ASSOCIATION WITH FOCUS

A Dissertation Presented

By

Mats Edward Rooth

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Department of Linguistics

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Three Northampton institutions contributed to the quality of my life there: the Pleasant Street Theater, the Smith College Library, and the Big Y Liquor Supermarket (which sometimes gives discounts to graduate students).

The author was born on a mountaintop in Stockholm.

ABSTRACT

Association with Focus

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Suppose John introduced Bill and Tom to Sue and performed no other introductions. Then (i) "John only introduced Bill to SUE" is true, while (ii) "John only introduced BILL to Sue" is false, where capitalization symbolizes a focus marked by a phonetic prominence. Two analyses of this phenomenon of association with focus are considered. The scope theory posits a logical form in which the focused phrase and a lambda abstract with a bound variable in the position of the focused phrases are arguments of "only". According to the domain selection theory I propose, (i) and (ii) have a function-argument structure mirroring the syntax. The translation of "only" has two arguments, the VP translation and the translation of the subject NP; (i) expresses a quantification over properties. Focus contributes to the meaning of (i) by delimiting the domain of quantification to properties of the form 'introduce Bill to y', where y is an individual. This yields an assertion: if John has a property of the form

'introduce Bill to y', then it is the property 'introduce Bill to Sue'. This is similar in truth conditions to the assertion produced by the scope theory, namely 'if John introduced Bill to y, then y is Sue'. This idea is executed by including a recursive definition of the sets which will serve as domains of quantification in a Montague grammar.

It is argued that the domain selection theory is superior in several ways. In particular, no bound variable in the position of the focused phrase is postulated; the relation between "only" (or "even") and a focused phrase violates structural conditions on bound variables. Chomsky's crossover argument for assigning scope to focused phrases is answered.

The proposal is extended to cases where "only" and "even" modify NP and various other categories by means of a crosscategorial semantics analogous to the crosscategorial semantics for conjunction proposed by Gazdar and others.

Other constructions discussed are association of focus with adverbs of quantification (MARY always takes John to the movies, Mary always takes JOHN to the movies), clefts (it is JOHN's father who came, it is Johns FATHER who came), and conditionals.

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C H A P T E R I

INTRODUCTION

1. Association with Focus: the Problem

Once I invited Carl to dinner. Yasuaki, who overheard the conversation, later warned me that Carl is a finicky eater, and likes few foods. I replied that this wouldn't be a problem. I said, "Carl likes HERRING, and that is what I am serving. I like herring too."

That afternoon Dave saw me purchasing some herring at the supermarket, and commented that no one really liked it. I replied that this wasn't true. "CARL likes herring, and he is dining at my place tonight."

I said the sequence of words "Carl","likes","herring" twice. Since the structures of the conversations in which these utterances occurred differed, I used different intonations. When talking to Yasuaki, I gave "herring" an intonational prominence; when talking to Dave, I gave "Carl" an intonational prominence, or as I shall say focused it. Focusing is indicated here by capitalization.

(1a) and (1b), the sentences I said to Yasuaki and Dave respectively, differ in some way. This is not a difference

in truth conditions; whatever the facts of the matter are, either both are true or both are false.

(1)a. Carl likes HERRING
b. CARL likes herring

Consider however (2a) and (2b), sentences having (1a) and (1b) respectively as subconstituents.

(2)a. I only claimed that Carl likes HERRING
b. I only claimed that CARL likes herring

(2a) is a true description of what happened on the day in question. For while I believed that Carl would like the beer I bought on the way home from the supermarket (supermarkets in Massachusetts don't sell beer), I kept this opinion to myself. (2b) on the other hand is clearly false, for in my conversation with Yasuaki I claimed that I like herring.

The technical term association with focus, introduced in Jackendoff (1972), refers to semantic effects of focus of this kind, in this case an effect on truth conditions. only is said to be "associated" with the focus on herring in (2a). Association with focus can be illustrated with simpler sentences as well:

(3)a. I only introduced BILL to Sue
b. I only introduced Bill to SUE

Suppose I introduced Bill and Tom to Sue, and performed

no other introductions. Then (3a) is false and (3b) is true.

My perspective on association with focus is that of Dretske(1972). While his discussion is based on a different class of examples, he succinctly states the problem posed by (1), (2), and (3):

> "Contrastive differences ..., however one may choose to classify these differences, are significantly involved in determining the meaning (hence, semantics) of a variety of larger expressions in which they are embedded. If C(U) is a linguistic expression in which U can be embedded, and U can be given different contrastive foci (say U_1 and U_2), then it often makes a difference to the meaning of C(U) whether we embed U_1 or U_2. Linguistically this is important because it means that any adequate semantical theory, one that is capable of exhibiting the source of semantical differences between complex expressions, between $C(U_1)$ and $C(U_2)$, will have to be provided with the resources for distinguishing between U_1 and U_2."

Dretske's "contrastive differences" are what I call differences in focus.

In my first example, U_1 is "Carl likes HERRING" (i.e. (1a)), U_2 is "CARL likes herring" (i.e. (1b)), and C is "I only claimed that ---". In this essay I will provide the resources for distinguishing (1a) from (1b) and show how these resources may be exploited to exhibit the source of the semantic difference, i.e. the difference in truth conditions, between (2a) and (2b). The most carefully

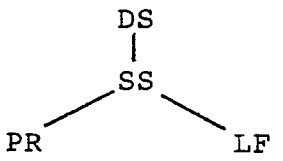
developed part of my proposal is the analysis of association of only and even with focus, versions of which are presented in chapters II and III. In subsequent chapters the analysis is extended with varying degrees of precision to other instances of association with focus, including one of those discussed by Dretske.

The remainder of this preliminary chapter outlines the syntactic and semantic frameworks I will be employing, with emphasis on the representation of focus.

2. EST grammar with Model Theoretic Interpretation

In order to maximize points of contact with the literature discussed, chapter II is based on a semi-recent version of transformational grammar embodying the organization of grammar of Chomsky and Lasnik (1977):

(4)



DS: "deep" structure
SS: "surface", "shallow", or S structure
PR: phonological representation
LF: logical form

DS, SS, and LF are related by movement and indexing rules. For instance, (5a,5b,5b), (6a,6a,6b), and (6a,6a,6c) are triples consisting of derivationally related deep structures, S-structures, and logical forms.

(5)a. I wonder John likes who
b. I wonder who$_2$ John likes $[_{NP}]_2$

(6)a. everyone likes someone
b. [someone$_2$[everyone$_3$[$[_{NP}]_3$ likes $[_{NP}]_2$]]]
c. [everyone$_3$[someone$_2$[$[_{NP}]_3$ likes $[_{NP}]_2$]]]

The movement creating (5a) is informally described as wh-movement, that creating (6b) as quantifier construal (QR). The indexed empty category (or "trace") $[_{NP}]_i$ created by movement is sometimes abbreviated e_i or t_i.

That the S-structure (6a) is derivationally related to distinct logical forms provides the basis for an account of the quantifier scope ambiguity of (6a); the ambiguity inherent in the S-structure (6a) is resolved at LF. Extending this point, I regard LF as a disambiguated language for which a model theoretic truth definition in the style of Montague (1973, called "PTQ") is provided. The truth definition takes the form of a recursive definition of the translations of LF phrases in Montague's intensional logic (IL). IL is in turn provided with a recursive definition specifying the denotations of IL phrases in a model. The translation procedure is illustrated in (8), a derivation of the IL translation for the logical form (7).

(7) [[some man]$_2$[John finds e_2]]

(8) LF phrase	IL translation	semantic type
e_2	x_2	e
[finds e_2]	find'(x_2)	<e t>
John	j	e
finds	find'	<e <e t>>
[John finds e_2]	find'(x_2)(j)	t
[some man]	some'(^man')	<<s <e t>> t>
[[some man]$_2$[John finds e_2]]	some'(^man')(^λx_2[find'(x_2)(j)])	t

The semantic type assignments differ from those of PTQ in two respects. Following Bennett(1974), individual concepts (type <s e>) are replaced by individuals (type e) throughout. Second, Montague's functional relationship between syntactic and semantic types is not observed; while the NP [some man] has the type Montague assigned to NPs (modulo the Bennett modification), the trace and proper name have type e. A corresponding adjustment is made in the extensional transitive verb finds: it has semantic type <e <e t>> in place of Montague's <<s<<s<<s e>t>>t>><<s e>t>>. Partee and Rooth(1983), Rooth and Partee(1983), provided an argument for exactly this type assignment for extensional transitive verbs. While their argument does not motivate a split semantic type assignment for NPs, they suggested this as a natural extension of their rule system. The split type

assignment has a simplifying though non-essential role in the analysis of focus, and produces more readily comprehensible IL translations.

The translation rules employed in (8) are:

(9)

	Configuration	Interpretation
a.	$[_{VP}$V NP]	V'(NP')
b.	$[_{S}$NP VP]	VP'(NP')
c.	$[_{NP}$Det N]	Det'(^N')
d.	$[_{S}NP_i$ S]	NP'(^λx_iS')

It has been suggested (Klein and Sag 1981) that the semantic rules corresponding to various syntactic rules are in many cases predictable. In particular, function argument rules such as the first three in (9) can be taken as default semantic rules, the identity of the translation which serves as the function being determined by the semantic types of the constituent phrases.

(10) Default function/argument combination

The IL translation of [A B] or [B A], where A' and B' are the IL translations of A and B respectively, is:

a. A'(B'), if A' has type <b c> and B' has type b

b. A'(^B'), if A' has type <<s b> c> and B' has type b

If we like, part of (9d) can be factored out as well. The semantic rule for the quantifier construal configuration $[_{S}NP_i$ S] need only specify that NP' and λx_iS' are combined

as A' and B' are combined in (10).

Given the split type assignment, default function/argument combination has a consequence apart from a simplification in semantic rules. Since phrases of different semantic type can have like syntactic category, and since the default function/argument combination is sensitive to semantic type, in a given syntactic configuration it is not predictable from information about syntactic category alone which phrase's translation will serve as a function. For instance, a subject may be either function or argument:

(11) $[_S[_{NP}$someone$]\ [_{VP}$stinks$]]$
<<s <e t>> t> <e t>

translation: someone'(^stink')

$[_S[_{NP}$John$]\ [_{VP}$stinks$]]$
e <e t>

translation: stink'(j)

It is usually assumed that QR is obligatory for quantified NPs (e.g. in May 1977). This would be so if QR must apply to quantified NPs in order that they may be interpreted. Given the rules sketched above, this would be true of a quantified NP which is the object of an extensional transitive verb. Unless an additional interpretive principle is provided, (12a) and (12b) can not combine to give an interpretation for $[_{VP}$finds $[_{NP}$every

man]]. (12c) on the other hand can be interpreted in the normal way.

(12)a. find' semantic type: <e <e t>>
b. [every man]' semantic type: <<s <e t>> t>
c. [[every man]$_7$[David finds e_7]

Partee and Rooth argued that an additional interpretive principle was in fact motivated. But since this point is not relevant here, I will leave the question whether QR can be "forced" by the rules of semantic interpretation open. What is relevant to part of the discussion in chapter II is the possibility of interpreting an NP with type e which has undergone QR. Such NPs can be interpreted, given the modification of (9d) contemplated above:

(13) a. [$_S$[John]$_7$[$_S$David finds e_7]
type e

b. λx_7[find'(x_7)(d)](j)

(13b), the interpretation for (13a), follows from the clause of (10), A' being x_7[find'(x_7)(d)] and B' being j. In this case the interpretation is equivalent to the one obtained when QR does not apply; we will see below that this is not so in certain richer systems of interpretation.

3. Representation of Focus

My assumptions about the representation of focus in the grammar are standard. That is, I assume that focus is a feature marked on syntactic phrases (cf. Jackendoff 1972, Selkirk 1984). More than one phrase may be marked:

(14)a. SHE insulted HIM
b. $[[\text{she}]_F$ insulted $[\text{him}]_F]$

In examples, the focus feature F is written as a subscript on phrases.

Given EST the organization of grammar (4), focus must be marked in S-structure, since it has correlated phonological/phonetic and semantic/pragmatic aspects; PR is where phonology happens, LF is the locus of semantic interpretation, and SS is the link between the two. The analytic problem then has two parts: (i) what is the semantic or pragmatic interpretation of F (presumably at LF)? and (ii) how is F phonologically and/or phonetically interpreted?

According to an influential theory, focus divides a sentence into "new information" and "old information". This is often illustrated by means of question/answer dialogues such as those is (15).

(15) a. Who did John introduce Bill to?
b. John introduced Bill to SUE
c. Who did John introduce to Sue?
d. John introduced BILL to Sue

The focused phrase is described as new information, since this is what the answerer conveys to the questioner. The balance of the response is in some way already known by the questioner, and thus is "old information".

Jackendoff(1972), and its successors Williams(1980), and Selkirk(1984), adopt versions of this theory. Jackendoff derived a level of representation for old information (for him, "presupposed" information) in two steps:

(16) (i) substitute variables for the focused phrases, giving the Presup of the sentence

(ii) lambda abstract the focus variables to produce a relation, the presuppositional set of the sentence

Sometimes I will refer to Jackendoff's Presup as a "presupposition skeleton". The answer component of (15a) is manipulated in the following way:

(17)a. introduce'(j,b,y)
b. λyintroduce'(j,b,y)

(17b) is a one-place relation, i.e. a property. The last step in Jackendoff's derivation is to form an actual "presupposition":

(18) λyintroduce'(j,b,y)

$$\left\{\begin{array}{l}\left.\begin{array}{l}\text{is a coherent set}\\ \text{is well-defined}\end{array}\right\}\\ \\ \text{is amenable to discussion}\\ \text{is under discussion}\end{array}\right. \text{ in the present discourse}$$

An alternative which Jackendoff rejects is that (15b) presupposes that John introduced Bill to someone. He points out that an acceptable response to (15a) is "John introduced Sue to NOBODY" (this wasn't his example), which has the same focal properties, but explicitly denies the alleged presupposition.

The focus-influenced component of meaning which I will employ is a variation on Jackendoff's intermediate representation Presup. In the system of interpretation which I am employing, Jackendoff's proposal could be executed by letting a logical form phrase **a** have two denotations. **a'** is the normal denotation. In the other, the Presup **a"**, distinguished variables of appropriate type have been substituted for focused phrases. **a"** can be derived by a recursive definition:

(19) Recursive definition of presupposition skeleton

a" is
(a) a variable matching **a'** in semantic type if **a** bears the feature F
(b) **a'**, if **a** is a non-focused non-complex phrase
(c) obtained by applying the semantic rule for **a** to $\mathbf{b}_1$" ... $\mathbf{b}_n$", where $\mathbf{b}_1$ ... $\mathbf{b}_n$ are the component phrases of **a**.

This definition can be modified to generate an object which allows a slightly different analysis of (15). The way I would like to think of the question-answer paradigm is that a question introduces a set of alternatives into a discourse; the alternatives introduced by (15a) are propositions of the form introduce'(j,b,y), where y is some individual. The function of the focus in the answer (15b), I suggest, is to signal that alternatives of this form are indeed under consideration:

Who did John introduce Bill to?

presents alternatives of the form introduce'(j,b,y)

John introduced Bill to SUE

signals that alternatives of this form are under discussion

(15d) as a reply to (15a) would incorrectly suggest that alternatives of the form introduce'(j,y,s) are under consideration.

The revision (20) of (19) recursively generates these sets of alternatives, which I will call p-sets.

(20) Recursive definition of p-sets

a" is
(a) The set of objects in the model matching **a**' in type, if **a** bears the feature F
(b) the unit set **a**', if **a** is a non-focused non-complex phrase
(c) the set of objects which can be obtained by picking one element from each of the p-sets corresponding to the component phrases of **a**, and applying the semantic rule for **a** to this sequence of elements, if **a** is a non-focused complex phrase.

In the example (15b), [John] falls under (20b) and [John]' is j, so [John]" is $\{j\}$. [introduced]", [Bill]", and [to]" are similarly unit sets. $[Sue]_F$ is focused, so its p-set is E, the set of individuals in the model. [to $[Sue]_F$] falls under (c). [to]" is a unit set, so exactly one element , namely to' can be picked from it. Thus [to $[Sue]_F$]" is the set $\{to'(x) \mid x \in E\}$, which is simply E, assuming that to' is the identity function. Similarly, [introduced Bill to [Sue]]" is the set of things which can be obtained by picking one element from [introduce]", one from [Bill]", one from [to $[Sue]_F$]", and combining them by means of the semantic rule for [introduced Bill to Sue], which is function application:

$$\{f(x,y) \mid f \in [\text{introduce}]" \ \& \ x \in [\text{Bill}]" \ \& \ y \in [\text{to } [Sue]_F]"\}$$

This is equivalent to

$\{introduce'(b,y) \mid y \in E\}$, since [introduce]" and [Bill]" are

the unit sets of introduce' and b, respectively. Similarly, [John introduced Bill to $[\text{Sue}]_F$]" is

$$\{f(x) \mid f \in [\text{introduced Bill to } [\text{Sue}]_F]\text{" } \& \text{ } x \in [\text{John}]\text{"}\},$$

which is equivalent to

$\{\text{introduce}'(b,y)(j) \mid y \in E\}$, since [John]" is $\{j\}$.

A similar computation shows that [John introduced $[\text{Bill}]_F$ to Sue]" is $\{\text{introduce}'(y,s)(j) \mid y \in E\}$. As desired, this is the set of "alternatives" of the form "John introduced y to Sue".[1]

4. Interpretation of Focus in Place

(20) is a recursive definition of a focus-influenced component of meaning. While interpretation is assumed to take place at LF, the examples discussed do not crucially involve logical froms distinct from surface structures; focused phrases are, or at least can be, interpreted "in place". Chomsky (1976) proposed that a process analogous or identical to QR assigns scope to focused phrases, so that (15b) has the logical form:

(21) $[_S[_{NP}\text{Sue}]_{F,4}[_S\text{John introduces Bill to } e_4]]$

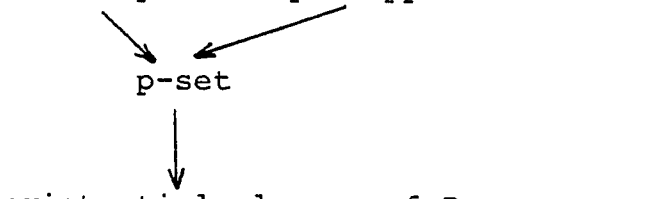
It is instructive to compare this proposal to my version (19) of Jackendoff's definition of Presup. Both involve a variable in the position of a focused phrase. In Chomsky's

proposal, the variable is a syntactic variable at LF, that is a trace. In a system employing (19), no syntactic variable need be present; rather, the meaning of the feature F in LF is taken to be that a semantic object with variables in the positions of focused phrases is available. The definition of p-sets should be seen in the same light.

Chomsky's argument for scope assignment to focused phrases, which has to do with the crossover phenomenon, is reviewed in chapter II, after some technical issues in the definition of p-sets have been addressed. It turns out that the crossover data are consistent with my proposal.

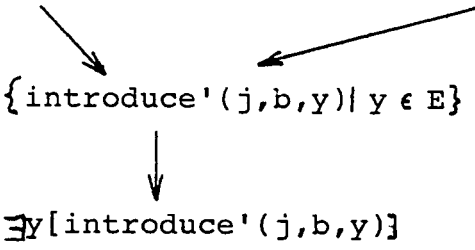
My discussion of the question-answer paradigm had two parts: (i) a definition of a focus-influenced component of meaning and (ii) an (informal) principle utilizing this component to characterize well-formed discourses, in particular well-formed question/answer pairs. When comparing candidates for (i), certain logical relationships should be kept in mind. Suppose we have a principle of (ii) which refers to p-sets as defined in (20). This could be modified into a principle refering to Presups as defined in (19), since there is a natural map from Presups to p-sets. The relationships between the candidates for (i) discussed above are:

(22)a. Presup ⟷ presupposition set



existential closure of Presup

b. introduce'(j,b,y) ⟷ λyintroduce'(j,b,y)



Presups and presupposition sets encode the same information, modulo some problems having to do with the order of variables and arguments. Either can be mapped in a natural way to p-sets. The existential closure of the Presup can be recovered as the (possibly infinite) disjunction of the elements the p-set; this fact is relevant in chapter V.

The significance of these relations is that should it be shown, for instance, that Jackendoff's presupposition set (the relation with argument positions corresponding to focused phrases defined in (16)) is the proper choice for (i), any results obtained using p-sets, specifically my treatment of association with focus, could be preserved. This is important, since my discussion of how p-sets might

be used in the theory of discourse was schematic.

5. Phonological Interpretation

While this is not the topic that I am investigating, it is interesting to see how the proposal made in the previous section fits in with an explicit theory of the phonological interpretation of focus. Selkirk (1984) makes a proposal which shares my basic assumptions, and which raises some interesting problems. The core of Selkirk's proposal is that the phonological reflex of focus is a pitch accent. She employs Pierrehumbert's theory of English intonation, in which intonational contours are analyzed in terms of high (H) and low (L) tones (Pierrehumbert 1980). An intonational contour consists of a series of pitch accents, a phrase accent and a boundary tone. The phrase accent and boundary tone are single tones. Pitch accents consist of either one or two tones. (23) is a minimal intonational contour.

