DP (NP), which is a type of expression that can be type-raised. Taking this expression to be type-raised, it can then be analyzed as the functional argument of the operator since it can apply to the interpretation of the VP saw Mary to its right. The semantics will work properly provided that the internal argument of only is identified with this VP (or alternatively with I’). I take the actual internal argument to be a pro-predicate (written pro-p), and identify the value of this pro-p via coindexing. The acceptable interpretation in which association is with the underlined DP will then be generated by the following structure.

(42)

The semantic interpretation of this structure under the present analysis is given in (43) (see Appendix for details).

(43) \[(\text{saw(m,j)}) \& \exists R(\text{saw(m,z_i)}) \& R \subseteq C_k \& R \neq \lambda P.P(j_i)]

\& \text{unlikely'(saw(m,j))} \]

\( (C_k \subseteq X_k) \subseteq \{ \lambda P.P(x_i) \mid x \text{ is an individual} \} \)

The impossibility of taking even to form a constituent with the matrix IP (or CP) in (22) follows from the fact that there is no predicate to which this IP/CP (whether type-lifted
or not) could possibly apply, and hence no possible identity for pro-\( p \) which will make the sentence interpretable. Thus while potentially syntactically well-formed, the structure given in (44) is semantically uninterpretable.

(44)

The analysis just developed makes a clear prediction regarding the expressions with which an operator such as only or even can together form a constituent. This will only be possible for an expression \( x \) if \( x \) is itself a predicate, or if \( x \) is interpretable as a function which can take a predicate-like expression as its argument. DP and CP clearly satisfy this latter requirement, as do many adverbials. IP and small clauses, on the other hand, satisfy neither. It follows that adjunction of such an operator to an IP or small clause should be impossible, as appears to be the case.\(^{32}\) I leave it to the

\(^{32}\) A reviewer points out that the same expressions that are argued here to qualify as potential external arguments of even or only are the same expressions that can be \( \Lambda' \)-moved in the syntax: DPs, CPs and AdvPs, but not IPs or small clauses. The parallel could potentially be explained if movement to a position adjoined to a phrase P is semantically taken to involve some form of predicate abstraction over P. The resulting structure will only be interpretable if the predicate formed from P can be semantically combined with the moved expression. Pursuing such an explanation would of course require restricting the range of interpretations that can be generated by predicate abstraction, and at present I do not see a
reader to verify that the analysis given accounts for the restrictions on interpretation found in the remaining examples in (23).

The explanation just given accounts for all cases in which only forms a constituent with a non-predicational expression. It does not yet account for all cases in which only appears immediately before a predicate such as the VP of a single clause sentence. In particular, it does not yet account for cases of association with an object across a focused verb as in one interpretation of (16). We can account for this case by analyzing the VP directly as the internal argument of the operator. Such an analysis allows for the external argument position of the operator to be filled by LF movement of an expression contained within the VP. I illustrate this possibility for (16) (on the reading highlighted in (17c)) below.

(45)

In addition to providing an explanation to the problems outlined in section 3, the analysis illustrated in (42) and (45) has several further benefits. First, given the semantics of even and only from (32), it is straightforward to characterize the scope of these operators as the constituent which ultimately satisfies their internal thematic role.

straightforward way of accomplishing this. While these comments are inadequate, considerations of time prevent me from giving a more detailed analysis of the parallel between syntax and semantics.
In (45), this constituent is the VP headed by *met*, which is assigned a thematic role directly by *only*. This leads to the prediction that when embedded in a higher clause, the scope of *only* will remain fixed -- any change in scope would result in a theta-criterion violation. The prediction for (42), on the other hand, is the opposite. Since the internal thematic role of *even* is assigned to an empty *pro*-predicate, it is possible for the scope of *even* to change by altering the predicate with which this *pro*- *p* is coindexed. If embedded in a higher clause, it will thus be possible for *even* to take either embedded scope (with the structure in (42) remaining unchanged) or matrix scope (by raising the NP *even pro-p John* to the matrix clause and coindexing the *pro*-*p* in *even*’ with the matrix VP). This analysis accounts for the observation made in Taglicht (1984) that an operator such as *even* or *only* can take wider scope than the clause it occurs in when this operator is adjoined to an argument, but its scope is fixed when it precedes a clausal predicate, as illustrated in (46).33

(46)  
\begin{align*}
\text{a.} & \quad \text{I knew he had learnt only Spanish} \\
\text{b.} & \quad \text{I knew he had only learnt Spanish}
\end{align*}

Tancredi (1990a,b) argues that operators like *even* and *only* have to c-command their intuitive associate at S-structure (though see section 6 below for an exception to