(23) (from Selkirk 1984 and Pierrehumbert 1980)

H* L H%
|
Legumes$_F$ are a good source of vitamins

L is the phrase accent and H% is the boundary tone (boundary tones are written with a following %). The pitch accent H* is linked to the most prominent syllable in [legumes], which is the sole focused phrase in (23). The

star in a pitch accent identifies the tone which is linked in this way; thus L*+H and L+H* are distinct pitch accents. Selkirk's Basic Focus Rule associates a pitch accent with a word marked with the focus feature in S-structure. Autosegmental mapping rules ensure that the starred tone is associated with the most prominent syllable of the focused word, where prominence is defined in terms of a metrical grid (Prince 1983). The focus feature has no phonological effect aside from this. In particular the choice of intonational contour (e.g. the choice between the various pitch accents) is free as far as focus is concerned (Selkirk, p. 200).

Thus a pitch accent is the phonological interpretation of the focus feature. The string of tones is itself a level which must be interpreted; Pierrehumbert proposes a quantitative theory of phonetic interpretation.

If we confined our attention to focused words, Selkirk's proposal would be a translation into the pitch accent formalism of earlier ones stated in terms of stress. For instance, Jackendoff imposed the condition:

> If a phrase P is chosen as the focus of a sentence S, the highest stress in S will be on the syllable of P that is assigned the highest stress by the regular stress rules.

(This doesn't take into account multiple foci, but see Jackendoff(1972), p 241.)

In the case of a focused word, this syllable is the one which Selkirk's basic focus rule, in conjunction with autosegmental association rules, associates with a pitch accent.

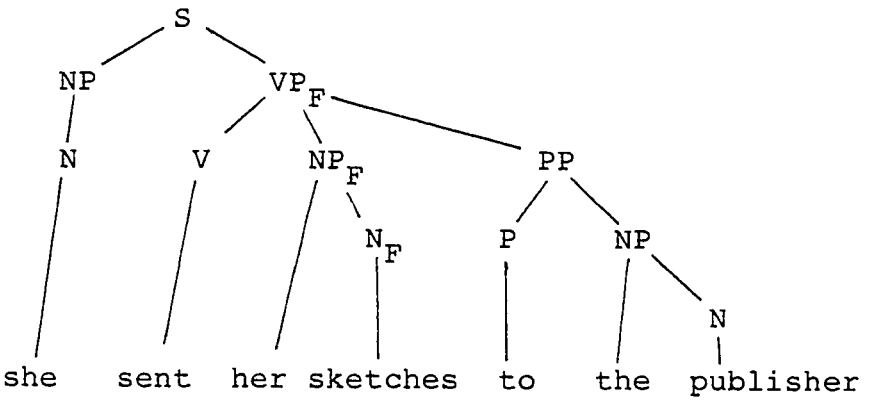
However, Selkirk argues that Jackendoff's analysis, which she calls the Nuclear Stress Rule-Focus analysis (since prominence falls on the syllable of the focused phrase which is assigned greatest prominence by the nuclear stress rule of Chomsky and Halle (1968)), gives the wrong result for complex phrases. For instance, (24) can have an "intonational meaning" which corresponds to a focused VP, rather than a focused NP. That is, it can be the answer to "What did Mary do?" as well as to "What did Mary send to the publisher?".

(24) Mary sent her SKETCHES to the publisher

Jackendoff's analysis predicts prominence on the first syllable of [publisher] when the VP is focused; this is a possibility, but not the only one.

In response to examples of this kind, Selkirk proposes that focus features on complex phrases are not phonologically interpreted (e.g. by assigning a pitch accent or stress feature to the most prominent syllable of the phrase). Rather, a focused complex phrase inherits its focus from one of its daughters:

(25) (Selkirk p 215)



In this tree, only the focus on [sketches] is phonologically interpreted.

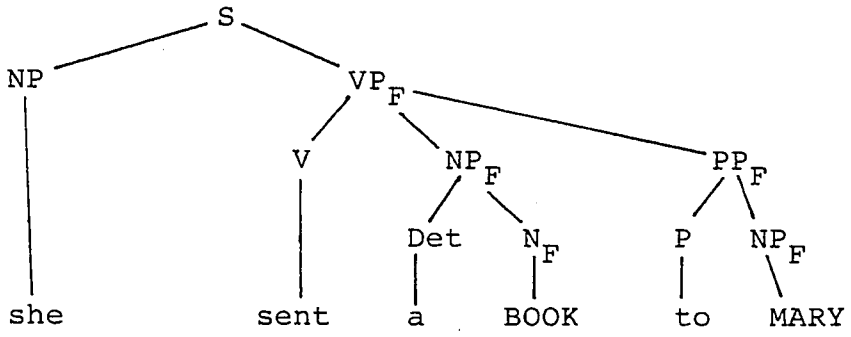
Focuses can percolate (i) to X-bar phrases from their heads and (ii) to a phrase interpreted as a function plus arguments from the argument phrases. The VP focus in (25) is a case of the second kind.

An interesting aspect of this analysis is that the prominence on sketches in (25) does not serve merely to mark focus on VP; embedded foci have a semantic/pragmatic significance. Selkirk employs the distinction between new and old information. In (25), the VP [sent her sketches to the publisher] and the NP [her sketches] are classified as new information. The NP [the publishers] is old information, although it is embedded in the a phrase which is new information. In another example discussed by Selkirk, focus on an argument is varied, while focus on a dominating VP remains constant:

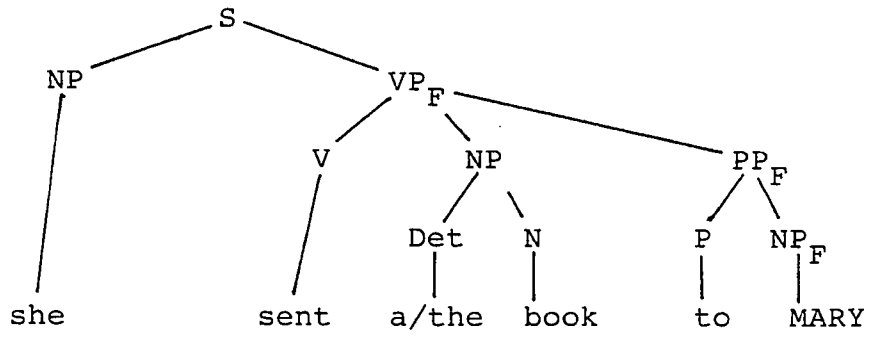
(26) a. She sent a BOOK to MARY
b. She sent a/the book to MARY

In both sentences, VP can bear the focus feature, since in each case at least one of the subcategorized arguments bears it. Within the arguments, F has percolated from the word level, as indicated in (27).

(27) a.



b.



Selkirk describes the difference in intonational meaning between (26a) and (26b):

> "Both have an intonational meaning in which the VP is focused. Either may answer a question about what she (Jane) did next (or even the question "What happened?", in a discourse where Jane is salient and thereby presupposed). But the full focus structure of the two sentences when they have VP focus is not identical. In [(26a)], both NP constituents of the VP represent new information. Given this, [(26a)] is an

> appropriate out-of-the-blue response to a question about Jane's activities. (26b) is also a possible response to the same question, but for it to be appropriate, it must be uttered in a discourse context in which a/the book is "old information," for this is how the lack of prominence on book is interpreted. Such a context is easily imaginable. Jane's job is illustrating books, and her current book is the topic of conversation. A question is raised about her recent activities. One of the speakers mentions that yesterday she (Jane) sent the book to Mary (a common friend), and that she was looking forward to getting some comments back on it. [(26b)] would be an appropriate utterance of the sentence."

Selkirk concludes that "the focusing (and interpretation) of a constituent within VP is indeed independent of the focusing (and interpretation) the VP."

How do Selkirk's embedded focus examples, which I find convincing, relate to the model theoretic interpretation for focus proposed above? The definition (20) produces identical p-sets for (26a) and (26b): the VP is focused and (20a), which deals with focused phrases, does not pay attention to the p-sets of constituent phrases. This accords with the idea that both (26a) and (26b) can be seen as answers to the question "What did Jane do?". But to represent Selkirk's distinction between (26a) and (26b), some further mechanism is required. Selkirk describes the intonational meanings of both the VP focus and the embedded NP foci in (26) in terms of the new/old information distinction. However, in her descriptions of discourse contexts such as the one quoted above the presence an

embedded NP focus is linked to the novelty of the referent of the NP in the discourse: NPs which introduce a new referent (typically indefinites) are focused, and NPs which pick up an established referent (typically pronouns or definite descriptions) are not focused. A non-embedded focus on the other hand is explained in terms of the question which is being answered. The significant difference between these two interpretations for focus is that the interpretation for an embedded focus has nothing to do with the role of the focused NP in the sentence as a whole; the opposite is true of non-embedded foci. Consider my suggestion that the role of the non-embedded focus in [John introduced BILL to Sue] is to suggest that alternatives of the form "John introduced y to Sue" are under discussion or consideration. The semantic object which implements this idea, the p-set {introduce'(j,y,s)| y E}, incorporates semantic information from the non-focused part of the sentence.

This distinction in pragmatic/semantic interpretations for focus has already been drawn by Rochemont (ms). Since his semantic assumptions are different from mine, it would be cumbersome to review his concrete proposals here. A promising venue for an account within a model theoretic framework of foci which serve to introduce new NP referents are Heim's and Kamp's theories of anaphora and

quantification (Kamp 1981, Heim 1982), which keep a running account of "discourse referents". Interesting issues include (i) whether the "new referent" phenomenon is limited to NPs and (ii) the extent to which the distinction between focused and non-focused NPs correlates with the distinction between indefinite and definite NPs analyzed by Heim and Kamp. Selkirk discusses some examples in which definite NPs have "new referent" pitch accents.

Developing an account of this kind would carry me too far afield. So I will retain (20), which neutralizes the effect of embedded F's. This should not obscure the fact that the account of association with focus proposed below is consistent with Selkirk's proposals regarding the grammar of focus, once a distinction between two kinds of "new information" is made.

Footnotes to Chapter I

[1] What is actually required is the set of propositions $\{\hat{}introduce'(y,s)(j) \mid y \in E\}$. This point is discussed in chapter II. Montagues version of IL does not include simultaneous arguments, so introduce'(a,b) should be considered an abbreviation for introduce'(b)(a). Below, introduce'(a,b)(c) is further abbreviated as introduce'(c,a,b), mimicing the syntactic order of the arguments: c translates the subject, a the object, and b the object of <u>to</u>.

C H A P T E R I I

DOMAIN SELECTION THEORY OF ASSOCIATION WITH FOCUS

1. Introduction

This chapter is concerned with association of only and even with focus. Horn(1969) analyzed the meaning of only into an assertion and a presupposition:

(1)a. Only John came
   b. assertion: no one who is not John came
      presupposition: John came

even can be analyzed in a similar way:

(2)a. even John came
   b. (from Karttunen and Peters (1979)).
      assertion: John came
      presupposition:
        (i) someone who is not John came
        (ii) For all x under consideration besides John, the likelihood of x coming is greater than or equal to the likelihood of John coming.

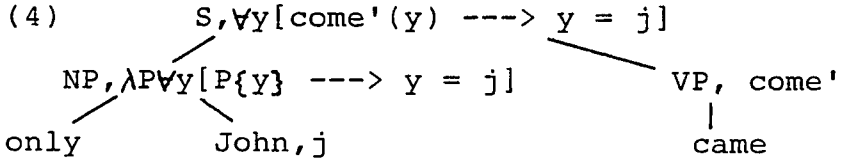
I endorse the distinction between assertions and presuppositions, and would take "presupposes" to be "conventionally implicates" in the sense of Grice(1975), as analyzed in a MG framework by Karttunen and Peters(1979). However, working with a Karttunen and Peters system, which involves a recursive definition of assertions and

conventional implicatures, would introduce a burden of complexity. Therefore attention will be restricted to assertions, that is to denotations of the normal kind. Given this restriction of attention, there are two ways of proceeding: either the assertion and presupposition can be combined into a single denotation of the normal kind (by conjoining them), or the presupposition can simply be dropped. In this chapter, I will take the latter course; only <u>only</u> is analyzed formally, although examples will involve both <u>even</u> and <u>only</u>. <u>even</u> is analyzed more explicitly in chapter III.

To give the assertion indicated in (1), only' should be equivalent to the intensional logic formula (3). This yields the semantic derivation (4), where phrases are annotated with expressions equivalent to their IL translations.

(3) $\lambda x \lambda P \forall y[P\{y\} \dashrightarrow y = x]$

(4)



As indicated, I assume that <u>only</u> is part of an NP constituent in (1); the motivation for this is discussed in chapter III. The semantic rules employed in (4) are rules of function application.

2. Scope Theory

Examples (3a) and (3b) from chapter I are repeated in (5). We want to account for the difference in truth conditions between them: if John introduced Bill and Tom to Sue and performed no other introductions, then (5a) is false and (5b) is true. If John introduced Bill to Sue and to Jill and performed no other introductions, then (5a) is true and (5b) is false.

(5)a. John only introduced BILL to Sue
   b. John only introduced Bill to SUE

'How to Get Even' (Anderson 1972) contains an outline of a theory of this phenomenon.

> "Assume that even, like other adverbial elements, is generated in some single position in underlying structure, but is not interpreted at this point. Then allow it to be moved into any of the derived-structure positions where adverbs can appear by a permutation of some sort.... Then, at some level of derived structure (perhaps shallow structure in the sense of Postal (1970)) we can apply an interpretive principle to determine the interpretation of even by locating a constituent ... which can serve as the element's scope. The reading of this constituent (or constituents) would then be inserted into the appropriate places in a complex dictionary reading for even..." (Anderson(1972), p898)

In Anderson's terminology, the focused phrase entering into the interpretation of even is the 'scope' of even. Thus in (5a), BILL is the scope of even. Since this conflicts

with other senses of 'scope', and because the terminology does not accord with my ultimate conclusions, I have not adopted it.[1]

No doubt because his work antedated the development of the logical form level in the extended standard theory, Anderson's remarks, while more extensive than the quoted passage, are programmatic. Nevertheless, the general outlines of an execution of Anderson's idea within EST seem fairly straightforward. I take the central idea behind Anderson's approach to be that at a semantically significant level which is an image of surface structure, the focused phrase is an argument of even/only. We identify SS as a level where even and only are in their surface positions; while Anderson suggests that they are moved into this position by an adverb movement rule, we could also assume that this is their deep structure position. We identify LF as the level where a focused phrase has moved to a position where it can serve as an argument of even (or only). For concreteness, I will propose a structure for these logical forms, one which facilitates semantic interpretation. Suppose that the S-structure of (5a) is (6), where only is Chomsky-adjoined to VP. As discussed in chapter I, the focused phrase is marked with the focus feature F. A logical form for this sentence is to express the idea that the focused phrase is an argument of only. Given that the

primary syntactic correlate of the function-argument relation is sisterhood, let us entertain the hypothesis that the focused phrase is a sister of only in LF. More specifically, suppose that the focused phrase is adjoined to only in the derivation of LF, so that (7) is a logical form for (6).[2]

(6)$[_S$John $[_{VP}$only$[_{VP}$introduced $[$Bill$]_F$ $[_{PP}$to Sue$]]]]$

(7)$[_S$John $[_{VP}[$only$[_{NP}$Bill$]_{F,2}][_{VP}$introduced $[_{NP}]_2$ $[_{PP}$to Sue$]]]]$

This logical form facilitates semantic interpretation in that independently motivated principles, the denotation for only and the semantic rule interpreting structures of quantifier construal, yield the desired model-theoretic interpretation for (7). The denotation for only was given in (3) above; it was motivated by examples like (1) where it is not necessary to postulate a logical form different from the S-structure.[3]

A semantic rule based on Montague(1973,"PTQ") interpreting structures of quantifier construal of the form $[_S NP_i S]$ was reviewed in chapter I. However, in (7) [only Bill] is adjoined to VP rather than to S.[4] Thus the clause of Montague's definition we are interested in is that which interprets a quantified NP adjoined to (or in his terminology quantified into) VP (in his terminology an

intransitive verb phrase):[5]

(8)a. Syntactic configuration: $[_{VP}NP_iVP]$
b. Intensional Logic translation: $\lambda zNP'(\hat{}\lambda x_i[VP'(z)])$
where NP' and VP' are the IL translations of NP and VP.

Given (3) and (8), the problem of providing an interpretation for the logical form (7) is solved. From (3) it follows that the phrase [only Bill] has the interpretation (9a). The minimal VP in (7) has the interpretation (9b), where the trace $[_{NP}]_2$ is interpreted as an individual variable. From (8) it follows that the maximal VP has the interpretation (9c). Hence (7) (and derivatively (6)) has the desired interpretation (9d).[6]

(9)a. $\lambda P\ \forall y[P\{y\} \dashrightarrow y = b]$
b. $introduce'(x_2,s)$
c. $\lambda z[[\lambda P\ \forall y[P\{y\} \dashrightarrow y = b]](\hat{}\lambda x_2 introduce'(z,x_2,s))]$,
equivalent to $\lambda z\ \forall y[introduce'(z,y,s) \dashrightarrow y = b]$
d. $\forall y[introduce'(j,y,s) \dashrightarrow y = b]$

A technical problem can be detected in this proposal: given the semantic rule (8), the entire phrase [only Bill] should bear the index 2 and the category label NP. This might follow from a theory of features; since I am not defending an Anderson-style theory (what I will call a "scope theory"), I will make no proposal in this area.

Criticisms

Anderson compared his analysis of association with focus with a standard theory account attributed to Fischer(1968), in which even is adjacent to the focused phrase in deep structure and is optionally moved to other positions in the sentence.[7] Judging by Anderson's explanation, the deep structure for (5a) would be:

(10) John introduced [only $Bill_F$] to Sue

Since in the standard theory deep structure is the locus of semantic interpretation, this solves the semantic problem in the same way as Anderson's proposal: only is a sister of its argument $[Bill]_F$ at the semantically interpreted level.

Anderson's criticisms of this standard theory proposal are interesting because several of them can be turned against his proposal, at least my version of it. The first piece of evidence concerns sentences in which the "scope" of even consists of more than one constituent. Anderson's example is the following.

(11) John claims that he can can sell refrigerators to the Eskimos, but in fact he couldn't even sell WHISKEY to the INDIANS (implying that of all selling tasks one could possibly undertake, selling whiskey to the Indians would be the easiest).

Similarly, (12) only can be associated with both Bill and

Sue, so that the sentence is false if John performed any introductions other than introducing Bill to Sue.[8]

(12) John only introduced BILL to SUE

The problem this raises for the standard theory account is that even can not be adjacent in deep structure to both focused phrases in (11). Anderson does not spell out exactly why his proposal is consistent with multiple foci . The implication is that the rules which derive logical representations from surface structure might insert any number of focused phrases in the semantic material associated with even. But when we look at my particular realization, this becomes problematic. Part of the appeal of the logical forms proposed was that their interpretation was an "automatic" consequence of (i) an independently motivated meaning for only/even and (ii) an independently motivated rule interpreting structures of quantifier construal. It is not clear what a logical form for (11) or (12) which could, similarly, be interpreted by independently motivated semantic rules would be.

Since Anderson's proposal is not specific, it is impossible turn the above remarks into a conclusive argument against it. But based on my specific realization of Anderson's proposal, I tentatively conclude that multiple foci are not handled in a smooth way. Of course, I do not

deny that semantic rules which derive the desired interpretations could be formulated.[9]

Constraints on Movement/Scope

Another argument adduced by Anderson is that even and an associated focused phrase do not stand in the syntactic relation characteristic of a syntactic movement rule. In the syntactic theory Anderson assumed, syntactic movement rules are subject to certain constraints, such as the complex NP constraint of Ross(1967) prohibiting movement out of S' in the configuration $[_{NP}N\ S']$. As illustrated in (13a), wh-movement out of a relative clause is impossible (examples are from Anderson):

(13)a. * What do you know a guy who does with bananas?
b. You can do lots of things with bananas; I even know a guy who SMOKES them.
c. John even has the idea that HE is tall for a Watusi.

However (13b) is okay, although in the standard theory analysis it is derived by moving even out of the complex NP from its deep structure site adjacent to SMOKES. Similarly, in (13c) even is associated with a focused phrase in the S' complement of the noun idea.

Anderson felt that his approach to association with focus, which employed (unformalized) rules interpreting surface structures, was consistent with the violation of

on syntactic movement: "While there is no doubt that such interpretive principles are subject to some constraints, probably quite strong ones, there is also no particular reason to believe that these are the same as those holding for syntactic processes" (Anderson 1972, p 900). Anderson is not to be faulted for this supposition, given the date of his contribution. However, in subsequent work it has been argued that (i) semantic variable binding processes are subject to some constraints and (ii) these constraints are similar or identical to constraints on syntactic movement (see e.g. Rodman(1976), May(1977)).

Rodman formulated the constraint on extraction from relative clauses in an MG fragment. As in PTQ, semantic variable binding rules were paired with syntactic rules eliminating subscripted pronouns of the form he_i/him_i. These should be seen as analogous to the traces or "syntactic variables" of recent versions of transformational grammar. The relative clause formation rule maps [John likes he_0] to [that John likes], deleting he_0. Rodman implements the restriction of extraction from relative clauses by introducing a separate class of syntactic variables, of the form he_n^R. These can not be deleted by variable binding rules. In the course of relative clause formation, all syntactic variables in the relative clause

are superscripted with R, making them unavailable for deletion by variable binding rules, such as question formation in (13a).

This mechanism predicts a restriction on wide scope readings for quantifiers. Since in PTQ quantifying in is a variable binding rule substituting an NP for a subscripted variable, quantifying into a relative clause is proscribed:

(14) [John has dated a woman who loves every man]
(quantifying in blocks due to R superscript)
[every man] [John has dated a woman who loves he_0^R]

This is desirable, since Rodman finds a wide scope reading impossible in (15a), an intuition confirmed by many speakers. (15b) is an example from Heim(1982); here the restriction on the scope of [every man] is made salient by the presence of a pronoun which [every man] can bind only if its scope is the maximal S.

(15) a. John has dated a woman who loves every man
b. A woman who saw every man disliked him

Rodman's mechanism is perhaps not illuminating; the important point for present purposes is that QR (quantifying in in Rodman's MG fragment) is subject to a structural constraint barring scope outside a relative clause for a quantified NP inside it. This makes Anderson's example (13b), which he presented in an argument against the

standard theory account attributed to Fischer, problematic for his account. This point is clear in my execution of his proposal. The logical form for (13c) would be roughly:

(16) [John [even he_F]$_n$[has [$_{NP}$the idea [$_S$,that e_n is tall for a Watusi]]]]

If movement from an S' complement of a noun (or in (13a) and (13b), from a relative clause) is prevented by a syntactic constraint on movement, such as subjacency, the adjunction of [he_F] to [even] in (16) will be prohibited. On the other hand, if some LF filter on representations is imposed, we would expect it to be invoked in (16), since this logical form is indistinguishable from a structure of quantifier construal.

Another constraint on scope which is of possible relevance is discussed in Kayne(1979) and Chomsky (1981). They observe that in multiple wh-questions, there seems to be an asymmetry between the subject and object positions of tensed sentences:

(17) (=(15iii), Ch.4 of Chomsky (1981))
a. I know perfectly well who thinks that he is in love with <u>whom</u>
b. ?*I know perfectly well who thinks that <u>who</u> is in love with him

It is proposed that an LF rule assigns scope to wh-phrases which have not been moved in the derivation of

S-structure, so that in LF there are bound variables in the underlined positions. The distinction between (17a) and (17b) is attributed to a wellformedness condition applied at LF (and perhaps elsewhere), the empty category principle, which distinguishes the subject and object positions of tensed sentences by means of the notion of government (Chomsky(1981), p250).

Chomsky notes as a puzzle that focused phrases, which according to his analysis are always assigned scope in LF, are acceptable in the subject position of embedded tensed sentences. This is also true of focused phrases semantically associated with only and even:

(18)a He even thinks that BILL is in love with him
b He only claims that SUE likes him

This is problematic because if (18b) had a bound variable in the position of the focused phrase in LF, the wellformedness condition which rules out (17b) would be violated.[10]

Stipulation of Association with Focus

My explanation of my version of Anderson's proposal was careless when I stated "suppose that the focused phrase is adjoined to only in the derivation of LF". Given the assumptions of EST subsumed under the slogan 'move alpha',

the focused phrase could indeed be adjoined to only in the derivation of LF, but so could any phrase. If the scope theory is to specify the desired relation between phonological and semantic objects, it must include principles which entail that (19b), but not (19c), is a possible logical form for (19a).

(19)a.(5)$[_S$John $[_{VP}$only$[_{VP}$introduced [Bill]$_F$ $[_{PP}$to Sue]]]]

b. $[_S$John $[_{VP}[$only$[_{NP}$Bill$]_{F,2}]$
$[_{VP}$introduced $[_{NP}]_2$ $[_{PP}$to Sue]]]]

c. $[_S$John $[_{VP}[$only$[_{NP}$Sue$]_3]$
$[_{VP}$introduced [Bill]$_F$ $[_{PP}$to $[_{NP}]_3$]]]]

In motivating the focus feature, I said that some such device is necessary, given that focus has both phonological and semantic significance, and that phonology and semantics (more specifically, the semantically interpreted level LF) are separate components of the grammar. The scope theory takes the semantic significance of F to be, in part, a structural relation between only/even and focused phrases at LF. That (19b) is the logical form for (19a) could be enforced by a simple cooccurrence restriction:

(20) In LF, only must be the sister of a phrase bearing the feature F.

My objection to a condition like (20) is that it stipulates that only interacts with focus. That focus influences the assertions and conventional implicatures of

sentences involving only, even, and a small group of other adverbs seems to be a marginal fact about English, and we should not have to state a separate principle which covers it.

Of course, I have not proven that all possible scope theories of the focus interaction are stipulative in the way that the one which I outlined is. In any case, it seems that Anderson had an account in mind which is: "...our principle might simply locate an element on which a stress maximum appears, and select as a possible scope any constituent containing it" (Anderson(1972), p898).[11]

3. Domain Selection Theory

According to the analysis reviewed above, the focused subphrase of the VP is an an argument of adverbial only. (21) is a special case; here the entire VP is focused.

(21) John only $[\text{swims}]_F$

(22) a. only' for (21): $\lambda P \lambda \wp \forall Q[\wp(Q) \dashrightarrow Q=P]$, where P is a variable of type <s <e t>> and $\wp$ is a variable of type <s <<s <e t>> t>>

b. $\lambda \wp \forall Q[\wp\{Q\} \dashrightarrow Q = \hat{}\text{swim}']$

c. $\lambda \wp \forall Q[\wp\{Q\} \dashrightarrow Q = \hat{}\text{swim}'](\hat{}\lambda P P\{j\})$

d. $\forall Q[Q\{j\} \dashrightarrow Q = \hat{}\text{swim}']$

(23) only" = $\lambda P \lambda x[\forall Q[Q\{x\} \dashrightarrow Q=P]]$

(24) (John)[[only](swims)]

It is necessary to posit a family of translations for

only, since phrases of various semantic types can be focused. (22a) is an analogue of (3) where the first argument has type <s <e t>>, and the type of the second argument has been adjusted accordingly. This produces the translation (22b) for [only swims]. (22b) can not be combined with John' directly, because there is a type mismatch. But if John' is first promoted to the type of quantified NPs, (cf Rooth and Partee(1983), appendix), we obtain (22c), which is equivalent to the desired translation (22d).[12]

(21) would have a more direct derivation if only had a different translation. At the price of redundancy in the grammar, (22d) could be derived without appealing to type accommodation, or the abstract logical form of footnote 12, by assigning only the alternative translation (23). (24) indicates the resulting function-argument relations; the translations of phrases enclosed in parentheses serve as arguments.

I would like to show that the simple denotation (23) provides the basis for an alternative treatment of association with focus. Independent of the choice between (22a) and (23) as a denotation for only in (21), a problem with the (22d) must be acknowledged. In any model (and any world), j has the properties $\hat{}\lambda x[x=x]$ and $\hat{}\lambda x[x=j]$, the properties of self-identity and of being John. In

conjunction with (22d), this entails that these properties are identical to swim', and hence to each other. Since any individual has the property ^λx[x=x], and since ^λx[x=j] is a unit property, it follows that any model which satisfies (22d) has exactly one individual. Hence (22d) can be true only in the most trivial of models. (This is true strictly; a similar argument shows that a model which satisfies (22d) has exactly one world.) There is a simple and familiar solution to this problem. Suppose the domain of the quantification over properties in (22d) is a contextually relevant set, say the set properties which are exercise activities (^swim', ^run', ^[play tennis]', ...), rather than the set of all properties of individuals. Then the quantification would not impose such strong constraints on the model, since ^λx[x=x] and ^λx[x=j], for instance, need not be in this set.

I prefer to write the domain of quantification into the semantics as a free variable in the translation of only:

(25) only" = λPλx[∀Q[[Q{x} & C(Q)] --> Q=P]]
(26) translation for (21): ∀Q[[Q{j} & C(Q)] --> Q = swim']

C is the characteristic function of a set of properties, which we think of as the set of relevant properties. (26) says that John has no relevant properties distinct from swim'.

Returning now to association with focus, consider the

translation (29) induced by (26) for (27) and (28), the examples considered above.

(27) John only introduced BILL to Sue
(28) John only introduced Bill to SUE
(29) ∀P[[P{j} & C(P)] --> P = ^introduce'(b,s)]

The translation is the same in the two cases, which does not do justice to our intuitions about the meanings of the sentences. But the right truth conditions can be obtained by supplying different values for C in the two cases. The idea is that in (27), the quantification is restricted to properties of the form 'introduce y to Sue', while in (28) it is restricted to properties of the form 'introduce Bill to y'. The desired value of C for (27) is (30). Substituting this into (29) yields (31), which is similar in truth conditions to the quantification over individuals (32), the translation for (27) produced by the scope theory.[13]

(30) λP ∃y[P = ^introduce'(y,s)]
(31) ∀P[[P{j} & ∃y[P = ^introduce'(y,s)]]
--> P = ^introduce'(b,s)]
(32) ∀x[introduce'(j,x,s) --> x=b]

(31) says that if John has a property of the form 'introduce y to Sue' then it is the property 'introduce Bill to Sue'. The desired value for C in (28) is (33). Substituting this into (29) yields (34), which says that if John has a property of the form 'introduce Bill to y' then

it is the property 'introduce Bill to Sue'. (34) is similar in truth conditions to the quantification over individuals (35), the translation for (28) produced by the scope theory.

(33) $\lambda P\ \exists y[P = \hat{}introduce'(b,y)]$
(34) $\forall P[[P\{j\}\ \&\ \exists y[P = \hat{}introduce'(b,y)]] \dashrightarrow P = \hat{}introduce'(b,s)]$
(35) $\forall x[introduce'(j,b,x) \dashrightarrow x=s]$

I suggest then that the truth conditional effect of focus in (27) and (28) is a result of a contribution of focus to the selection of domains of quantification. Since the focused phrase is not an argument of only, it is not necessary to structurally distinguish (27) and (28) in LF by assigning scope to focused phrases.

Formalization

In order to formalize the treatment of association with focus sketched above, the set of properties of the form 'introduce y to Sue' must be made available in the semantic derivation for (27), and the set of properties of the form 'introduce Bill to y' must be made available in the semantic derivation for (28). Covertly, the p-sets which were proposed in chapter I as the model-theoretic interpretation for focus were designed to make these sets available. At this point, a technical problem in the definition of p-sets

must be addressed. In the type assignment reviewed in chapter I, which was derived ultimately from PTQ, the semantic type of a VP was <e,t>. The p-set for a phrase with semantic type a is a set of objects in the model of type a. But what was required above, i.e. $\{\hat{}introduce'(y,s) | y \in E\}$ in the case of (27), was not a set of sets of individuals, but a set of properties of individuals. Call this desired set of properties a "p-set intension"; call the set defined in chapter I a "p-set extension" (note that the p-set intension is not simply a function from worlds to p-set extensions). The technical problem is that p-set intensions are not recoverable from p-set extensions, given the recursive definition of denotations of PTQ. Let us begin by reviewing the general structure of that definition.

A model is built from a set E of individuals and a set W of worlds (a set of times may be included as well, and is included in PTQ). The family of denotation spaces based on E and W is defined recursively:

(36) Definition

$D_{e,E,W} = E$

$D_{t} = 2$ (i.e. $\{0,1\}$)

$D_{<a\ b>,E,W} = D_{b,E,W}^{D_{a,E,W}}$

$D_{<s\ b>,E,W} = D_{b,E,W}^{W}$

An assignment function relative to E and W is a function g with domain the set of variables $v_{<n\ a>}$, where n is a natural number and a is a type label, such that for any such <n a>, $g(v_{<n\ a>}) \in D_{a,E,W}$. $G_{E,W}$ is the set of assignment functions relative to E and W.

The denotation of an IL expression **a** of type a, relative to a world and assignment function, is an element of $D_{a,E,W}$. The semantics for the intension operator gathers together the denotations of an IL phrase at the various worlds:

(37) PTQ semantics for ^ :

$$|\hat{}\mathbf{a}|_{w,g}: W \dashrightarrow D_a$$

$$w' \rightsquigarrow |\mathbf{a}|_{w',g}$$

It is simplest to illustrate the problem in the definition of p-sets for expressions of type t. In accordance with the discussion above, we assume that the p-set extension for a phrase of type t is a set of truth values, and that the p-set intension for a phrase of type t is to be a certain set of propositions, i.e. a set of functions from worlds to truth values.

Consider the sentence [$John_F$came]. Below are specified, for various phrases **a**, their denotations (**a'**) and p-set extensions (**a"**) in two models M and M' with three worlds

w_1,w_2, and w_3, and two individuals j and b.[14]

(38) denotation or p-set with respect to an arbitrary assignment function and the world:

M

	w_1	w_2	w_3
come' char. fn. of:	{j}	{j}	{b}
come": unit set of char. fn. of:	{j}	{j}	{b}
$John_F$'	j	j	j
Bill	b	b	b
$John_F$"	{j,b}	{j,b}	{j,b}
[John come]'	1	1	0
[Bill come]'	0	0	1
[John come]"	{0,1}	{0,1}	{0,1}

denotation or p-set with respect to an arbitrary assignment function and the world:

M'	w_1	w_2	w_3
come' char. fn. of:	{j}	{b}	{b}
come": unit set of char. fn. of:	{j}	{b}	{b}
$John_F$'	j	j	j
Bill	b	b	b
$John_F$"	{j,b}	{j,b}	{j,b}
[John come]'	1	0	0
[Bill come]'	0	1	1
[John come]"	{0,1}	{0,1}	{0,1}

In each model, the p-set extension for [John come] is {0,1} at each world, since one individual came and one individual did not come. But the p-set intension for [John come] is different in the two models: in M but not in M', it includes the function mapping w_1 and w_2 to 1 and w_3 to 0. So p-set extensions can not be recovered from p-set intensions.

It turns out that this problem does not arise in the alternative semantics for IL which Montague proposed in UG (Montague 1970). Here information is organized in a

different way: the "denotation" of a phrase is a function from worlds and assignment functions to denotations of the kind employed in PTQ. For instance, the semantic object associated with an IL phrase of type t is a function from world-assignment function pairs to truth values. If an IL phrase contains no free variables, the associated semantic object will be a function which does not depend on its assignment-function argument. It is convenient to define sets of "constant meanings" of this kind:

(39) Constant meanings

a. $C_{e,E,W}$ is the set of functions f such that for some $x \in D_{e,E,W}$

$$f: G_{E,W} \times W \longrightarrow D_{e,E,W}$$
$$(g,w) \rightsquigarrow x$$

b. If $a \neq e$, $C_{a,E,W}$ is the set of functions f such that for some $f' \in D_{<s\ a>,E,W}$

$$f: G_{E,W} \times W \longrightarrow D_{a,E,W}$$
$$(g,w) \rightsquigarrow f'(w)$$

$D_{a,E,W}$ and $G_{E,W}$ were defined above. $C_{a,E,W}$ is called a set of constant meanings because, in an interpretation of IL in a model, the function F which interprets constants maps a constant of type a to an element of $C_{a,E,W}$. The type e is treated as a special case; a "constant meaning" of type e depends neither on the world parameter nor on the assignment

function parameter. This encodes meaning postulate 2 of PTQ, which states that individual constants are rigid designators.[15]

In order to state the definition of p-sets in a compact and precise way, an extension of IL which includes a focusing operation is defined.

(40) Formation rules of ILF (intensional logic with focus)

a. (focusing)
If $\alpha \in ME_a$ then $[\alpha]_F \in ME_a$

From Montague (PTQ):

b. Every variable or constant of type a is in ME_a

c. If $\alpha \in ME_a$ and u is a variable of type b, then
$[\lambda u \alpha]$ $ME_{<b\ a>}$

d. If $\alpha \in ME_{<a\ b>}$ and $\beta \in ME_a$, then $\alpha(\beta) \in ME_b$

e. If $\alpha, \beta \in ME_a$ then $[\alpha = \beta] \in ME_t$

f. If $\varphi, \psi \in ME_t$ and u is a variable,
then $-\varphi$, $[\varphi \& \psi]$, $[\varphi \vee \psi]$, $[\varphi \rightarrow \psi]$, $\forall u \varphi$, $\exists u \varphi$ $\in$ ME_t

g. If $\alpha \in ME_a$ then $[\hat{}a]$ $ME_{<s\ a>}$

h. If $\alpha \in ME_{<s\ a>}$ then $[\check{}a] \in ME_a$

The meaning assignment for ILF determined by <E,W,F> (a set of individuals, a set of worlds, and an assignment of values to constants of the kind defined above) takes the form of a recursive definition of

(i) the normal denotation $|\mathbf{a}| : G_{E,W} \times W \rightarrow D_a$ of an ILF phrase **a** of type a

(ii) the p-set $\|\mathbf{a}\|$ of an ILF phrase **a** of type a, which is a set of functions $f : G_{E,W} \times W \rightarrow D_a$

The bulk of the following definition is from Montague's UG, although revisions have been made to accommodate the larger version of IL defined in PTQ. The new parts are the rules for computing p-sets, and (1), the semantics for the focusing operator. The UG definitions are related to the PTQ definitions in a systematic way. To get at a corresponding PTQ denotation, a UG denotation is applied to an world-assignment function pair. This corresponding PTQ denotation is then manipulated as in the PTQ semantics.

(41) Meaning assignment for ILF determined by <E,W,F>
D_a abbreviates $D_{a,E,W}$ and G abbreviates $G_{E,W}$.

(a) If **b** is a constant of type b, then $|\mathbf{b}|$ is the function

$|\mathbf{b}|$: G x W ---> D_b
(g,w) $\rightsquigarrow$ F(**b**,w)

$\|\mathbf{b}\|$ is $\{|\mathbf{b}|\}$.

(b) If **b** is a variable of type b, then $|\mathbf{b}|$ is the function

$|\mathbf{b}|$: G x W ---> D_b
(g,w) $\rightsquigarrow$ g(**b**)

$\|\mathbf{b}\|$ is $\{|\mathbf{b}|\}$.

(c) If $\mathbf{a} \in ME_a$ and u is a varable of type b, then $|\lambda u \mathbf{a}|$ is the function

$|\lambda u \mathbf{a}|$: G x W ---> $D_{<b\ a>}$
(g,w) $\rightsquigarrow$ the function f: D_b ---> D_a
x $\rightsquigarrow$ $|\mathbf{a}|(g',w)$,
where g' is like g except that g'(u)=x.

$\|\lambda u \mathbf{a}\|$ is the set of functions h such that, for some $h' \in \|\mathbf{a}\|$,

h: G x W ---> $D_{<b\ a>}$
(g,w) $\rightsquigarrow$ the function f: D_b ---> D_a
x $\rightsquigarrow$ h'(g',w),
where g' is like g except that g'(u)=x.

(d) If $\mathbf{a} \in ME_{<b\ c>}$ and $\mathbf{b} \in ME_b$ then $|\mathbf{a}(\mathbf{b})|$ is the function

$|\mathbf{a}(\mathbf{b})|$: G x W ---> D_c
(g,w) $\rightsquigarrow$ $|\mathbf{a}|(g,w)(|\mathbf{b}|(g,w))$

$\|\mathbf{a}(\mathbf{b})\|$ is the set of functions h such that, for some $h' \in \|\mathbf{a}\|$ and $h'' \in \|\mathbf{b}\|$,

h: G x W ---> D_c
(g,w) $\rightsquigarrow$ h'(g,w)(h"(g,w))

(e) If **a**,**b** ME_a then $|\mathbf{a} = \mathbf{b}|$ is the function

$|\mathbf{a} = \mathbf{b}| : G \times W \longrightarrow 2$

$(g,w) \rightsquigarrow 1$ if $|\mathbf{a}|(g,w) = |\mathbf{b}|(g,w)$

$\rightsquigarrow 0$ otherwise

$\|\mathbf{a} = \mathbf{b}\|$ is the set of functions h such that, for some $h' \in \|\mathbf{a}\|$ and $h'' \in \|\mathbf{b}\|$,

$h: G \times W \longrightarrow 2$

$(g,w) \rightsquigarrow 1$ if $h'(g,w) = h''(g,w)$

$\rightsquigarrow 0$ otherwise

(f)

i. If $\mathbf{a} \in ME_t$, then $|-\mathbf{a}|$ is the function

$|-\mathbf{a}| : G \times W \longrightarrow 2$

$(g,w) \rightsquigarrow 1$ if $|\mathbf{a}|(g,w) = 0$

$\rightsquigarrow 0$ otherwise

$\|-\mathbf{a}\|$ is the set of functions h such that, for some $h' \in \|\mathbf{a}\|$,

$h: G \times W \longrightarrow 2$

$(g,w) \rightsquigarrow 1$ if $h'(g,w) = 0$

$\rightsquigarrow 0$ otherwise

ii. If $\mathbf{a},\mathbf{b} \in ME_t$ then $|\mathbf{a} \ \& \ \mathbf{b}|$ is the function

$|\mathbf{a} \ \& \ \mathbf{b}| : G \times W \longrightarrow 2$

$(g,w) \rightsquigarrow 1$ if $|\mathbf{a}|(g,w) = 1$ and $|\mathbf{b}|(g,w) = 1$

$\rightsquigarrow 0$ otherwise

$\|\mathbf{a} \ \& \ \mathbf{b}\|$ is the set of functions h such that, for some $h' \in \|\mathbf{a}\|$ and $h'' \in \|\mathbf{b}\|$,

$h: G \times W \longrightarrow 2$

$(g,w) \rightsquigarrow 1$ if $h'(g,w) = 1$ or $h''(g,w) = 1$

$\rightsquigarrow 0$ otherwise

Similarly for v, -->, <-->.