33 I have until now left it as a stipulation that a *pro*- *p* argument of an operator such as *even* or *only* be coindexed with the predicate of its clause. However, it is straightforward to derive this identification as a consequence of other principles. If the *pro*- *p* is identified with a clause that it is contained within, then the interpretation procedure will lead to an infinite regress, resulting in lack of any semantic interpretation. If the *pro*- *p* is identified with a lower clause, or if it is identified with some expression outside of the sentence it is contained in, then (portions of) the sentence in which it occurs will occur vacuously, contributing nothing to the interpretation of the sentence as a whole. The identification assumed thus remains as the only viable alternative.
this generalization). Under the present analysis, the S-structure c-command requirement falls out naturally from the semantics of the operators together with plausible restrictions on syntactic movement, without having to be stipulated as an independent condition on S-structures as it was in these earlier analyses. The semantics given for *even* and *only* in (32) generates alternatives considered for comparison from the focus semantic value of the expression assigned the external thematic role of the operator. This has the effect that the intuitive associate of one of these operators will always be contained in this constituent. By hypothesis, the relevant theta assignment can be accomplished either via syntactically combining the operator with its external argument as in (42) or via raising an expression out of the internal predicate argument of the operator to its Spec position at LF as in (45). The c-command requirement follows from the plausible assumption that an operator cannot be base generated in a random position in a syntactic structure and moved without leaving an interpretable trace at LF. Under the first alternative, the only way for the operator to be a legitimate part of the syntactic structure at all will be for it to be syntactically combined with some expression, a requirement that plausibly needs to be met prior to entering the PF component.\footnote{In this instance, the operator itself will not strictly c-command its intuitive associate, though a projection of the operator will. The papers cited do not consider the possibility of operators having internal structure, and so the question of whether what was required was the standard notion of c-command or some other related notion did not arise.} Under the second alternative, S-structure c-command follows from restrictions on LF movement preventing lowering of an expression to a position it did not raise through.\footnote{Movement to *even/only* in the present analysis is motivated entirely by semantic requirements of the operator. The determination of the constituent that moves is semantically restricted, but is not}
6 Leftward Association: a Remaining Problem

While the above analysis covers a wide range of data, there remains at least one fact that it does not explain, namely the fact that even can but only cannot associate leftward with a subject across an intervening auxiliary verb, as illustrated below.

(47) a. JOHN can even do that

b. *JOHN can only do that

Unfortunately, I have little to say to shed light on the source of this distinction. However, there is some reason to think that its explanation should be at least partially pragmatic in nature in a way in which typical rightward association is not. In a typical case of rightward association with even, the operator itself can either be accented or not, as illustrated in (48).

(48) EVEN/even JOHN can do that

In (47), however, it is not possible to both place an accent on even and maintain its leftward association. This suggests that even in (47a) has to be part of the background in order for leftward association to be possible. If we follow Horn (1969) in splitting the semantics for only and even into a presupposition and an assertion, then perhaps the possibility of deaccenting even can be made to follow from the fact that it adds nothing to the assertion in (47a), in contrast to only in (47b) which obligatorily alters the assertion. That it is impossible to accent the operators does not appear to follow from such an analysis, however, indicating that this can at most be one part of the story syntactically identifiable in any fixed way. This movement thus differs from analyses of wh-pied piping such as that of Nishigauchi (1986), where the presence of a wh-feature on the moved expression is essential for motivating the movement. The absence of a clear syntactic trigger for the movement proposed here makes it difficult to see how the analysis can be incorporated into the Minimalist Program without postulating ad hoc features. I leave this question for future research.
needed. Turning these informal comments into a concrete analysis would take us far beyond the scope of this paper, and so I leave their pursuit for a later occasion.

7 Summary and Conclusion

In this paper, I have been concerned mainly with fixing up the syntax and semantics of the operators even and only within the general framework of Rooth (1992), assuming a full-fledged syntax. I argued for a unified semantic treatment of these operators which has the following properties:

i: Only and even each take two syntactic arguments.

ii: The internal argument is predicational and obligatory. If not filled by an overt predicate, it is filled by a pro predicate which gets identified with the predicate of the clause it immediately occurs in.

iii: The external argument applies to the internal argument to generate an expression of type t. The external argument can either combine overtly with the operator (when the operator has a pro internal argument) or be raised to the specifier position of the operator at LF from within an overt internal argument of the operator.

iv: The contrast set generated by the operators is constructed entirely from the external argument of the operator (perhaps indirectly via the operator ¬), and therefore the intuitive associate(s) of the operator must be contained within the operator’s external argument. The associate need not constitute the whole of that argument, however.

This analysis directly accounts for the distribution of island effects found with long-distance association, as well as for restrictions on association for operators in pre-clausal positions.
In the process of developing the above analysis, it has been necessary to alter some basic assumptions of Rooth (1992), upon which the analysis is constructed. Most significantly, I have shown that the notion of focus semantic value must be revised in order to account for cases of association with non-focused expressions. An analysis which derives focus semantic values from the Focus Related Topics of Tancredi (1995) (modified from Tancredi (1992)) was seen to overcome this shortcoming, while both making association with focus the predicted norm and allowing association with non-focused expressions whenever the syntactic associate of an operator contains no foci. Since focus semantic values play a role for Rooth in predicting contrast, scalar implicatures and felicitous question-answer pairs in addition to association with operators, these other areas will have to be examined more thoroughly to see whether this unified framework for treating focus-related effects can be upheld. Though I have adopted Rooth’s framework, the major claims of the paper can be translated into the framework of structured propositions adopted by Krifka, though I have not pursued this task here.

Appendix

In this appendix, I supply detailed semantic derivations for the sentence *John only saw MARY* under two potential LF representations of the sentence given below in (50) and (51), and for the sentence *Even John saw Mary* with the structure given in (42). As suggested in the text, the interpretations assigned to (50) and (51) are equivalent. I assume the interpretations of *only* and *even* given in (32) and repeated here.

(32)  
\[
\text{even: } \lambda Q . P(Q) \land \exists R \left[ R(Q) \land R \subseteq C \land R \neq P \right] \land \text{unlikely} 'P(Q) \\
\text{only: } \lambda Q . P(Q) \land \forall R \left[ R(Q) \land R \subseteq C \rightarrow R = P \right]
\]

Following Heim (1990), I interpret indexed traces as indexed semantic variables and use indices on non-variable expressions to trigger lambda abstraction over co-indexed variables. The specific convention I assume is given in (49).
(49) Convention for combining an expression containing free occurrences of a variable \(z_i (= \varphi(z_j))\) with an argument \(a_i\):

\[ \varphi(z_j)(a) = [a_i](\varphi(z_j)) = [\lambda z. \varphi(z)](a) = \varphi(a) \]

I assume throughout that the head I of IP is semantically vacuous.

(50)

<table>
<thead>
<tr>
<th>syntactic expression</th>
<th>normal semantic value</th>
<th>focus semantic value (where relevant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a John (_j)</td>
<td>(\lambda P. P(j)) (or (j))</td>
<td></td>
</tr>
<tr>
<td>b MARY (_i)</td>
<td>(\lambda P. P(m))</td>
<td>({\lambda P.P(x)lx \text{ is an ind.}} = {\lambda P.P(a), \lambda P.P(b),)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(\ldots, \lambda P.P(m), \ldots})</td>
</tr>
<tr>
<td>c (X_k)</td>
<td>({\lambda P.P(a), \lambda P.P(b), \lambda P.P(m)})</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(pragmatically determined by d)</td>
<td></td>
</tr>
<tr>
<td>d ([\text{MARY}_i] \sim X_k)</td>
<td>(\lambda P. P(m))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(presupposition: value of (X_k) is a subset of fsu(MARY) containing (\lambda P.P(m)) and at least one expression distinct from (\lambda P.P(m)))</td>
<td></td>
</tr>
<tr>
<td>e saw</td>
<td>(\lambda x \lambda y. saw(x,y))</td>
<td></td>
</tr>
</tbody>
</table>
\( f \) \( t_i \) \( z_i \)

\( g \) saw \( t_i \) \( \lambda y.\text{saw}(z_i,y) \)

\( h \) \( t_j \) \( z_j \)

\( i \) \( t_j \) saw \( t_i \) \( \text{saw}(z_i,z_j) \)

\( j \) only(\( C_k \)) \( \lambda Q \lambda P[Q(\lambda) \text{ & } \forall R[[R(Q) \text & \text{ R}=C_k] \rightarrow \text{ R}=P]] \)

\( k \) [only(\( C_k \) ) [\( t_j \) saw \( t_i \) ]]

\( \text{nsv:} \) \( \lambda Q \lambda P[Q(\lambda) \text{ & } \forall R[\text{ R}(Q) \text & \text{ R}=C_k] \rightarrow \text{ R}=P]](\text{ t}_j \text{ saw } \text{ t}_i \)

\( =\lambda P[\text{ P}(\text{ saw}(z_i,z_j)) \text{ & } \forall R[\text{ R}(\text{ saw}(z_i,z_j)) \text & \text{ R}=C_k] \rightarrow \text{ R}=P]](\lambda \text{ P}(\text{ m}_j)) \)