(g) If $\mathbf{a} \in ME_t$ and u is a variable of type a, then $|\exists u\mathbf{a}|$ is the function

$|\exists u\mathbf{a}| : G \times W \longrightarrow 2$
$(g,w) \rightsquigarrow 1$ if for some $x \in D_a$, $\mathbf{a}(g',w) = 1$,
where g' is like g except that $g'(u) = x$.

$\|\exists u\mathbf{a}\|$ is the set of functions h such that, for some $h' \in \|\mathbf{a}\|$,

$h: G \times W \longrightarrow 2$
$(g,w) \rightsquigarrow 1$ if for some $x \in D_a$, $h'(g',w) = 1$,
where g' is like g except that $g'(u) = x$.

(h) If $\mathbf{a} \in ME_t$ and u is a variable of type a, then $|\forall u\mathbf{a}|$ is the function

$|\forall u\mathbf{a}| : G \times W \longrightarrow 2$
$(g,w) \rightsquigarrow 1$ if for every $x \in D_a$, $|\mathbf{a}|(g',w) = 1$,
where g' is like g except that $g'(u) = x$.

$\|\forall u\mathbf{a}\|$ is the set of functions h such that, for some $h' \in \|\mathbf{a}\|$,

$h: G \times W \longrightarrow 2$
$(g,w) \rightsquigarrow 1$ if for every $x \in D_a$, $h'(g',w) = 1$,
where g' is like g except that $g'(u) = x$.

(j) If $\mathbf{a} \in ME_a$ then $|\hat{}\mathbf{a}|$ is the function

$|\hat{}\mathbf{a}| : G \times W \longrightarrow D_{<s,a>}$
$(g,w) \rightsquigarrow$ the function
$f: W \longrightarrow D_a$
$w' \rightsquigarrow |\mathbf{a}|(g,w')$

$\|\hat{}\mathbf{a}\|$ is the set of functions h such that, for some $h' \in \|\mathbf{a}\|$,

$h: G \times W \longrightarrow D_{<s,a>}$
$(g,w) \rightsquigarrow$ the function
$f: W \longrightarrow D_a$
$w' \rightsquigarrow h'(g,w')$

(k) If $a \in ME_{<s\ a>}$ then $|^{\vee}a|$ is the function

$|^{\vee}a| : G \times W \longrightarrow D_a$

$(g,w) \rightsquigarrow |a|(g,w)(w)$

$||^{\vee}a||$ is the set of functions h such that, for some $h' \in ||a||$,

$h: G \times W \longrightarrow D_a$

$(g,w) \rightsquigarrow h'(g,w)(w)$

(l) If $a \in ME_a$ then $|[a]_F|$ is $|a|$.

$||a_F||$ is $C_{a,E,W}$

The final clause (l) lets the p-set for a focused expression of ILF be the set of constant meanings of appropriate type. The rules for computing p-sets in the other clauses recapitulate at the level of ILF the idea that the p-set for a complex phrase is obtained by applying the semantic rule for the phrase to elements of the p-sets of component phrases.

Let us see how this definition solves the problem pointed out in connection with (38). $\|come'([j]_F)\|$ is the set of functions h such that for some $x \in E$,

$h: G \times W \longrightarrow 2$

$(g,w) \rightsquigarrow [F(come')(g,w)](x)$

The important point about this is that, because of the way information is organized in the UG meaning assignment, this set of extensions encodes the same information as a set of

intensions. $\|\hat{}come'([j]_F)\|$ can be recovered from $\|come'([j]_F)\|$:

$\|\hat{}come'([j]_F)\|$ is the set of functions h such that for some $h' \in \|come'([j]_F)\|$,

$$h: G \times W \longrightarrow D_{<s\ t>}$$
$$(g,w) \rightsquigarrow \text{the function } f:W \longrightarrow 2$$
$$w \rightsquigarrow h'(g,w'),$$

i.e. the set of functions h such that for some $x \in E$,

$$h: G \times W \longrightarrow D_{<s\ t>}$$
$$(g,w) \rightsquigarrow \text{the function } f:W \longrightarrow 2$$
$$w \rightsquigarrow [F(come')(g,w')](x)$$

The definition of p-sets by means of ILF will be my "official" proposal. In the translation from LF to ILF, LF phrases bearing the feature F are translated as before, except that the entire translation is subscripted with F. Having made this formal proposal, I will not always refer to it explicitly. That is, I may describe a certain p-set as the set of properties of the form 'introduce y to Sue', or somewhat more formally, $\{\hat{}introduce'(y,s) \mid y \in E\}$.

Does the problem discussed above constitute any kind of argument against PTQ in favor of UG? Here it should be recalled that the intermediate language IL is officially merely a convenience. But if we were interpreting LF directly, and if we wanted to define p-sets, we would have to use a UG-style meaning assignment. There are however some alternatives to this. If p-sets were replaced with a

component of meaning with distinguished variables in the position of focused phrases, the presupposition skeleton of chapter I, the problem addressed above would not arise. Another alternative is the meaning assignment of Cresswell(1973), where propositions are at the base of the recursive definition of types, instead of truth values. I believe that p-sets can be defined in this system without trouble.[16]

In summary, the components of the proposed analysis of association with focus are: (i) the definition of p-sets as encoded in the semantics for ILF and (ii) a process which identifies the domain variable in the translation of only with the p-set for the intension of the VP argument of only.

If we like, (ii) can be formalized. To do this, a way of linking up the two components of meaning (normal denotation and p-set) must be provided. The following operator lets the value of a specified variable be the p-set for a specified expression.

(42) Semantics for restriction operator R.

Let C be a variable of type <a t>, and let be **a** and **b** be expressions of type a and b respectively.

a. $|R(C,\mathbf{a},\mathbf{b})| : G \times W \longrightarrow D_{b,E,W}$

$(g,w) \rightsquigarrow |\mathbf{b}|(g',w)$, where
g' is like g except that
$g'(C): D_a \longrightarrow 2$
$x \rightsquigarrow 1$ if for some $x' \in \|\mathbf{a}\|$, $x'(g,w) = x$.
$\rightsquigarrow 0$ otherwise

b. $\|R(C,\mathbf{a},\mathbf{b})\|$ is the unit set of $|R(C,\mathbf{a},\mathbf{b})|$.

The following translation rule specifies that the domain of the quantification over properties induced by <u>only</u> is the p-set for the intension of the VP argument of <u>only</u>.

(43) Translation rule for <u>only</u>

$[_{VP}$only VP] has the ILF translation:

$R(C, VP', \lambda x \forall P[[P\{x\} \ \& \ C(P)] \longrightarrow P = \hat{} VP'])$

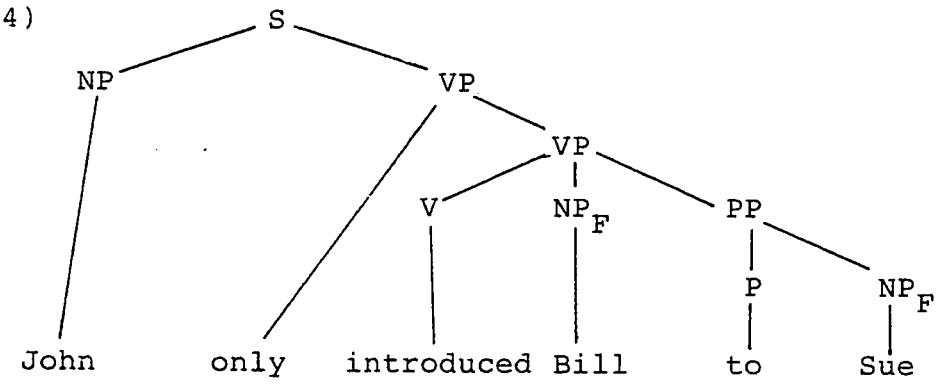
In one sense, (43) is unnecessarily complex, in that a variable C which always becomes bound is introduced. I retained C because I find the possibility that association with focus has something to do with a general phenomenon of selecting domains of quantification interesting. Pending such a theory, (43) makes specific predictions, allowing comparisons with other proposals, such as the scope theory.

4. Review of Criticisms

Multiple Foci

The domain selection analysis allows without modification for multiple foci. This is a consequence of the ways p-sets were defined. The meaning assigned to (44) can be described: if John has a property of the form 'introduce x to y', then it is the property 'introduce Bill to Sue'. (45) shows how the p-set for the intension of [introduced $Bill_F$ to Sue_F], which serves as the domain of the quantification over properties, is computed.

(44)



(45) p-set for $\hat{}$introduce'($[b]_F$,$[s]_F$)

$\|$introduce'$\|$ is the unit set of the function

$$f:GxW \dashrightarrow D_{<e\ <e\ <e\ t>>>}$$
$$(g,w) \rightsquigarrow F(\text{introduce}')(g,w)$$

$\|[b]_F\|$ is the set of functions h such that for some $x \in E$,

$$h:GxW \dashrightarrow E$$
$$(g,w) \rightsquigarrow x$$

$\|[s]_F\|$ is the set of functions h such that for some $y \in E$,

$$h:GxW \dashrightarrow E$$

$$(g,w) \rightsquigarrow y$$

$\|introduce'([b]_F,[s]_F)\|$ is the set of functions h such that for some $h_1 \in \|introduce'\|$, $h_2 \in \|[b]_F\|$, and $h_3 \in \|[s]_F\|$,

$$h:GxW \dashrightarrow D_{<e\ t>}$$

$$(g,w) \rightsquigarrow [h_1(g,w)](h_2(g,w),h_3(g,w))$$

Referring to the previous steps in the derivation, this is the set of functions h such that for some $x \in E$ and some $y \in E$,

$$h:GxW \dashrightarrow D_{<e\ t>}$$

$$(g,w) \rightsquigarrow F(introduce')(g,w)(x,y)$$

$\|\hat{}introduce'([b]_F,[s]_F)\|$ is the set of functions h such that for some $h' \in \|introduce'([b]_F,[s]_F)\|$,

$$h:GxW \dashrightarrow D_{<s\ <e\ t>>}$$

$$(g,w) \rightsquigarrow \text{the function } f:W \dashrightarrow D_{<e\ t>},\ w' \rightsquigarrow h'(g,w')$$

Referring to the previous step, this is the set of functions h such that for some x E and some $y \in E$,

$$h:GxW \dashrightarrow D_{<s\ <e\ t>>}$$

$$(g,w) \rightsquigarrow \text{the function } f:W \dashrightarrow D_{<e\ t>},\ w' \rightsquigarrow F(introduce')(g,w')(x,y)$$

This is the required set of properties of the form 'introduce x to y'.

Variables in LF

The interpretive procedure I have specified does not involve assigning scope to focused phrases; they can be interpreted in place. Hence well-formedness conditions on variables in LF or constraints on movement in the derivation of LFs will not be invoked.

Stipulation of Association with Focus

The scope theory of association with focus was criticized for making explicit reference to the focus feature. In the domain selection theory, no direct relation between focusing adverbs and the focus feature is stated. Rather, focus is given a model-theoretic interpretation in the definition of p-sets, and a p-set is taken as the domain of the quantification over properties inherent in the meaning of only.

Ideally, one would like to derive association with focus as a kind of theorem. In natural language, the domain of a quantifier is quite generally taken to be some pragmatically relevant set of objects. For instance, we would typically not take the pair of sentences (46) as conveying any information about whether people not at Mary's party danced.

(46) Mary threw a party. Everyone danced.

In chapter I, I suggested that p-sets were interpreted as sets of alternatives under consideration in the discourse; the sentence "John introduced BILL to Sue" was held to suggest that alternatives of the form 'John introduced y to Sue' were under consideration. In chapter III, I will suggest a modification of the current proposal in which only expresses a quantification over propositions rather than properties. "John only introduced BILL to Sue" is analyzed roughly as in (47).

(47) If a proposition of the form 'John introduced x to Sue' is true, then it is the proposition 'John introduced Bill to Sue'

Given this modification, the following story can be told. Focus in "John introduced BILL to Sue" conveys that propositions of the form 'John introduced x to Sue' should be considered alternatives. The independent meaning of the entire sentence [John only introduced BILL to Sue] is that if one of the alternative propositions under consideration is true, then it is the proposition 'John introduced Bill to Sue'. These independent considerations combine to yield (47).

This is not really tied to the the claim that only expresses a quantification over propositions rather than properties. We could retain the semantics for only employed

in this chapter and say that focus in the VP [introduced BILL to Sue] conveys that properties of the form [introduce y to Sue] are under consideration.

These remarks are simply a story, since no explicit account of how domains of quantification are selected and of how p-sets are interpreted has been given. This equivocation should not obscure the fact that a precise proposal has been made; what remains open is how well it fits into a larger picture. Whatever the resolution of this issue, it is an advantage that the domain selection theory makes use of a semantic object which is of use in explicating the function of focus in discourse, the p-set corresponding to an S (or VP), which is of use in explicating the function of focus in discourse. That is, even if we had to stipulate that a p-set is used as a domain of quantification for a focusing adverb, this would be an improved theory. To make this point, it is not necessary that p-sets be directly used in explicating the function of focus in discourse. It would be sufficient if p-sets could be recovered from whatever is used in explicating the function of focus in discourse. For example, the weaker form of my theory (i.e. the version formalized in (43)) could easily be restated in terms of the presupposition skeleton of chapter I.

Types of Variables

Another difference between the scope and domain selection theories follows from the fact that essentially all syntactic categories can be focused. This has the consequence that, if we adopt the scope theory, we must postulate quantified variables of all types used in translating syntactic phrases. For instance, the logical form (48b) for (48a) has a trace in the position of the focused transitive verb, and the intensional logic formula (48c) which translates (48b) has a bound relation variable R.[17]

(48)a. John only intends to CRITICIZE Bill
b. $[_{S}$John[VP[only criticize$_{F,6}$]
$[_{VP}$ intend [to $[_{VP}[_{V}]_{6}$ Bill]]]]]
c. only'(criticize', R[intend'(j,R(b)))

On the other hand, the translation assigned to (48a) by the domain selection theory is (49), which mirrors the surface structure in its constituency, and does not include a variable over relations.

(49) only'(intend'($[$criticize'$]_{F}$(b)))(j)

While this difference is interesting, it doesn't constitute a clear argument against the scope theory, for variables of various exotic types may be required for the

analysis of such constructions as VP ellipsis, comparatives and wh-questions. Here two kinds of variables should be distinguished. "Syntactic" variables are the indexed empty categories of LF, or perhaps a proper subset of them. "Semantic" variables are the variables of the semantic metalanguage. When we ask what syntactic variables are present in LF, we ask, e.g., what syntactic categories are subject to QR. This is an empirical question, and, if it is agreed that QR (or some analogue to QR, such as Montague's quantifying in rule, or Cooper's quantifier store) is required for NP, there appears to be no notion of simplicity external to linguistic theory which dictates whether a grammar which restricts QR to NPs or a grammar which extends QR to all categories is simpler. When we turn to the semantic metalanguage, there are reasons to investigate alternatives more restrictive than IL. It is known that the notion of logical consequence for IL can not be given a finitely specifiable axiomatization (this is discussed in Gallin(1975)). Chierchia(1984) proposes a restrictive alternative to IL which involves a radical reduction in the number of semantic types required for the analysis of natural language. Whether association with focus, in either of the formulations contemplated here, can be accommodated in this framework appears to be an important question. In particular, what is the effect of the F operator of ILF on

the "restrictiveness" of a semantic metalanguage?

5. Crossover Argument

Apparent Evidence for the Scope Theory

The scope theory of the focus interaction is similar to Chomsky's (1975) proposal, mentioned in chapter I, according to which focused phrases are uniformly assigned scope in logical form. In the cited paper, the logical form of (50) is informally represented as (51). Taking (51) to be the logical form of (50) requires the postulation of structure building rules deriving logical forms. For simplicity, I will instead assume that the logical form of (50) is (52) in this proposal, (51) serving merely to suggest what the interpretation of the logical form (52) is.[18]

(50) Bill likes $[\text{John}]_F$
(51) the x such that Bill likes x - is John
(52) $[_S[\text{John}]_{F,4}[_S\text{Bill likes } [_{NP}]_4]]$

The primary argument favor of Chomsky's proposal is based on the weak crossover phenomenon illustrated below.

(53) a. Who was betrayed by the woman he loved?
b. Who did the woman he loved betray?
c. for which person x, [the woman x loved betrayed x]
(54) a. Every man was betrayed by the woman he loved.
b. The woman he loved betrayed every man.
c. [for all men x][the woman x loved betrayed x]

In (53) and (54), sentences a., but not sentences b., have the bound variable readings indicated by the paraphrases c. The similarity of (53b) and (54b) is evident in their logical forms (55) and (56), which have identical configurations of traces and indexed pronouns, assuming quantified NPs have scope in LF.

(55) $[_S$,who$_5[_S[_{NP}$the woman he$_5$ loved] betrayed $[_{NP}]_5]]$

(56) $[_S[_{NP}$every man$]_9[_S[_{NP}$the woman he$_9$ loved] betrayed $[_{NP}]_9]]$

The absence of a bound pronoun reading for (53b) and (54b) has been attributed in the literature to various wellformedness conditions which rule out the logical forms (55) and (56). Two examples are the abstract leftness condition of Higginbotham (1980), which rules them out because the trace is to the right, in a technical sense, of the coindexed pronoun, and the bijection principle of Koopman and Sportiche (1981), which requires that an operator be the minimal binder for exactly one variable. In (55), who$_5$ is the minimal binder for both $[_{NP}]_5$ and he$_5$, because neither of these phrases c-commands the other. For present purposes, it is sufficient to assume that some LF wellformedness condition, the "weak crossover condition", rules out logical forms such as (55) and (56).

Returning to the proposal that focused phrases are assigned scope in LF, consider the interpretations possible

for the sentences (57). Chomsky observes that the bound pronoun reading suggested by (57c) is possible in (57a) but not (57b).

(57)a. JOHN was betrayed by the woman he loved
b. The woman he loved betrayed JOHN
c. the x such that the woman x loved betrayed x - is John

(58) $[_S[_{NP}\text{John}]_{F,9}[_S[_{NP}\text{the woman he}_9\text{ loved}]\text{ betrayed }[_{NP}]_9]]$

If focused phrases are uniformly assigned scope in LF, (57) is assimilated to (53) and (54): (58), the logical form for (57b) under this proposal, has the same configuration of pronouns and traces as (55) and (56).

This argument is of interest here because it can be replicated in the context of the focus-only interaction. In (59), it seems that a. but not b. has the bound pronoun reading suggested by c.

(59)a. We only expect JOHN to be betrayed by the woman he loves
b. We only expect the woman he loves to betray JOHN
c. $\forall x$[we expect the woman x loves to betray x ---> x = John]

(60)a. We $[[\text{only John}_F]_2[\text{expect }[[_{NP}]_2$ to be betrayed by the woman he_2 loves]]]

b. We $[[\text{only John}_F]_3$ [expect [the woman he_3 loves to betray $[_{NP}]_3$]]]

According to the scope theory of the focus-only interaction, the logical forms associated with the intended bound variable readings of (59a) and (59b) are (60a) and (60b) respectively. Since (60b) has the configuration of

traces and pronouns found in (55) and (56), it violates the weak crossover condition. Thus the scope theory explains in an independently motivated way why (59b) has no bound variable reading. This would appear to confirm the scope theory of the focus interaction and to disconfirm a theory which does not depend on the assignment of scope to focused phrases. I will show that the conflict between the crossover datum and my analysis is only apparent.