\( \text{nsv:} \) \( \lambda P[\text{ P}(\text{ saw}(z_i,z_j)) \text{ & } \forall R[\text{ R}(\text{ saw}(z_i,z_j)) \text & \text{ R}=C_k] \rightarrow \text{ R}=\lambda P(\text{ m}_j)](\lambda \text{ P}(\text{ m}_j)) \)

\( \text{nsv:} \) \( \text{ [John}_j \text{ [MARY}_i \text{ only}(\text{ C}_k) \text{ t}_j \text{ saw t}_i \text{ ]]} \)

\( \text{nsv:} \) \( \text{ [saw}(\text{ m},\text{ z}_j) \text & \forall R[\text{ R}(\text{ saw}(z_i,z_j)) \text & \text{ R}=C_k] \rightarrow \text{ R}=\lambda P(\text{ m}_j)]\text{ (j)} \)

\( =\text{ John saw Mary, and if an expression is in the set } \{\lambda \text{ P}(a_i), \lambda \text{ P}(b_i), \lambda \text{ P}(m_j)\} (=C_k=\text{ X}_k) \) \text{ and applies to the property saw}(z_i,j) \) \text{ then that expression is the expression } \lambda \text{ P}(\text{ m}_j), \text{ i.e. the interpretation of Mary}_j. \)

This is equivalent to:

\( \text{ [saw} \text{ (m},\text{ j) & \forall y[[\text{ saw}(y,j)) \text & \text{ y}=\{a,b,m\}] \rightarrow \text{ y=m} \)
(51)

expression  normal semantic  focus semantic value

value  (where relevant)

(a, e and h as above)

a'  MARY  m

b'  saw MARY  λy.saw(m,y)

c'  [t_j saw MARY]_i  [saw(m,z_j)]_i  \{[saw(x,z_j)]_i | x is an ind\}

=\{[saw(a,z_j)]_i,[saw(b,z_j)]_i,

...,[saw(m,z_j)]_i,...\}

d'  X_k  \{[saw(a,z_j)]_i,[saw(b,z_j)]_i,[saw(m,z_j)]_i\}

(pragmatically determined as in e')

e'  [t_j saw MARY]_i ~X_k  [saw(m,z_j)]_i

(presupposition: value of X_k is a subset of fsv([t_j saw MARY]_i) containing

[saw(m,z_j)]_i and at least one expression distinct from [saw(m,z_j)]_i)

f'  t_i  Z_i

g'  [only t_i]
\[
\text{nsv: } \lambda Q \lambda P[Q(P)] \land \forall R[[R(Q) \land R \in C_k] \rightarrow R=P](Z_i)
\]
\[
= \lambda P[P(Z_i) \land \forall R[[R(Z_i) \land R \in C_k] \rightarrow R=P]]
\]
\[
\text{h'} \quad [t_j \text{ saw MARY}]_i \text{ [only } t_j]\]
\[
\text{nsv: } \lambda P[P(Z_i) \land \forall R[[R(Z_i) \land R \in C_k] \rightarrow R=P]]([\text{saw}(m,z_j)]_i)
\]
\[
= [[\text{saw}(m,z_j)]_i(Z_i) \land \forall R[[R(Z_i) \land R \in C_k] \rightarrow R=[\text{saw}(m,z_j)]_i]]
\]
\[
= [[\text{saw}(m,z_j) \land \forall R[[R(Z_i) \land R \in C_k] \rightarrow R=[\text{saw}(m,z_j)]_i]]
\]
\[
\text{i'} \quad [\text{John}_j \quad [t_j \text{ saw MARY}]_i \text{ only } t_j]\]
\[
\text{nsv: } [[\text{saw}(m,z_j) \land \forall R[[R(Z_i) \land R \in C_k] \rightarrow R=[\text{saw}(m,z_j)]_i]](j_i)
\]
\[
= [[\text{saw}(m,z_j) \land \forall R[[R(Z_i) \land R \in \{[\text{saw}(a,z_j)]_i, [\text{saw}(b,z_j)]_i, [\text{saw}(m,z_j)]_i\} \rightarrow R=[\text{saw}(m,z_j)]_i]](j_i)
\]
\[
= [[\text{saw}(m,j) \land \forall R[[R(Z_i) \land R \in \{[\text{saw}(a,j)]_i, [\text{saw}(b,j)]_i, [\text{saw}(m,j)]_i\} \rightarrow R=[\text{saw}(m,j)]_i]]
\]
\[
= \text{ John saw Mary, and any expression which applies to the variable } Z_i \text{ and which is in the set of expressions } \{[\text{saw}(a,j)]_i, [\text{saw}(b,j)]_i, [\text{saw}(m,j)]_i\} \text{ is the expression } [\text{saw}(m,j)]_i.
\]
\[
\text{This is equivalent to:}
\]
\[
[[\text{saw}(m,j) \land \forall y[[\text{saw}(y,j)] \land y \in \{a,b,m\}] \rightarrow y=m]
\]