Before proceeding, I will simplify the examples in two ways. First, we can sidestep the issue of how to interpret the coindexation of a pronoun with a proper name by restricting our attention to examples with pronouns. These exhibit the phenomenon we are interested in:

(61)a. We only expect HIM to be betrayed by the woman he loves.
b. We only expect the woman he loves to betray HIM
c. $\forall x$[we expect the woman x loves to betray x ---> $x = x_2$],
where x_2 is a free pronoun translation.

As before, a. but not b. has the reading suggested by c. Having made this revision, we can simplify the semantics of the examples, and sharpen intuitions, by considering examples of 'strong' crossover.[19]

(62)a. We only expect HIM to claim that he is brilliant
b. We only expect him to claim that HE is brilliant
c. $\forall z$[we expect z to claim z is brilliant ---> $z = x_2$]

(62a) but not (62b) has the reading suggestd by (62c). As before, this is explained by the scope theory, since (62b) is associated with a logical form where a pronoun $[him]_i$ and trace e_i are in a crossover configuration. Note that (62b) does have a reading where [him] and [HE] are are coreferential. For instance, in the context "John is in charge of writing up this year's merit pay proposals....", both pronouns can be taken to refer to John. This reading of (62b) is suggested by the formula (63), which differs form (62c) in that a free variable x_2 is substituted for the first occurence of z. Consequently I will refer to this reading of (62b) as a "free variable" reading. (62a) has a free variable readings as well.

(63) $\forall z$[we expect x_2 to claim z is brilliant ---> $z = x_2$]

The significance of the distinction between the 'bound' and 'free' readings is pointed out in Horvath(1981), page 215 and following. Rochemont(1978) had argued that Chomsky's demonstration of a crossover effect for focus was flawed. The underlined occurence of <u>he</u> in (64), Rochemont observed, can be coreferential with <u>John</u>.

(64) A: Sally and the woman John loves are leaving the country today.
B: I thought that the woman he loves had BETRAYED Sally.
A: No-the woman he loves betrayed JOHN; Sally and she are the best of friends.

The reading which Rochemont appears to have in mind is the the free variable reading. In my terms, at the time of A's second utterance, propositions of the form 'the woman he (John) loved betrayed y' are presupposed to be relevant. This example does not defeat Chomsky's argument, Horvath points out since it is the bound variable reading which is claimed to be absent.

Outline of Argument

(62a) is associated with logical forms by 'move alpha'. Of the possible logical forms, two are of particular interest: (65a) is identical to the S-structure (62a), and in (65b) the focused phrase has been adjoined to the embedded S.

(65)a We only expect $[_S$ him$_{F,2}$ to claim he$_2$ is brilliant]

b [We only expect $[_S$[him]$_{F,2}$
$[_S[_{NP}]_2$ to claim he$_2$ is brilliant]]]

(66)a $\forall z$[we expect z to claim x_2 is brilliant ---> $z = x_2$]

b $\forall z$[we expect z to claim z is brilliant ---> $z = x_2$]

Suppose that both of these are admissible logical forms, and that they have the distinct interpretations suggested by the formulas repeated in (66). (66b), the interpretation for (65b), is the bound variable reading

discussed above. In (66a) x_2 is logically a free variable, the denotation of which we can assume is fixed by an assignment function.

If the above assertions are correct, we can conclude that, while focused phrases can according to my proposal be interpreted without scope assignment, assigning scope to focused phrases in LF can affect interpretation. The bound variable reading which figures in the crucial examples is associated with a logical form where the focused NP has been assigned scope. Consider now the logical forms for (62b) corresponding to(65):

(67)a We only expect [him$_3$ to claim that HE$_3$ is brilliant]

b We only expect [$_S$ [he]$_{3,F}$[him$_3$ to claim that [$_{NP}$]$_3$ is brilliant]]

(68)a $\forall z$[we expect x_3 to claim that z is brilliant ---> $z = x_3$]

b $\forall z$[we expect z to claim that z is brilliant ---> $z = x_3$]

Suppose that, as before, it is (67b) which has the bound variable interpretation (68b). But (67b) is not a well-formed logical form, since him$_3$ and e_3 are in a crossover configuration. This explains why the bound variable reading is not available for (65b). As noted, the free variable reading, which I am claiming is associated with the LF (67a), is available.

In summary, I have suggested that the crossover

phenomenon is consistent with the theory of association with focus proposed above. While focused phrases need not be assigned scope in order to interact with only, scope assignment can influence interpretation. In particular, the 'bound variable' reading present in sentences a., but not sentences b., of (59), (61) and (62) requires scope assignment in LF. It is this which triggers the crossover effect, which following Chomsky I take to be a consequence of LF scope assignment.

I will now develop the steps in the above argument.

Position of NPs in LF

The claim that (65a) and (65b) are both possible logical forms for (62a) may be in conflict with the a common view of the distribution of NPs in LF, expressed in Higginbotham (1983):

> "Elements subject to Scope Assignment will be called operators. I will leave the extension of this concept partially open, but operators certainly include quantificational elements and wh-elements. Not only may operators be assigned scope, but, we may suppose, they must be assigned scope to create a well-formed LF-representation."

This passage suggests that whether a phrase is assigned scope in LF is completely determined by its form. NPs of a certain form are operators, and an NP is assigned scope in the derivation of LF if and only if it is an operator. Since the focused phrase either is or is not an operator,

(65a) and (65b) could not both be wellformed LF representations.

But the interpretive system I am employing does not have this consequence. The rule proposed in chapter I for interpreting structures of quantifier construal, essentially (69), allows NPs with type e to be interpreted in S-adjoined position.

(69) LF configuration: $[_S NP_i S]]$
Semantic rule: combine NP' and $\lambda x_i S'$ by function application.

(69) does not specify whether NP' or S' is to be the function. This will depend on the type of NP': if NP' is a generalized quantifier, it will serve as the function. If NP' is an individual, it will serve as the argument. These possibilities are illustrated in (70) and (71).

(70) a $[[\text{every man}]_4\ [[_{NP}]_4 \text{left}]]$
b $[\text{every man}]'(\hat{}\lambda x_4 \text{left}'(x_4))$
(71) a $[[\text{John}]_4\ [[_{NP}]_4 \text{left}]]$
b $[\lambda x_4 \text{left}'(x_4)](j)$, equivalent to left'(j)

Given these assumptions about semantic interpretation, (65a) and (65b) are both interpretable logical forms, $[\text{him}]_{F,2}$ being a phrase of semantic type e.

Some Computations

It would hardly be of interest to simply assert that the bound variable readings are associated with logical forms where the focused phrase has been adjoined to the embedded S. Rather, this should follow from independent interpretive principles, specifically the semantics for p-sets and the semantic rule for structures of quantifier construal. Consider first the logical forms not involving scope assignment, repeated in (72). The ILF translations of (72a) and (72b) are (73a) and (73b) respectively. These differ only in the location of the focus operator; the normal denotation of each is the same as the normal denotation of (73c).

(72)a. We only expect [S HIM_3 to claim he_3 is brilliant]
b. We only expect [him_3 to claim that HE_3 is brilliant]

(73)a. $\forall P[P(w)\ \&\ C(P)\ \text{---}>\ P = \hat{}expect'(\hat{}claim'([x_3]_F,\hat{}brilliant'(x_3)))]$
b. $\forall P[P(w)\ \&\ C(P)\ \text{---}>\ P = expect'(\hat{}claim'(x_3,\hat{}brilliant'([x_3]_F)))]$
c. $\forall P[P(w)\ \&\ C(P)\ \text{---}>\ P = \hat{}expect'(\hat{}claim'(x_3,\hat{}brilliant'(x_3)))]$

In (73), the value of the domain variable C remains to be determined. This is to be the p-set for the intension of the translation of the VP which is the sister of only, that is (74a) in the case of (72a) and (74b) in the case of (72b).

(74)a. expect'(^claim'($[x_3]_F$,^brilliant'(x_3)))
b. expect'(^claim'(x_3,^brilliant'($[x_3]_F$)))

The important parts of these expressions are the pronoun translations x_3 and $[x_3]_F$. Since the former contains no focus operators, its p-set is the unit set of the denotation of x_3. The p-set for $[x_3]_F$ is C_e, the set of constant meanings of type e. Although the same variable x_3 is involved in both cases, the focus is not "transmitted" in any way from $[x_3]_F$ to x_3. The p-sets for the the entire expressions (74a) and (74b) are (the normal denotations of the IL expressions) (75a) and (75b) respectively.[20]

(75)a $\lambda P \exists y[P = \hat{}expect'(\hat{}claim'(y,\hat{}brilliant'(x_3)))]$
b $\lambda P \exists y[P = \hat{}expect'(\hat{}claim'(x_3,\hat{}brilliant'(y)))]$
(76)a $\forall P[P(w) \wedge \exists y[P = \hat{}expect'(\hat{}claim'(y,\hat{}brilliant'(x_3)))]$
---> $P = \hat{}expect'(\hat{}claim'(x_3,\hat{}brilliant'(x_3)))]$
b $\forall P[P(w) \wedge \exists y[P = \hat{}expect'(\hat{}claim'(x_3,\hat{}brilliant'(y)))]$
---> $P = \hat{}expect'(\hat{}claim'(x_3,\hat{}brilliant'(x_3)))]$
(77)a $\forall y$[we expect y to claim x_3 is brilliant ---> $y = x_3$]
b $\forall y$[we expect x_3 to claim y is brilliant ---> $y = x_3$]

When (75a) is substituted for C in (73c), the result is (76a), which can be paraphrased: if we have a property of the form 'expect y to claim that x_3 is brilliant', then it is the property 'expect x_3 to claim that x_3 is brilliant'. (76a) is similar in truth conditions to the first order

formula (77a), which I described as the 'free-variable' reading of (62a). In a parallel way, when (75b) is substituted for C in (73c), we obtain (76b), which is similar in truth conditions to (77b), the 'free variable' reading for (62b).

It remains to be verified that (65b), repeated in (78), has the 'bound variable' interpretation.

(78) [We only expect $[_S$[him]$_{F,2}$
$[_S[_{NP}]_2$ to claim he$_2$ is brilliant]]]

(79) $[\lambda x_2$claim'$(x_2,\hat{}$brilliant'$(x_2))]([x_2]_F)$

(80) $\lambda q \exists y[q = \hat{}$claim'$(y,\hat{}$brilliant'$(y))]$

(79) is the ILF interpretation of the S complement of <u>expect</u> in (78). The semantic rule for structures of quantifier construal reviewed above has applied; the type of the NP which has been assigned scope dictates that it serves as the argument of the lambda abstract. The important point is that the the operator λx_2 binds both occurences of x_2, one of which is a trace translation, the other a pronoun translation. Since the expression λx_2[claim'$(x_2,\hat{}$brilliant'$(x_2))]$ contains no F operators, its p-set is the unit set of its denotation. The p-set for $[x_2]_F$ is C_e, the set of constant meanings of type e. It follows from this and the ILF semantics for function application that the p-set for (79) is (the normal

denotation of the IL expression) (80). Note that the variable y occurs in both pronoun positions.

(81) λP∃y[P = ^expect'(^claim'(y,^brilliant'(y)))]

A computation based on (80) shows that the p-set which is to be taken as the value of C in the translation (78) is (the normal denotation of the IL expression) (81). Thus we obtain the meaning: if we have a property of the form 'expect y to claim that y is brilliant', then it is the property 'expect x_3 to claim that x_3 is brilliant'. This is similar in truth conditions to the formula (82), which was characterized as the "bound variable" reading.

(82) ∀y[we expect y to claim y is brilliant ---> y = x_3]

Concluding Remarks on the Crossover Argument

Given the rule for computing p-sets and the semantic rules for the relevant constructions (in particular, the rule for a structure of quantifier construal), a 'bound variable' reading for the strong crossover example (62b) would require a logical form where the focused phrase has been adjoined to the embedded S. Since such a logical form would violate the crossover condition, the absence of a bound variable reading is explained or at any rate assimilated to other cases of crossover. The same reasoning

applies to the weak crossover example (61b), and to (59b), the example involving a proper names rather than a pronoun.

Since this result was obtained in an explicit system of semantic interpretation, it has been demonstrated that the crossover datum is not evidence for the scope theory of association with focus. More generally, the crossover datum is not evidence for a scope theory of focus interpretation such as that proposed in Chomsky(1975). This result is not tied to the particular way in which the meaning of focus was represented here. We can draw the same conclusion while employing the alternative meaning for focus discussed in chapter I, which provides a component of meaning where focused phrases are translated by distinguished variables.

6. Review of this Chapter

I sketched a scope theory of association with focus according to which a focused phrase is inserted as an argument of only/even in LF. The resulting quantifier binds a variable in the surface position of the focused phrase. In the alternative theory which I proposed, the first argument of only is the VP adjacent to it in S-structure. The focused phrase is (or at least can be) interpreted in its S-structure position. The semantic interaction of only/even with focus is attributed to a contribution of focus to the selection of domains of quantification. Three

advantages over the scope theory were contemplated:

(i) No syntactic bound variable is postulated; thus we do not expect the relation between only/even and the focused phrase to be restricted by scope islands or local conditions on variables.

(ii) Association with multiple foci is accommodated without special stipulation.

(iii) Association with focus is derived as a "theorem" from independently motivated principles.

Points (i) and (ii) were explicitly verified. (iii) should be regarded as a "best theory" suggested by my proposal. It has not been completely demonstrated, since if association with focus is a theorem, it is a theorem of a pragmatic theory of the interpretation of focus and of selecting domains of quantification.

Footnotes to Chapter II

[1] Karttunen and Peters distinguish between the scope and focus of even; Anderson's "scope" is their "focus".

[2] Possibly there are other logical forms. It might be that individual denoting NPs ([John], [Sue], etc.) can be assigned scope (i.e. adjoined to S or other phrasal nodes). Given the interpretive system employed below, this would not effect semantic interpretation.

[3] This point would not be affected if QR is obligatory, so that (1a) has the logical form $[_S[\text{only John}]_7[e_7 \text{ came}]]$. This is interpreted as in (4), $[e_7 \text{ came}]'$ being turned into a characteristic function of a set of individuals by lambda abstraction.

[4] The motivation for taking only to be a VP modifier is that it can not associate with the subject or subphrases of the subject when it is in auxiliary position:

?JOHN's father only came (≠ only JOHN's father came)

even is different:

JOHN's father even came (= even JOHN's father came)

Data of this kind, which were pointed out in Jackendoff (1972), are discussed in chapter III.

[5] A way of generalizing quantifying in across the semantic types was suggested in Rooth(1981). This is discussed in chapter III, where it is used to motivate a formalism for crosscategorial operators to be applied to only and even.

[6] The derivation employs the following assumptions and abbreviations, some of which were previously introduced:

(i) The IL translation of a name is an individual constant, which in my examples will always be the first letter of the name.

(ii) The IL translation of a trace $[_{NP}]_i$ is the individual varaible x_i.

(iii) The preposition to has no semantic effect (or, equivalently, denotes the identity function), so that the IL translation of $[_{PP}$to Sue] is s.

(iv) In the VP [introduce NP_1 $[_{PP}$to NP_2]], the translations of NP_1 and PP are simultaneous arguments of introduce', the translation of introduce.

(v) introduce'(a,b)(c) is abbreviated introduce'(c,a,b).

(vi) Tense is ignored.

[7] I have not been able to confirm this attribution.

[8] In this and other examples, there is always the potential for focus on the VP. In Selkirk's terms, (11) could have (i) focus on VP with embedded foci on the NPs or (ii) maximal foci on the NPs. It is the latter possibility that I am concerned with.

[9] David Pesetsky points out that LF structures where wh phrases have been "absorbed" into a single quantifier might provide a model for the interpretation of a scope theory LF for (12).

[10] Chomsky (1981, p238) mentions a possible explanation (attributed to Sportiche) for the absence of an ECP effect with focus. If in the logical form of the sentence [I don't think that JOHN solved this problem] the focused phrase has scope in the embedded sentence rather than the matrix sentence (i.e if it is adjoined to the embedded S), the ECP will not be violated, since the trace will be bound by a sufficiently local operator (c.f. the formulation of proper government, (Chomsky(1981) p 250). But if we adopt the scope theory of the focus interaction, this is not a possibility in (18); the scope of the focused phrase is determined by the surface position of only.

In this context, it is of interest to note that the ambiguity of the sentence (i) is resolved if only is placed in front of a VP.

(i) We are required to study only SYNTAX
(ii) We are required to only study SYNTAX
(iii)We are only required to study SYNTAX

Presumably the ambiguity of (i) is a normal quantifier scope ambiguity, [only syntax] being a quantified NP. (ii) has the reading of (i) with narrow scope for [only syntax], and (iii) has the wide scope reading. These facts are reminiscent of the discussion of the French ne-personne construction in Kayne(1979): only appears to be acting as a 'scope marker'. The ne-personne construction exhibits an ECP effect, an effect which is marginal or absent for most quantifiers. It has been suggested that this distinction is to attributed to the fact that that the scope of personne, unlike that of other quantifiers, is syntactically marked in S-structure (by the position of the scope marker ne). The parallelism with the ne-personne construction leads us to expect an ECP effect for focused phrases associated with even and only. Thus it is the more significant that no such effect is observed.

[11] In the standard theory proposal Anderson summarizes, the cooccurrence restriction between even and the focus feature are stated in a phrase structure rule. Horn(1969) appears to concur with this proposal: "[Muriel on vote for Hubert] is a paraphrase of [Muriel voted only for/for only Hubert], and is in fact derived from it, by an optional adverb movement transformation of the kind described in Kuroda (1966)." In their detailed study of the compositional semantics of even, Karttunen and Peters state that sentences where even is not adjacent to the focused phrase are not problematic for their analysis (which is a scope or quantifying in analysis), "except for syntactic complications" (Karttunen and Peters(1979), page 24). This suggests that they would treat (5) in a way similar to the one I outlined, by binding a variable in the position of the focused phrase. Horn and Karttunen and Peters were primarily concerned with semantic issues.

[12] Another possibility is that (21) has a derivation fully parallel to the derivation for (5a). We assume that it has the the logical form

$[_S$John $[_{VP}$[only swims]$_3$ $[_{VP}]_3]]$.

By virtue of (22a), [only swims] receives the translation $\lambda P \forall Q[P\{Q\} \text{ ---> } Q = \hat{}\,\text{swim}']$. [only swim]' is combined with the translation of $[_{VP}]_3$, which we take to be P_3, by means of an analogue of the quantifying in rule (8), yielding:

$\lambda x[\lambda P \forall Q[P\{Q\} \text{ ---> } Q = \hat{}\,\text{swim}'](\hat{}\lambda P_3[P_3\{x\}])]$, equivalent to

$\lambda x \forall Q[Q\{x\} \dashrightarrow Q = \hat{}\text{swim}']$

When this is combined with John' (i.e. with j), we obtain the same result as in the text. In this derivation, the "generalized property quantifier" [only swim]' is quantified into the property variable P_3, binding the property variable P_3.

[13] Consider the following false claim:

Proposition: the formulas (i) and (ii) are true in the same models.

(i) $\forall P[[P\{j\} \wedge \exists y[P=\hat{}\text{introduce}'(y,m)]] \dashrightarrow P=\hat{}\text{introduce}'(b,m)]$

(ii) $\forall x[\text{introduce}'(j,x,m) \dashrightarrow x=b]$

"Proof": Let M be a model.

(a) Suppose (ii) is true in M. We want to show that (i) is true in M. Let P_1 and a be such that the conditions in the antecedent of (i) are true, i.e. $P_1\{j\}$ and $P_1 = \hat{}\text{introduce}'(a,m)$. Combining these two statements we have introduce'(j,a,m). It follows from (ii) that a = b. Therefore ^introduce'(a,m) = ^introduce'(b,m). So $P_1 = \hat{}\text{introduce}'(b,m)$. This is the consequent in (i), as required.

(b) Suppose that (ii) is false in M, say introduce'(j,a,m) and $a \neq b$. We want to show that (i) is false in M.

^introduce'(a,m) satisfies the conditions on P in the antecedent of (i). "But since $a \neq b$, ^introduce'(a,m) $\neq$ ^introduce'(b,m)", and the consequent of (i) is false if ^introduce'(a,m) is the value of P. So (i) is false.

The flaw in this argument is the part in scare quotes. There are models in which ^introduce'(a,m) = ^introduce'(b,m), but $a \neq b$. In a model of this kind, (i) may be true and (ii) false. This would be true, for instance, in a model with one possible world, a world in which the extentions of ^introduce'(a,m) and ^introduce'(b,m) are both {j}, and the extension of ^introduce'(c,m) is the empty set for any c distinct from a and b.

Is it pernicious that (ii) implies (i), but is not equivalent to it? We have an intuition that John introduced only BILL to Sue and John only introduced BILL to Sue mean the same thing. This may be because our intuitions reflect facts about models more 'realistic' than the degenerate one I described. In models where ^introduce'(b,m) and ^introduce'(a,m) are different properties (for all $a \neq b$),

(i) and (ii) denote the same proposition. Mathematical statements are the thorniest, because their truth does not presumably vary from world to world, even in 'realistic' models.

(iii) Nine is only the square of THREE
(iv) Nine is the square only of THREE
(v) $\forall P[[P\{9\} \wedge \exists y[P = \hat{}\lambda x[x=y^2]]] \text{ ---> } P = \hat{}\lambda x[x = 3^2]]$
(vi) $-x[9 = x^2 \text{ ---> } x = 3]$

Since 9 is the square of -3 as well as 3, (vi) (which I am supposing is the translation of (iv)) is false. But since $3^2 = (-3)^2$, $\hat{}\lambda x[x = 3^2]$ and $\hat{}\lambda x[x = (-3)^2]$ are the same property. So (v) (which I am supposing is the translation of (iii)) is true.

Our intuition is that (iii) is false, just like (iv). To do justice to our intuitions, a 'more intensional' semantics, one in which <u>being the square of 3</u> and <u>being the square of -3</u> are distinct but cointensional properties, is required. Philosophers have made proposals of this kind, motivated by problems of propositional attitudes. Chierchia (1984) proposes a semantics for English employing Cochiarella's second order logic HST which admits models with the right properties. If my analysis of interaction with focus is correct, these proposals can be motivated outside the realm of propositional attitudes. For other arguments to this effect, see Chierchia(1984).

[14] That is, j and b are elements of E, as well as symbols of IL.

[15] Below, the p-set for $[\text{Bill}]_F$ is taken to be $C_{e,E,W}$. Unless $C_{e,E,W}$ were defined as in (39a), the p-set for $[\text{Bill}]_F$ would include individual concepts which are distinct but coextensional at a given world. It follows that for any member P of the p-set for the intension of [introduce BILL to Sue] and any world w, there is a member P' of the p-set for the intension of [introduce BILL to Sue] which is coextensional with P at w (that is, P(g,w) = P'(g,w)). Given my analysis, [John only introduced BILL to Sue] would under these circumstances be necessarily false.

[16] I tried using Cresswell's system, but became confused because quantifiers and truth functions can not be used in the familiar way (in the way familiar to me).

[17] In (48c) I assume that the complement of <u>intend</u>

denotes a property. The point I am making is unaffected if it denotes a proposition.

[18] The definite description in (51) suggests that Chomsky had in mind an existence (and perhaps uniqueness) presupposition as the meaning of focus.

[19] That is, examples where the pronoun c-commands the trace. Such configurations violate condition C of the binding theory of Chomsky(1982), and are felt to clearly ungrammatical, while weak crossover configurations have intermediate acceptability.

[20] More precisely, the p-set for (74a) is a set of functions $h:G\times W \rightarrow D_{<s <e\ t>>}$; call this set S. At any index (g,w), S determines a set of properties $S_{g,w} = \{h(g,w) \mid h \in S\}$. The normal denotation for (75a) is a function $f:G\times W \rightarrow D_{<<s <e\ t>>\ t>}$. While S is not identical to f, they are systematically related: for any (g,w), $S_{g,w} = f(g,w)$. That is, at any index the p-set for (74a) and the normal denotation for (75a) determine the same set of properties. Subsequent statements of identity between p-sets and sets of normal denotations should be modified in a corresponding way.

C H A P T E R I I I

CROSSCATEGORIAL SEMANTICS OF ONLY AND EVEN

In chapter II, only was analyzed as an ad-VP in sentences of the form [NP only VP]. In this chapter, the analysis is extended to sentences where only and even modify other categories. Section 1 is devoted to constituency arguments, in particular to arguments in favor of the constituency $[_{NP}$only/even ---]. Data from Jackendoff(1972) suggesting that even can modify both VP and S is reviewed. The constituency arguments pose the problem of providing a uniform semantic analysis of these configurations. In section 2, a formalism for crosscategorial semantic operators is motivated by reviewing the crosscategorial semantics of conjunction and quantifying in. The formalism is applied to only and even in section 3, which closes with a discussion of the implications of the crosscategorial analysis for the claim that association with focus is part of a process of pragmatic domain selection.

1. Constituency Arguments

In the sentences (1), is the focusing adverb part of an

NP constituent? I will review three arguments in favor of [$_{NP}$only ---] and [$_{NP}$even ---] constituents, and conclude with one counterargument.

(1) a. Only John likes Bill
b. John likes only Bill
c. Even John likes Bill
d. John likes even Bill

Adverbs

Normally adverbs are marginal when intervening between V and NP, except when set off by intonation breaks:

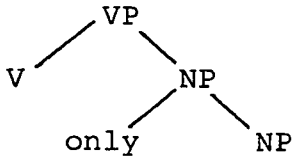
(2)a. ?John strummed quietly the guitar
b. ?John insulted recently his history teacher
c. ?*John likes very much himself
d. ?*John's mother ridiculed, recently, him

The worst cases are those where the NP is a pronoun, as in c. and d. Thus it is significant that only/even can intervene between V and a pronominal NP, without intonation breaks:

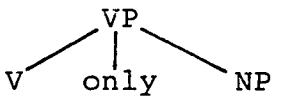
(3)a. John likes only himself
b. John's mother despises even him

This argues for the constituency (4a) as opposed to (4b).

(4) a.



b.



NP Scope Ambiguities

Another argument is based on the scope ambiguity discussed in footnote 10 of chapter II. The sentences in (5), but not the corresponding sentences in (6), are ambiguous. If we adopt the view that only can be part of an NP constituent, the ambiguities in (5) can be analyzed as NP scope ambiguities, predicted in an LF theory by the multiple adjunction sites possible for $[_{NP}$only --]. The ambiguity is not predicted by a constituency in which only is a daughter of VP in (5a), since in this case only chiselers is not a constituent which can be assigned scope.

(5)a. The government has refused to help only chiselers
b. Dan promised to bring only his guitar
c. We are required to study only syntax
(6)a. The government has refused to only help chiselers
b. Dan promised to only bring his guitar
c. We are required to only study syntax

Taglicht (1984) provides a number of convincing examples of the scope ambiguity, and of the scope fixing effect:

(7)a. I knew he had learnt only Spanish (I knew he hadn't learnt any other language)
b. I knew he had learnt only Spanish (I didn't know he had learnt any other language)
c. They were advised to learn only Spanish (They were advised not to learn any other language)
d. They were advised to learn only Spanish (They were not advised to learn any other language)
e. I knew he had missed only ONE lecture (I knew he had not missed more than one)
f. I knew he had missed only ONE lecture (I did not know he had missed more than one)

g. I managed to miss only ONE lecture (I managed not to miss more than one)
h. I managed to miss only ONE lecture (I did not manage to miss more than one)

(8)a. I knew he had only learnt Spanish
b. They were only advised to learn Spanish

Taglicht notes: "The scope ambiguity illustrated [in (7)] can avoided by shifting the only as in [(8)]".

Restrictions on Association with Focus

Jackendoff (1972) points out that when even precedes the subject NP, it can associate with the subject NP, or with subconstituents of it, but not with focused phrases anywhere else in the sentence.

(9)(=6.90 of Jackendoff 1972)
a. Even JOHN gave his daughter a new bicycle
b. *Even John GAVE his daughter a new bicycle
c. *Even John gave HIS daughter a new bicycle
d. *Even John gave his DAUGHTER a new bicycle
e. *Even John gave his daughter a NEW bicycle
f. *Even John gave his daughter a new BICYCLE

On the other hand, when even is in the auxiliary following the subject, it can associate with a focused phrase anywhere in the S:

(10) (=6.89 of Jackendoff (1972))
a. JOHN even gave his daughter a new bicycle
b. John even gave his DAUGHTER a new bicycle
c. John even gave HIS daughter a new bicycle
d. John even gave his daughter a NEW bicycle
e. John even gave his daughter a new BICYCLE
f. John even GAVE his daughter a new bicycle

Similarly, when even precedes [his daughter], it can associate only with subphrases of this NP.

(11) (=6.91 of Jackendoff (1972))
a. *JOHN gave even his daughter a new bicycle
b. *John GAVE even his daughter a new bicycle
c. John gave even HIS daughter a new bicycle
d. John gave even his DAUGHTER a new bicycle
e. *John gave even his daughter a NEW bicycle
f. *John gave even his daughter a new BICYCLE

Jackendoff expressed these restrictions by means of a structural condition on association with focus: even associates with focused phrases in its "range", as defined in (12).

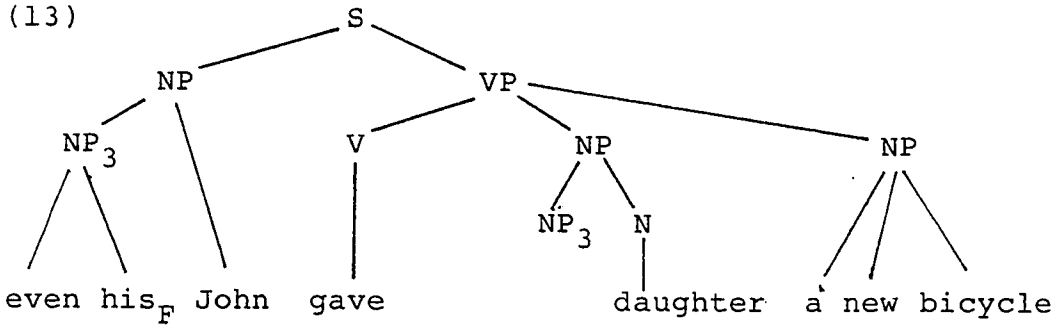
(12) If even is dominated by a node X, X and all nodes dominated by X are in the range of even

That is, even can associate with a phrase **a** if and only if even c-commands **a**. This gives the right results if even is dominated by S in (10) and by NP in (9) and (11). It would give the wrong results if even were dominated by S in (9) or by VP in (11).

The above examples provide constituency evidence in that NP constituency for even in (9) and (11), combined with Jackendoff's c-command condition, allow the possibilities for association with focus to be predicted. The c-command condition should however be regarded as a descriptive statement. It finds a ready explanation in the scope theory of chapter II. In the candidate logical form for (9c), [even

for (9c), $[\text{even his}]_3$ does not bind the syntactic variable $[_{NP}]_3$:

(13)



Below it is shown that the c-command condition can be derived in a version of the domain selection proposal as well.

Restricted Distribution

We now turn to the counterargument. If [only John] and [even John] are NPs, we expect them to have the distribution of NPs. But even and only are marginal or impossible in PP:

(14)a. ?At the party, John spoke to only Mary
b. *The children play in only the common
c. *The library is closed on only Sunday
d. *They joked about even the flood

Similarly, only and even are bad in NPs:

(15)a. *The entrance only to the Santa Monica freeway was blocked off
b. *The entrance to only the Santa Monica freeway was blocked off
c. *The entrance even to the Santa Monica freeway was blocked off
b. ?The entrance to even the Santa Monica freeway was blocked off

Taglicht (1984) points out that what he calls 'scalar' occurences of only are exceptions to the restriction on only/even in PP:

(16)a. At the party, John spoke to only ONE person
b. The children play in only TWO parks
c. The library is closed on only SOME holidays

A plausible explanation is that (16a), for example, has the constituency [[only one] person] rather than [only [one person]].[1]

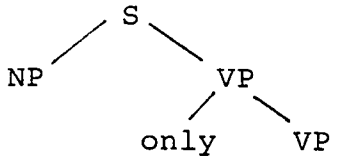
Conclusions on Constituency

In the balance of this chapter, it is assumed that there are NPs of the form [even/only ---], as suggested by the first three arguments. That is, I will assume that there is an explanation for the restriction on only/even in PP and NP consistent with this constituency.[2]

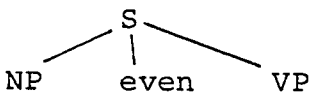
Only and Even in the Auxiliary

In the examples analyses in Chapter II, only was assumed to be adjoined to VP as in (17a). We have seen that Jackendoff analyzed even in (10) as being a daughter of S rather than VP.

(17) a.



b.



The source of the divergence illustrated in (17) is a difference between only and even noted by Jackendoff. (10a), repeated in (18a), was a case where an even between the subject and VP was associated with a focused subject. (10b), the corresponding example with only, is marginal.

(18)a. JOHN even gave his daughter a new bicycle
a. ?JOHN only gave his daughter a new bicycle

The distinction is sharpened in examples with an intervening auxiliary verb discussed by Jackendoff:

(19)a. JOHN will even give his daughter a new bicycle
a. *?JOHN will only give his daughter a new bicycle

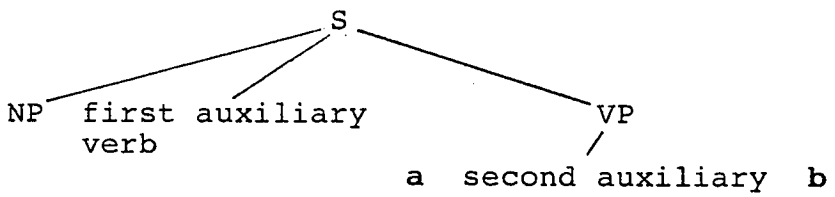
He further notes that when two or more auxiliary verbs intervene between a focused subject and even, association with focus is blocked:

(20) *?JOHN will have even given his daughter a new bicycle

Jackendoff's account of these data combines a theory of the structure of the auxiliary with an idiosyncratic restriction on only. It is proposed that in surface structure, the first auxiliary verb is a daughter of S, while subsequent ones are

dominated by VP:

(21)



It follows that an occurence of even in position **a** can be a daughter of VP or S, while one in position **b** can be a daughter of VP but not of S. In combination with the c-command restriction, this accounts for (20). The difference between only and even is accounted for by assigning only a "range" more restricted than that of even:

(22) Range of only
If only is dominated by a node X, X and all nodes dominated by X and to the right of only are in the range of only .

I will adopt a version of Jackendoff's proposal. One revision is required. Since the domain selection account does not include a rule of association with focus association referring to the structural position of a focused phrase, the distinction between only and even must be captured in a different way. Suppose that we do not allow only to be a daughter of S. Then an occurence of only in position **a** of (21) must be a daughter of VP. In the semantic analysis proposed below, this has the consequence that it can not associate with a focused subject; this would

also follow in the scope theory. Like Jackendoff's distinction in ranges, this restriction on only is simply a stipulation; I do not see how this is to be avoided.

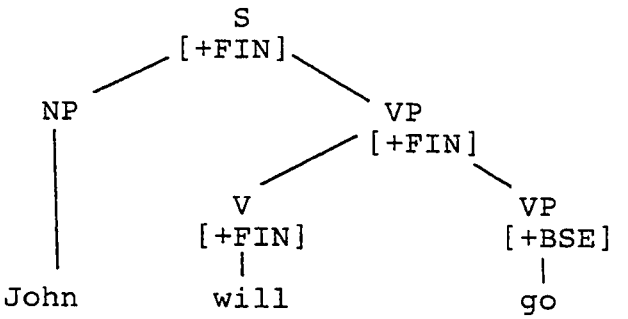
The above amounts to saying that even but not only can be a sentence adverb. Two senses in which an adverb can have S scope should be distinguished: an adverb can achieve sentence scope by virtue of the syntax-semantics map, or purely in the semantics. Gazdar, Pullum, and Sag's (1981) analysis of the auxiliary exemplifies the second possibility. Their's is an analysis where auxiliary verbs are heads of VPs, and have VP complements. Their phrase structure schema introducing auxiliary verbs is:

(23) $\langle n, [_{VP\ \alpha\ +AUX}\ V\ \underset{\beta}{VP}], \lambda\mathcal{P}[V'(\hat{}VP'(\mathcal{P}))]\rangle$

AUX is a feature identifying auxiliary verbs. n is an integer identifying a particular rule subsumed under (23); different values of n are associated with different values for the feature bundles α and β; features are used to capture the order of auxiliary verbs and "affix hopping". The intensional logic expression is a recipe for constructing the IL translation of the VP from the IL translation of its daughters V and VP. (24) is a syntactic tree accepted by this rule, together with other rules proposed by Gazdar, Pullum, and Sag. My S, NP, and VP

abbreviate their V", N", and V'.

(24)



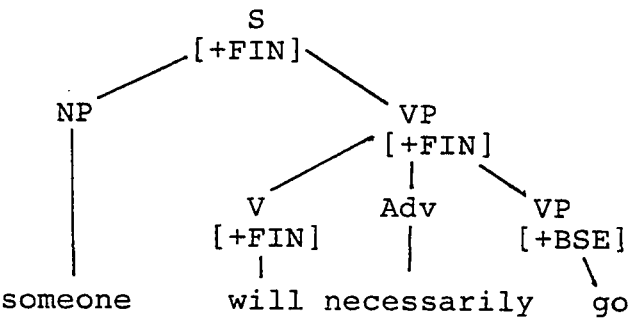
A phrase structure rule introducing sentence adverbs is created by a metarule:

(25) $<[_{VP}$ V VP] , F> ===>

$<[_{VP}$ V Adv VP] , $\lambda\mathcal{P}$[Adv'(^F($\mathcal{P}$))]>
[+FIN +AUX]

This generates a phrase structure rule which which accepts the VP in (26).

(26)a.



b. IL translation:

$\lambda\mathcal{P}$[necessarily'(^$\lambda\mathcal{P}$[will'(^go'($\mathcal{P}$))]($\mathcal{P}$))](^someone')

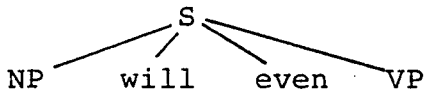
c. equivalent to: necessarily'(^will'(^someone'(^go')))

The significant feature of this proposal is that, to the extent that necessarily has sentence scope, this is a

matter of semantics. That is, it is a theorem of IL that (26b) is equivalent to (26c). In the actual IL translation (26b), the first argument of necessarily' contains no semantic material contributed by the subject.

It turns out that this feature of Gazdar, Pullum, and Sag's analysis is inconsistent with my analysis of association with focus. I will make the alternative assumption that, as a matter of the syntax-semantics map, the translation of <u>even</u> in the sentence [John will even give his daughter a new bicycle] has as its argument the translation of [John will give his daughter a new bicycle]. How this is achieved is not crucial, but consider the following implementation in an LF theory. Following Jackendoff, we assume that (19a) has a surface structure of the form (27).

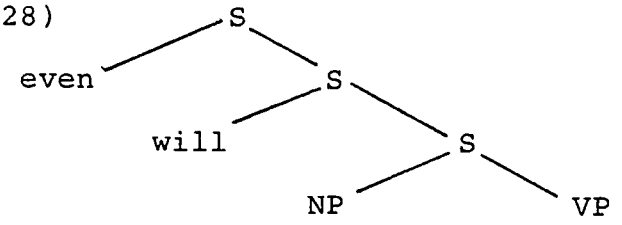
(27)



This tree does not provide a direct representation of function argument structure: none of the four daughters of S is a function which takes the other three as an arguments. However, let us suppose that at LF, function-argument structure is represented. What I mean by this is that, in LF, the daughters of a given node should be interpreted as a function and its arguments. The desired result is that the

surface structure (27) be consistent with the logical form (28).

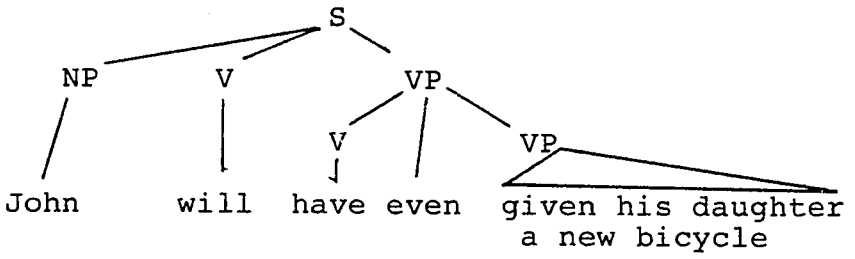
(28)



Note that this LF representation includes no traces. Given my interpretive framework, assigning scope to an adverb via QR would not necessarily affect interpretation[3]. Instead, I assume that (i) linear order is not represented at LF and (ii) a surface structure tree is homomorphic to a corresponding LF tree. That is, a node in S-structure can be expanded into two or more nodes in LF. In (28), the S node of (27) is expanded into three S nodes.

Given the homomorphism condition, the S-structure

(29)



has no logical form in where [John] is contained in a sister of [even]. In particular, (28) is not a possible logical form for (29). This will account for the impossibility of

association of even with a focused subject in (29).

Possible Relations to Quantifier Scope

According to Thomason and Stalnaker (1973), one of the properties which distinguish S modifiers from VP modifiers is that sentence modifiers can have scope over the subject. This is illustrated by (30a), where two people can have either wide or narrow scope with respect to never. (30b) has the same scope ambiguity.