Note that the semantic value of \(C_k\) needs to be fixed within the semantic interpretation of the sentence prior to combination of onlyP with the subject in order to generate the proper interpretation in \(i'\). This is not a problem if it is assumed that the semantics generates a value for \(C_k\) at random (or perhaps a whole set of values) with improper values filtered out in the pragmatic component.
Expression | Normal Semantic | Focus Semantic Value | Value
---|---|---|---
\(a''\) Mary | \(m\) |  | 
\(b''\) saw | \(\lambda x\lambda y.\text{saw}(x, y)\) |  | 
\(c''\) \([\text{saw Mary}]_j\) | \([\lambda y.\text{saw}(m, y)]_j\) |  | 
\(d''\) \(t_i\) | \(z_i\) |  | 
\(e''\) \([t_i \text{saw Mary}]_j\) | \([\lambda y.\text{saw}(m, y)(z_i)]_j\) |  | 
\(= [\text{saw}(m, z_i)]_j\) |  |  | 
\(f''\) John_{i} | \(\lambda P.P(j_{i})\) | \{\(\lambda P.P(x_{i})|x_i\) is an ind.\} | 
\(=\{\lambda P.P(a_{i}), \lambda P.P(b_{i}),\) | 
\(\ldots, \lambda P.P(j_{i}), \ldots\}\) |  | 
\(g''\) \(X_{k}\) | \{\(\lambda P.P(a_{i}), \lambda P.P(b_{i}), \lambda P.P(j_{i})\}\} | (pragmatically determined by \(h''\)) | 
\(h''\) \([\text{John}_{i} \sim X_{k}]\) | \(\lambda P.P(j_{i})\) | (presupposition: value of \(X_{k}\) is a subset of \(\text{fsv(John}_{i})\) containing \(\lambda P.P(j_{i})\) and at least one expression distinct from \(\lambda P.P(j_{i})\)) | 
\(i''\) pro-\(p_j\) | \(Z_j\) |  | 

j” even \( \lambda Q \lambda P[P(Q) \land \exists R[R(Q) \land R \in C \land R \neq P] \land \text{unlikely}'P(Q)] \)

k” even pro-\( p_j \) \( \lambda P[P(Z_j) \land \exists R[R(Z_j) \land R \in C \land R \neq P] \land \text{unlikely}'P(Z_j)] \)

l” [even pro-\( p_j \) [John \( \sim X_k \)]

\[ \text{nsv: } [\lambda P.P(j_i) ][(Z_j) \land \exists R[R(Z_j) \land R \in C \land R \neq \lambda P.P(j_i)] \land \text{unlikely}'[\lambda P.P(j_i) ][(Z_j)] \]

\[ = Z_j(j_i) \land \exists R[R(Z_j) \land R \in C \land R \neq \lambda P.P(j_i)] \land \text{unlikely}'Z_j(j_i) \]

\[ \text{m” even pro-\( p_j \) [John]~\( X_k \) [t \( \sim X_k \) saw Mary]\( j \)]

\[ \text{nsv: } [\text{saw}(m,z_i)](Z_j(j_i) \land \exists R[R(Z_j) \land R \in C \land R \neq \lambda P.P(j_i)] \land \text{unlikely}'Z_j(j_i)) \]

\[ = [\text{saw}(m,z_i)](j_i) \land \exists R[R([\text{saw}(m,z_i)]) \land R \in C \land R \neq \lambda P.P(j_i)] \land \text{unlikely}'[\text{saw}(m,z_i)](j_i) \]

\[ = \text{saw}(m,j) \land \exists R[R([\text{saw}(m,z_i)]) \land R \in C \land R \neq \lambda P.P(j_i)] \land \text{unlikely}'[\text{saw}(m,j)] \]

References


Atlas, Jay David (1991) Topic/Comment, Presupposition, Logical Form and Focus

Stress Implicatures: The Case of Focal Particles only and also. *Journal of Semantics* 8: 127-147.


Heim, Irene (1990) *Introduction to Formal Semantics*. ms. MIT.


Rooth, Mats (1985) *Association with Focus*. Doctoral dissertation, University of Massachusetts, Amherst: GLSA.


Tancredi, Christopher (1990a) Not Only Even, but Even Only. ms., MIT.