(30)a. Two people never have the same fingerprints.
b. Some number necessarily exceeds the number of planets
c. never'([two people have the same fingerprints]')

As we saw when examining the Gazdar, Pullum, and Sag proposal, it does not follow that an IL translation of (30a) has the form (30c); never' could achieve scope over [two people]' in the semantics. Thus it will not be possible to motivate an approach which gives adverbs sentence scope as a matter of the syntax-semantics map purely from quantifier scope data. Nevertheless it is interesting to see whether Jackendoff's data on association with focus have parallels in data on quantifier scope. Consider first the distinction between the adverb position following the first auxiliary verb and that following the second one. Most speakers agree that in (31a), never can have scope over two scientists.

(31)a. At the end of the double blind experiment, two scientists will never have talked to each other

b. At the end of the double blind experiment, two scientists will have never talked to each other

The question is whether this is possible in (31b). I have received mixed responses to this question, although some speakers perceive a distinction, finding maximal scope for never in (31b) impossible.

Consider next the difference between only and even. Since they are quantificational, we can ask what scope they have relative to a quantified subject.

(32)a. Some students will even answer the LAST question
b. Someone has even been cleaning the BATHROOM

(33)a. Every student will only answer the FIRST question
b. Most of the students will only attend BILL's class

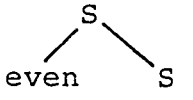
Speakers agree that in (32), even can have scope over the quantified subject. For instance, (32a) is appropriate in a situation where each student is to choose exactly one question and answer it. The question of interest is whether maximal scope for only is possible in (33). For instance, does (33a) have a reading consistent with some student answering question 2? Again, I have received mixed responses.

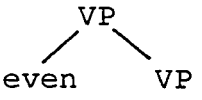
The interest of these questions lies in the possibility of deriving Jackendoff's observations about association with

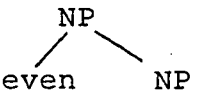
focus from principles required for a description of quantifier scope. For instance, if wide scope for only were indeed impossible in (33), the stipulation that only can not be a daughter of S would be motivated from quantifier scope data. Since the data are unclear, I do not claim to have done this.

Concluding Remarks on Constituency

The point of the above discussion was to show that even occurs in a variety of syntactic contexts. The semantic problem that this poses is to provide a uniform way of interpreting, at least, the configurations:

(34) a. 

b. 

c. 

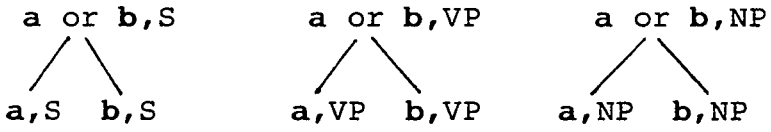
The approach taken below is to provide a primitive meaning for even which operates on the category S, and to generalize this to the other cases; even will be treated as a crosscategorial operator.

2. Crosscategorial Semantic Operators

A formalism for crosscategorial operators can be motivated by examining the semantics for conjunction and for quantifying in.

Conjunction[4]

In English and many other languages, virtually any major category can be conjoined with and and or. Montague introduced conjunction syncategorematically for three categories in PTQ: S, VP, and NP (t, IV, and T in his notation)[5]. The rules produce derivation trees of the form:

(35) a. 

His translation rules produce the following translations (where **a'** is the translation of **a** and **b'** is the IL translation of **b**).

(36)a. **a'** v **b'**
b. λx[**a'**(x) v **b'**(x)], where x is a variable of type e
c. λP[**a'**(P) v **b'**(P)], where P is a variable of type <s <e t>>

PTQ uses three separate rules to generate these translations. But there is a clear generalization about the form of these rules. The rule conjoining phrases of

semantic type t is regarded as primitive. To conjoin NPs or VPs, supply the translations with variables of the appropriate type as arguments, producing an expression of type t, apply the conjunction rule, and lambda-abstract the variables to get back to the original type. We could do the same thing with higher types such as <e <e t>>, the type of transitive verbs, by adding more variables and then abstracting them in the corresponding order. One can construct a theory of crosscategorial semantic operations incorporating this generalization directly, and this is what I will end up doing. But it is instructive to consider what is happening in the model, as opposed to IL.

Von Stechow (1974), Keenan and Faltz (1978) (in their 'Lifting Theorem'), and Gazdar (1980) describe how a conjunction operation in $D_{<a,b>}$ can be defined in terms of a conjunction operation in D_a. Elements f,g of $D_{<a,b>}$, which are functions from D_a to D_b, are viewed as sequences of elements of the set D_b, indexed by D_a. f and g are conjoined by performing the operation defined in D_b "coordinate by coordinate", or "point by point". The operation in D_t is regarded as primitive.

(37) Conjoinable types

(i) t is a conjoinable type
(ii) if b is a conjoinable type and a is a type, then <a b> is a conjoinable type

(38) Definition: $\{\&_c \mid c \text{ is a conjoinable type}\}$, $\{v_c \mid c \text{ is a conjoinable type}\}$

(i) $\&_t$: 2 x 2 ----> 2

$(x,y) \rightsquigarrow 1$ if x=1 and y=1
$\rightsquigarrow 0$ otherwise

v_t: 2 x 2 ----> 2

$(x,y) \rightsquigarrow 1$ if x=1 or y=1
$\rightsquigarrow 0$ otherwise

(ii) $\&_{<a\ b>}$: $D_{<a\ b>} \times D_{<a\ b>}$ ----> $D_{<a\ b>}$

$(f,g) \rightsquigarrow$ the function $h: D_a$ ----> D_b

$x \rightsquigarrow f(x)\ \&_b\ g(x)$

$v_{<a\ b>}$: $D_{<a\ b>} \times D_{<a\ b>}$ ----> $D_{<a\ b>}$

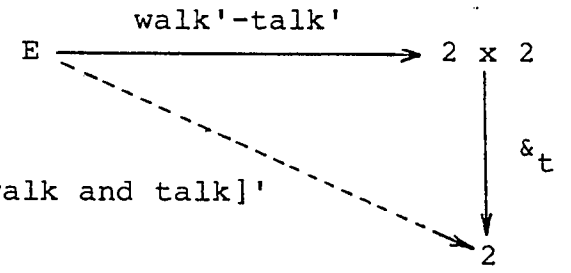
$(f,g) \rightsquigarrow$ the function $h: D_a$ ----> D_b

$x \rightsquigarrow f(x)\ v_b\ g(x)$

(38) defines operations $\&_c$ and v_c, where c is any of the conjoinable types defined in (37). Algebraically, $<D_{<a\ b>}, \&_{<a\ b>}>$ is a product of $|D_a|$ copies of $<D_b, \&_b>$, where $|D_a|$ is the cardinality of D_a.

Levin(1982) provides a slightly different perspective. Let walk'-talk' be the function which maps an individual x to the ordered pair (walk'(x),talk'(x)). Then [walk and talk]' can be regarded as the composition of the functions walk'-talk' and $\&_t$:

(39)



There may be a slight difference between the two ways of generalizing conjunction meanings. According to (38), there is a family of & operators, one for each conjoinable type. The occurences of and in (40) have different but systematically related meanings.

(40)a. John left and Mary arrived.
b. John walked and talked.
c. One man and two dogs left.
d. Mary bought and ate a bagel.

One interpretation of the function composition idea, however, would claim that the occurences of and in (40) all have the same translations. The difference arises in the way and' combines with the translations of the two conjoined phrases. In (40a), [john left]' and [Mary arrived]' are arguments of and'. In (40b), walk' and talk' are combined with and' by function composition, in the way indicated in (39).

The algebraic construction presented above is fundamental. However, since we are working with an indirect truth definition, i.e. a truth definition by translation,

it is necessary to restate the construction in terms of the intermediate language, intensional logic. Accordingly, we define a family of operators which construct IL expressions.

(41) Definition.
The crosscategorial family of and-operators is $\{ F_{and,c} \mid c \text{ is a conjoinable type} \}$, where

a. If c is t, $F_{and,c}(\mathbf{a},\mathbf{b}) = [\mathbf{a} \,\&\, \mathbf{b}]$

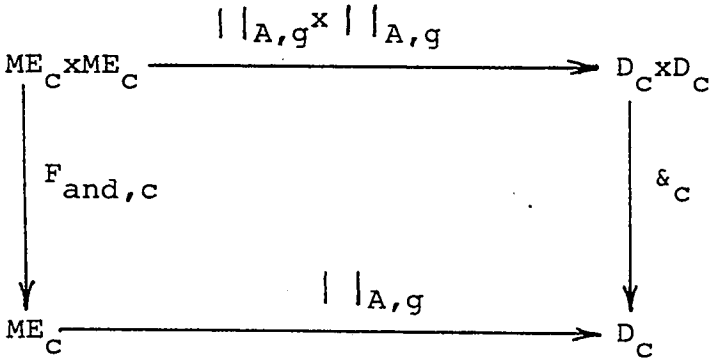
b. If c is <a,b>, where b is a conjoinable type,

$F_{and,c}(\mathbf{a},\mathbf{b}) = \lambda v F_{and,b}(\mathbf{a}(v),\mathbf{b}(v))$, where v is the first variable of type a not occuring in **a** or in **b**.

According to the following proposition, (41) is consistent with (38).

(42) Proposition.

Let **a** and **b** be IL expressions of conjoinable type c. Then for any interpretation A and assignment function g, the following diagram commutes.



Here $| |_{A,g}$ is the meaning assignment induced by an

interpretation A, and $|\,|_{A,g}x|\,|_{A,g}$ is the function mapping an ordered pair of IL expressions to the ordered pair of their denotations. F_c is the constructor of IL expressions defined in (41); $\&_c$ is the operation in the model defined in (38). The diagram says that applying the IL formula constructor first and taking the denotation of the resulting expression gives the same result as combining the denotations of two expressions by means of the operation $\&_c$.

We prove the proposition by induction on the conjoinable types.

(i) Suppose c is t.

$$|F_{and,t}(\mathbf{a},\mathbf{b})|_{A,g} = |\mathbf{a} \,\&\, \mathbf{b}|_{A,g} = |\mathbf{a}|_{A,g} \,\&_t\, |\mathbf{b}|_{A,g}$$

(ii) Suppose c is <a b>, where b is a conjoinable type.

$F_{and,<a\ b>}(\mathbf{a},\mathbf{b})_{A,g}$

$= |\lambda v F_{and,b}(\mathbf{a}(v),\mathbf{b}(v))|_{A,g}$, where v is the first variable of type a not occuring in **a** or **b**.

= the function $f: D_a \longrightarrow D_b$

$x \rightsquigarrow |F_{and,b}(\mathbf{a}(v),\mathbf{b}(v))|_{A,g'}$, where g' is like g except that $g'(v) = x$

By induction hypothesis,

$$\begin{aligned}
&|F_{and,b}(\mathbf{a}(v),\mathbf{b}(v))|_{A,g'} \\
&\quad = |\mathbf{a}(v)|_{A,g'} \,\&_b\, |\mathbf{b}(v)|_{A,g'} \\
&\quad = |\mathbf{a}|_{A,g'}(|v|_{A,g'}) \,\&_b\, |\mathbf{b}|_{A,g'}(|v|_{A,g'}) \\
&\quad = |\mathbf{a}|_{A,g'}(x) \,\&_b\, |\mathbf{b}|_{A,g'}(x) \\
&\quad = |\mathbf{a}|_{A,g}(x) \,\&_b\, |\mathbf{b}|_{A,g}(x),
\end{aligned}$$

since v does not occur in **a** or **b**.

We turn now to the path through $D_c x D_c$ in the diagram, referring to definition (38):

$$|\mathbf{a}|_{A,g} \,\&_{\langle a\ b\rangle}\, |\mathbf{b}|_{A,g} : D_a \dashrightarrow D_b$$
$$x \rightsquigarrow |\mathbf{a}|_{A,g}(x) \,\&_b\, |\mathbf{b}|_{A,g}(x)$$

As required, this is the same result as was obtained taking the path through ME_c.

The proof uses a lemma: if g and g' agree on the variables which occur in **a**, then $\mathbf{a}_{A,g} = \mathbf{a}_{A,g'}$. This is proven by induction on the recursive definition of IL formulas.

Type Accommodation

I have been working with a split semantic type system for NPs. Since e is not a conjoinable type, the family of or-operators can not deal with the NP [John or Mary] directly. Partee and Rooth (1983,appendix) propose a number of procedures for accommodating type mismatches. They suggest that an individual-denoting NP be lifted to the semantic type <<s <e t>> t> in order to combine with or:

(43) [John or Mary],NP, $F_{or,\langle\langle s\ \langle e\ t\rangle\rangle t\rangle}(\lambda PP\{j\}, \lambda PP\{m\})$

John,NP,$\lambda PP\{j\}$ — Mary,NP,$\lambda PP\{m\}$

John,NP,m — Mary,NP,m

Here I will pursue a slightly different approach, which puts type accommodation into the translation rule for conjunction. Suppose we have a semantic rule taking an NP translation of type <<s <e t>> t> as an argument:

$$F(\ \text{----}, \mathbf{a}, \text{----}\ )$$

We define another semantic rule taking an argument of type e in the corresponding position:

$F'(\ \text{----}, \mathbf{b}, \text{----}\ ) = F(\ \text{----}, \lambda PP\{\mathbf{b}\}, \text{----}\ )$,
where P is the first variable of type <s <e t>> not occuring in **b**.

Let $F_{or,e,e}$ be the result of modifying

$F_{or,<<s\ <e\ t>>\ t>}$ in this way in both argument places.

Then we obtain the following translation for

$[_{NP}$John or Mary]:

(44) $F_{or,e,e}(j,m) = F_{or,<<s\ <e\ t>>\ t>}(\lambda PP\{j\}, \lambda PP\{m\})$
$= \lambda Q F_{or,t}([\lambda PP\{j\}](Q), [\lambda PP\{m\}](Q))$
$= \lambda Q[[\lambda PP\{j\}](Q)\ v\ [\lambda PP\{m\}](Q)]$,
equivalent to: $\lambda Q[Q\{j\}\ v\ Q\{m\}]$

Quantifying In

PTQ includes rules for quantifying NPs into Ss, common noun phrases, and VPs.

(45) a. S14 If $\mathbf{a} \in P_T$ and $\mathbf{b} \in P_t$, then $F_{10,n}(\mathbf{a},\mathbf{b}) \in P_t$, where $F_{10,n}(\mathbf{a},\mathbf{b})$ comes from replacing the first occurrence of he_n or him_n by **a** and all other occurences of he_n or him_n by he or him respectively.

b. S15 If $\mathbf{a} \in P_T$ and $\mathbf{b} \in P_{CN}$ then $F_{10,n}(\mathbf{a},\mathbf{b}) \in P_{CN}$

c. S16 If $\mathbf{a} \in P_T$ and $\mathbf{b} \in P_{IV}$ then $F_{10,n}(\mathbf{a},\mathbf{b}) \in P_{IV}$

The description of $F_{10,n}(\mathbf{a},\mathbf{b})$ is somewhat abbreviated. P_T, P_t, P_{CN}, P_{IV} are respectively the sets of terms (NPs), sentences (Ss), common noun phrases (N bars), and intransitive verb phrases (VPs). Thus S14, S15, and S16 are respectively the S level, N', and VP level quantifying in rules. The corresponding semantic rules are:

(46) a. T14 If $\mathbf{a} \in P_T$ and $\mathbf{b} \in P_t$, with translations **a'** and **b'** respectively, then $F_{10,n}(\mathbf{a},\mathbf{b})$ translates into $\mathbf{a}'(\hat{}\lambda x_n \mathbf{b}')$.

b. T15 If **a** P_T and **b** P_{CN}, with translations **a'** and **b'** respectively, then $F_{10,n}(\mathbf{a},\mathbf{b})$ translates into $\lambda y \mathbf{a}'(\hat{}\lambda x_n \mathbf{b}'(y))$.

c. T16 If **a** P_T and **b** P_{IV}, with translations **a'** and **b'** respectively, then $F_{10,n}(\mathbf{a},\mathbf{b})$ translates into $\lambda y \mathbf{a}'(\hat{}\lambda x_n \mathbf{b}'(y))$.

Given the correspondence between quantifying in in PTQ and QR in EST, T14 - T16 could equally well be viewed as rules interpreting LF phrases of the forms:

(47)a. $[_S[_{NP}\mathbf{a}]_n[_S\mathbf{b}\ ]]$
b. $[_{N'}[_{NP}\mathbf{a}]_n[_{N'}\mathbf{b}]]$
c. $[_{VP}[_{NP}\mathbf{a}]_n[_{VP}\mathbf{b}]]$

In PTQ the VP level quantifying in rule finds motivation in (48a).

(48)a. John wishes to find a unicorn and eat it
b. John wishes to seek a unicorn

Montague analyzes the complement of wish as an IV (i.e. VP). In order to obtain a translation in which a-unicorn' binds the translation of it and is de dicto (narrow scope) with respect to wish', a-unicorn' is quantified in at the VP level. Similarly, quantifying into VP is required to obtain a translation for (48b) where a-unicorn' has scope between wish' and seek'. This argument for a VP level quantifying in rule is valid in the context of PTQ or other theories which posit a property denoting complement for wish. However, in grammatical frameworks where wish has a proposition denoting complement at the syntactic level which is semantically interpreted (i.e. LF, or F-structure in LFG; c.f. Halvorsen(1983)) these readings of (48) do not provide evidence for quantifying into VP. A logical form for (48b)

which has the interpretation under discussion is:

(49) $[_S John_1 \ [_{VP} wishes [_S [a\ unicorn]_2 [_S\ PRO_1$ to seek $t_2]]]]$

Thus the status of examples like (48) as motivation for quantifying into phrases of semantic type other than t is uncertain. Partee has provided a more compelling argument for the N' level rule. (50) has three readings, analyzed as S-scope, N'-scope, and non-quantified-in readings.

(50) Every search for a redheaded man failed.

Two readings can be indicated by first-order formulas:

(51)a. S-scope: $\exists y[$red-headed-man'(y)
& $\forall x[$search-for*'$(y)(x) \dashrightarrow$ fail'$(x)]]$

b. common-noun scope: $\forall x[\exists y[$redheaded-man'(y)
& search-for*'$(y)(x)] \dashrightarrow$ fail'$(x)]$

Here search-for*' is a relation between individuals: search-for*'(y)(x) is interpreted: x is a search for y. The non-quantified-in reading involves search-for', a relation between individuals and properties of properties (Montagovian NP intensions).

(52) minimal scope:
$\forall x[$search-for'$(\hat{}\lambda P \exists y[$redheaded-man'$(y)$ & $P\{y\}])(x)$
$\dashrightarrow$ fail'$(x)]$

It can be verified that a derivation employing T15 yields an IL translation equivalent to the indicated N'-scope

reading. I do not know of an equally convincing argument for S16. But since VPs and common nouns have the same semantic type, this does not affect the number of semantic types for which quantifying in is motivated.

NP Scope

While Montague did not include an NP-level quantifying in rule, one can be motivated in the context of his theory of intensional transitive verbs. To prepare for this, we need a crude idea of the lexical semantics for need:

(53) x needs $\mathcal{P}$ in w iff

$\forall w'$[the needs that x has in w are satisfied in w' ---> $\exists P$[P is in the extension of $\mathcal{P}$ at w' & x has (or owns) every element of the extension of P at w']]

(54)a John needs a car
b John needs every cancelled check

A property P is an element of the extension of ^a-car' if and only if the extension of P at w' contains at least one car (that is, at least one element of the extension of car' at w'). In particular, if y is a car at w', then the unit property of x is in the extension of ^a-car' at w'. Thus if x has a car y in w', then x has every element of the extension of ^a-car' at w'. It follows from this and (53) that John's need in w for a car is satisfied in w' if he has at least one car in w'. Similarly, the extension of

^every-cancelled-check' in w' is the set of properties P which include the cancelled checks of w' in their extension at w'. Hence John's need in w for every cancelled check is satisfied in w' if he has the cancelled checks of w'. I believe this accurately represents one reading of (54b).

(55) has a reading where the scope of [some norwegian]' is inferior to need', but superior to [every]; Mary's need would be satisfied if she collected all the works of Sigrid Undset, or if she got a hold of the complete works of Knut Hamsun (pseudonym of Knut Pedersen). We obtain this reading by quantifying the NP [some norwegian] into the NP [every book by he_2], employing the rule (56).

(55) For her term project, Mary needs every book by some Norwegian.

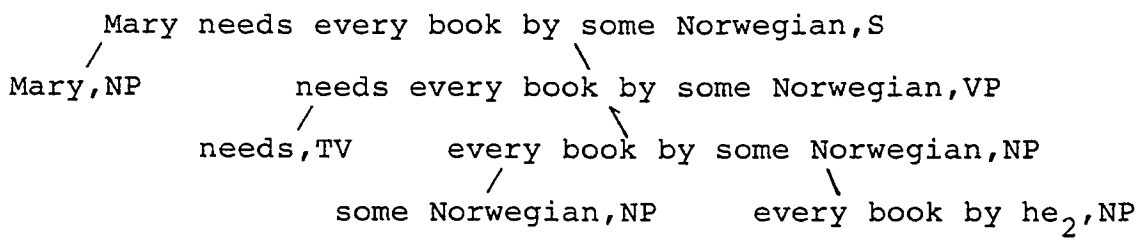
(56) a. If $\mathbf{a} \in P_T$ and $\mathbf{b} \in P_T$ then $F_{10,n}(\mathbf{a},\mathbf{b}) \in P_T$

b. If $\mathbf{a} \in P_T$ and $\mathbf{b} \in P_T$, with translations $\mathbf{a}'$ and $\mathbf{b}'$ respectively, then $F_{10,n}(\mathbf{a},\mathbf{b})$ translates into $\lambda Q\mathbf{a}'(\hat{}\lambda x_n \mathbf{b}'(Q))$.

The NP level quantifying in rule produces a translation for (55) equivalent to:

(57)a. need'(m,$\hat{}\lambda P \exists z$[norwegian'(z)
& $\forall y$[book'(y) & by(y,z)] --> P{z}])

b. partial derivation tree:



c. Mary needs $[_{NP}[\text{some Norwegian}]_2[_{NP}\text{every book by } e_2]]$

The extension of $\hat{}\lambda P\exists z$[norwegian'(z) & $\forall$y[book'(y) & by(y,z)] --> P{z}] in a world w' is the set of properties P such that for some norwegian z, the set of books by z is a subset of the extension of P at w'. This is exactly what intuition demands: Mary's need is satisfied in w' if there is some norwegian z in w' such that at w' she has every book by z.

The argument can be reproduced with other intensional transitive verbs, such as Montague's seek, or with look for; "Mary is looking for every book by some Norwegian" seems to have the NP scope reading.

In an LF theory, the reading of (55) corresponding to the MG derivation (57b) has the logical form (57c).[6]

Crosscategorial Quantifying In

We have seen that quantifying into the categories S, NP, N' and perhaps VP is empirically motivated. Conversely, I know of no argument to the effect that quantifying into

some category X is prohibited[7].

The various quantifying in rules can be unified in a manner which is formally identical to the way in which Montague's conjunction rules were unified. I presented two versions of crosscategorial conjunction: (i) the product construction, which directly manipulated denotations in the model, and (ii) a corresponding operation on IL expressions. For technical reasons, the quantifying in rule will be presented only in its IL version.[8]

(58) The crosscategorial family of Q,n-operators is $\{F_{Q,n,a} \mid a \text{ is a conjoinable type}\}$, where

a. $F_{Q,n,t}(\mathbf{a},\mathbf{b}) = [\mathbf{a}(\hat{}\lambda v_{e,n}\mathbf{b})]$

b. $F_{Q,n,<a,b>}(\mathbf{a},\mathbf{b}) = \lambda v_{a,i} F_{Q,n,b}(\mathbf{a},\mathbf{b}(v_{a,i}))$, where $v_{a,i}$ is the first variable of type a distinct from v_n which does not occur in **a** or **b**.

This definition is illustrated in (59).

(59) [every book by some norwegian]' =

$$F_{Q,2,<<s\ <e\ t>>\ t>}(\text{some-norwegian}', \text{every-book-by-he}_2')$$

$$= \lambda P F_{Q,2,t}(\text{some-norwegian}', \text{every-book-by-he}_2'(P))$$

$$= \lambda P[\text{some-norwegian}]'(\hat{}\lambda x_2 \text{every-book-by-he}_2'(P))$$

Formalism for Crosscategorial Operators

Conjunction and quantifying in are primitively operations on the type t. Generalization to other types is

empirically motivated, and can be accomplished by a construction which is algebraically a product construction. Accordingly, I propose that natural language semantics should allow crosscategorial families of semantic operations of the following form.

(60) Definition.

Let F_X be an m+n place operation on IL expressions, where $m \geq 0$ and $n>0$. The family of X-operators based on F_X and crosscategorial in the positions m+1 ... m+n is

$\{F_{X,a} \mid a \text{ is a conjoinable type}\}$, where

a. $F_{X,t}$ is F_X

b. For any conjoinable type $\langle a,b \rangle$,
$F_{X,\langle a,b \rangle}(\boldsymbol{a}_1,\ldots,\boldsymbol{a}_m,\boldsymbol{b}_1,\ldots,\boldsymbol{b}_n) =$

$[\lambda v_{a,n} F_{X,b}(\boldsymbol{a}_1,\ldots,\boldsymbol{a}_m,\boldsymbol{b}_1(v_{a,n}),\ldots,\boldsymbol{b}_n(v_{a,n}))]$,

where $v_{a,n}$ is the first variable of type a not occuring in any of $\boldsymbol{a}_1,\ldots,\boldsymbol{a}_m,\boldsymbol{b}_1,\ldots,\boldsymbol{b}_n$.

The definition embodies the hypothesis that the primitive element of a crosscategorial family of operators operates on the type t. Clearly, the structure of the definition is consistent with primitive operations on other types[9].

3. Crosscategorial Rules for Even and Only

According to the definition, the basic operation in a crosscategorial family operates on expressions of type t. This is appropriate for *even*, since it can occur as a sentence adverb. In section 3.1, I suggested that the scope properties of *only* could be captured by not allowing it to have S scope, and in chapter II, occurences of *only* in the auxiliary were assigned an ad-VP semantics. But it turns out that this can not be taken to be the basic meaning for *only*, even if the requirement that the basic element of a crosscategorial family operate on the type t were dropped; it is necessary to posit a basic only-operator operating on IL expressions of type t. (61) defines basic operators F_{only} and F_{even}, both of which operate on expressions of type t, constructing expressions which involve quantifications over propositions.

(61) $F_{only}(\mathbf{a})$
$= \underbrace{\forall p[C(p) \;\&\; {}^{\vee}p \text{ ---> } p = {}^{\wedge}\mathbf{a}]}_{\text{assertion}} \;\&\; \underbrace{\mathbf{a}}_{\text{conventional implicature}}$

$F_{even}(\mathbf{a})$
$= \underbrace{\exists p[C(p) \;\&\; {}^{\vee}p \;\&\; [p \neq {}^{\wedge}\mathbf{a}] \;\&\; \text{unlikely}'(p)]}_{\text{conventional implicature}} \;\&\; \underbrace{\mathbf{a}}_{\text{assertion}}$

The conventional implicature and assertion have been combined by conjoining them. Definition (61) induces

crosscategorial families $\{F_{only,a}$: a is a conjoinable type$\}$ and $\{F_{even,a}$: a is a conjoinable type$\}$. The operators which will be employed in the examples below are:

(62) $F_{even,t} = F_{even}$

$F_{only,<e\ t>}$: $F_{only,<e\ t>}(\mathbf{a}) = \lambda x F_{only}(\mathbf{a}(x))$

$F_{only,<<s<e\ t>>\ t>}$: $F_{only,<<s<e\ t>>\ t>}(\mathbf{a}) = \lambda P F_{only}(\mathbf{a}(P))$

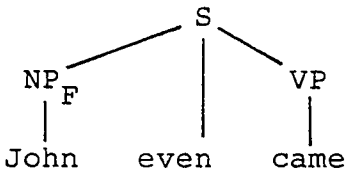
$F_{even,<<s<e\ t>>\ t>}$: $F_{even,<<s<e\ t>>\ t>}(\mathbf{a}) = \lambda P F_{even}(\mathbf{a}(P))$

Note that, while both $F_{only,<<s<e\ t>>\ t>}$ and $F_{only,<e,t>}$ can be defined in terms of F_{only} (i.e. $F_{only,t}$), $F_{only,<<s<e\ t>>\ t>}$ could not be defined in terms of an operator on the type <e t>, at least not via the construction I presented. This is why the "phantom" operator $F_{only,t}$ is required.

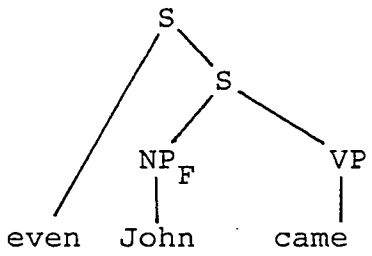
Some Examples

We begin with an example where even has S scope. As discussed in section 3.1, I assume that the surface structure (63a) is associated with the logical form (63b).

(63)a.



b.

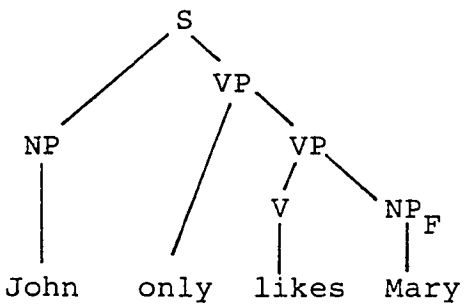


(63b) has the ILF translation:

(64) $F_{even,t}(came'([j]_F)$
$= \exists p[C(p) \& {}^{\vee}p \& p \neq {}^{\wedge}came'([j]_F \& unlikely'(p)] \& came'([j]_F)$

(65) is an example of the kind analyzed in chapter II. In this case the crosscategorial definition is invoked, producing the ILF translation (66).[10]

(65)



(66) $F_{only,<e\ t>}(like'([m]_F))(j)$

$= \lambda x F_{only}(like'([m]_F)(x))(j)$

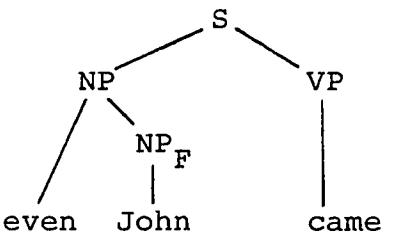
$= \lambda x[\forall p[C(p) \ \& \ {}^{\vee}p \ \text{---}> p = {}^{\wedge}like'([m]_F)(x)] \ \& \ like'([m]_F)(x)](j)$

equivalent to:

$\forall p[C(p) \ \& \ {}^{\vee}p \ \text{---}> p = {}^{\wedge}like'([m]_F)(j)] \ \& \ like'([m]_F)(j)$

(67) is an example where <u>even</u> modifies an NP. As in the conjunction case, it is necessary to assume that type accommodation modifies the semantic rule $F_{even,<<s<e\ t>>\ t>}$ so that it can apply to expressions of type e. Then the translation of the NP [even John] is (68), and (67) has the ILF translation (69).

(67)



(68) $F_{even,<<s<e\ t>>\ t>}(\lambda P P\{[j]_F\}) = \lambda P F_{even}(\lambda P P\{[j]_F\}(P))$,

equivalent to

$\lambda P F_{even}(P\{[j]_F\}) =$

$\lambda P[\exists p[C(p) \ \& \ {}^{\vee}p \ \& \ [p \neq {}^{\wedge} P\{[j]_F\}] \ \& \ unlikely'(p)] \ \& \ P\{[j]_F\}]$

(69) $\lambda P[\exists p[C(p) \ \& \ \check{}p \ \ \& [p \neq \ \hat{} P\{[j]_F\}] \ \&$
unlikely(p)] $\&P\{[j]_F\}]($ came')

equivalent to

(70) $\exists p[C(p) \ \& \ \check{}p \ \ \& [p \neq \ \hat{}$ came'$([j]_F)] \ \&$ unlikely(p)]
$\&$ came($[j]_F$)

Domain Selection: Local of Global?

(64) is a quantification over propositions. According to the domain selection proposal, this quantification is restricted to a certain p-set; since the domain is to be a set of propositions, it must be the p-set associated with the intension of the ILF translation of [John$_F$ came]. This has the effect of restricting the quantification to propositions of the form ^come'(y).

Since (69), the ILF translation of [even John$_F$ came], is equivalent to (64), the ILF translation of [John$_F$ even came], and since these two sentences are synonymous, one might think that domain selection works in the same way in the two cases. But this can not be correct. First, the desired domain $\{\hat{}come'(y) \mid y \in E\}$ is not the p-set associated with any phrase of (67); this is simply because [John$_F$ came] is not a phrase of (67). In this sense, the desired domain is not available. Second, the synonymy observed between (64) and (69) does not obtain for other sentence pairs of

similar form. It was noted in section 3.1 that sentences where even precedes the subject and sentences where even is in the auxiliary have different association with focus properties. For instance, even can associate with focus in (71a), but not in (71b).

(71)a. John even likes MARY
    b. Even John likes MARY

Both of these problems are solved if domain selection is local, in the following sense. Consider again the derivation for the NP [even John] in (67). Its ILF translation is $\lambda PF_{even}([\lambda PP\{[j]_F\}](P))$. The argument of F_{even} is an ILF expression of type t; the p-set associated with the intension of this expression is a set of propositions. Suppose the quantification over propositions in the translation of [even $John_F$] is restricted to this p-set. To be explicit, we can do this with the operator R defined in chapter II.

(72) $\lambda PR(C,\hat{}P\{[j]_F\},F_{even}(P\{[j]_F\}))$

$= \lambda PR(C,\hat{}P\{[j]_F\},$
$[\exists p[C(p) \;\&\; \check{}p \;\&\; p \neq \hat{}P\{[j]_F\} \;\&$
$\text{unlikely}(p)] \;\&\; P\{[j]_F\}])$

In this expression, R identifies the variable C in its last argument with the p-set for its second argument. The ILF

translation of (67) is then (73).

(73) $[\lambda PR(C,\hat{}P\{[j]_F\},$
$[\exists p[C(p) \ \& \ \check{}p \ \& \ [p \neq \hat{}P\{[j]_F\}] \ \& \ unlikely(p)]$
$\& \ P\{[j]_F\}])](\hat{}came')$

A lambda reduction into the scope of R is permissible for expressions which include no F-subscripts. Since came' contains to F-subscripts, (73) is equivalent to:

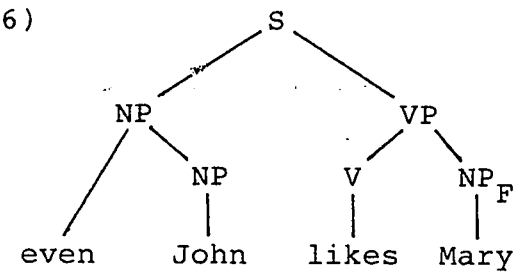
(74) $R(C, came'([j]_F),$
$\exists p[C(p) \ \& \ \check{}p \ \& \ [p \neq \hat{}came'([j]_F)] \ \& \ unlikely(p)]$
$\& \ came'([j]_F))$

Since the semantics for R makes any F-subscripts in its last argument irrelevant, (74) is equivalent to:

(75) $R(C,\hat{}came'([j]_F),$
$\exists p[C(p) \ \& \ \check{}p \ \& \ [p \neq \hat{}came'(j)] \ \& \ unlikely'(p)]$
$\& \ came'(j))$

As required, the "local" domain selection in (72) produces results equivalent to the "global" domain selection in (70). In (71), on the other hand, equivalence of denotations after domain selection is not desired. (76) is a logical form for (71b).

(76)



The semantic derivation is parallel to the derivation of (73); as above, I assume that domain selection applies locally. We obtain the ILF translation:

(77) $[\lambda PR(C, \hat{}P\{j\},$
$[\exists p[C(p) \ \& \ \check{}p \ \& \ [p \neq P\{j\}] \ \& \ \text{unlikely}(p)]$
$\& \ P\{j\}])](\hat{}\text{like}'([m]_F))$

In this case, since $\hat{}\text{like}'([m]_F)$ contains a F-subscript (and is thus "focally open"), a lambda reduction into the scope of R is not permissible. In fact, (77) is itself not focally closed; in this respect it differs from (73), and from the post-domain selection translation of (71a). In informal terms, the domain selection operator R does not capture the focused constituent $[m]_F$. This is the analysis of Jackendoff's observation that <u>even</u> can not associate with focus in sentences like (71b).

A closer examination of (77) yields an explanation for the fact that (71b) is an odd sentence. Since $\hat{}P\{j\}$ contains no F-subscripts, its p-set is the unit set of $|\hat{}P\{j\}|$. It follows that (77) is a contradiction: the conditions C(p) and $[p \neq P\{j\}]$ can not both be satisfied. In general, if the syntactic sister of <u>even</u> contains no focused phrases, we obtain after "local" domain selection a contradictory meaning, and in corresponding sentences with <u>only</u> a necessary truth. This provides an account the fact

that in Even John loves Mary and Only John love Mary, John is obligatorily focused, if we are willing to consider some necessarily false or necessarily true sentences semantically deviant (cf. the account of the definiteness condition on there-insertion in Barwise and Cooper (1981)).

Implications for the Autonomy of Semantics with Respect to Pragmatics

In the derivations above, domain selection, formalized in terms of the restriction operator R, crucially applied locally. Is this consistent with the suggestion that the restriction of the quantifications inherent in the meanings of only and even is part of a pragmatic process of domain selection? This question can be clarified by considering some semantic autonomy theses formulated by H. Kamp.

(81) (from Gazdar(1979); attributed by Gazdar to Kamp(1976))

"Our overall semantic theory T employs a set of terms I_1 . . . I_n which are agreed to be semantic in character (TRUTH, SATISFACTION, VALIDITY, CONSEQUENCE, etc.) and another set P_1 . . . P_m which are agreed to be pragmatic (IMPLICATURE, ILLOCUTIONARY FORCE, TOPIC, etc.). Then we can say that the semantic component of T is autonomous with respect to the pragmatics if and only if there is some $T' \subseteq T$ which does not involve P_1 . . . P_m and which is such that if **a** is a sentence not involving P_1 . . . P_m then $T' \Vdash \mathbf{a} \leftrightarrow T \Vdash \mathbf{a}$."

(82) (from Kamp (1979))

"In much of the recent formally oriented thinking about language there has been, I believe, the implicit assumption that the semantic and pragmatic components of such a theory are separable, in a sense which I will try to explain presently.

I have already referred to the generally recognized view that any language theory which is to account for, at least, the truth conditions of declarative sentences must incorporate a component which has the form of a recursive definition. If we accept this view, the implicit assumption to which I just alluded can be formulated as consisting of the following two parts:

(SSP) (i) The concept, or concepts, characterized by the recursive component of the theory belong(s) to semantics.

(ii) Moreover no notion to which this component refers belongs to pragmatics."

(At least in Kamp(1979), Kamp was arguing against the autonomy thesis.)

The force of (81) depends on what we take $I_1 \ldots I_n$ and $P_1 \ldots P_m$ to be. But if we agree that TRUTH is a semantic term and that RELEVANT PROPOSITION is a pragmatic one, then it is clear that a theory which claims that the truth conditions of "John only introduced BILL to Sue" is a function of a set of relevant propositions is not consistent with (81).

In one sense, it is equally immediate that my theory of association with focus violates (82). One component of the theory is a recursive definition of p-sets; P-SET is one of the concepts characterized by the recursive component of the

theory. Hence the theory is not autonomous in the sense of (82), if P-SET is a notion belonging to pragmatics. But it is not necessary to make this assumption. Consider an intermediate position:

(83) (i) The recursive definition of p-sets is part of the semantic component.

(ii) The process which interprets the p-set associated with an S as a set of relevant propositions, and which takes the domains of quantifications to be relevant sets, is part of the pragmatic component.

We imagine that the recursive semantic component associates with (84a) two objects, (84b) and the p-set (84c).

(84)a. John only introduced BILL to Sue
b. $\forall p[C(p) \;\&\; \check{}p \;\dashrightarrow\; p = \hat{}\text{introduce}'(j,b,s)]$
c. $\lambda p \exists y[p = \hat{}\text{introduce}'(j,y,s)]$

It is the function of the pragmatic component to identify C with (84c).

The local applications of domain selection in the the derivations of the previous section are inconsistent with this view of domain selection. To see this, consider (85b), the IL translation of (85a).

(85)a. Only JOHN came
b. $\lambda P \forall p[C(p) \;\&\; \check{}p \dashrightarrow p = \hat{}[\lambda P P\{j\}(P)]](\hat{}\text{came}')$

In a local application of domain selection, C was identified with $\|P\{[j]_F\}\|$. Doing this at the level of the

denotation (85b) would give the wrong result. In the expression (86), the first occurence of P is not bound by λP.

(86) $R(C,\hat{}P\{[j]_F\},\lambda P\forall p[C(p) \;\&\; \check{}p \dashrightarrow p = \hat{}[\lambda P P\{j\}(P)]](\hat{}came'))$

This formal problem matches the intuition that there is no sense in which the set of propositions $\{\hat{}P\{y\} \mid y \in E\}$ is relevant to a discourse including (85a). I conclude that the derivations involving "local" domain selection violate autonomy principle (82); they involve an essential interleaving of semantic rules and a putatively pragmatic one.

This property is not unique to the crosscategorial version of my theory of association with focus. According to the proposal of chapter II, in (87) the domain of the quantification in the embedded sentence is restricted to the set of properties $\{\hat{}introduce'(x_2,y) \mid y \in E\}$. But as above, there is no sense in which this set of properties is relevant at the discourse level, and the restriction can moreover not be accomplished by manipulating the model-theoretic denotation of (87).

(87) Every woman$_2$ believes that John only introduced her$_2$ to BILL

The above considerations defeat the claim that

association with focus is a consequence of pragmatic domain selection only if it can be shown that other instances of pragmatic domain selection do not themselves violate the autonomy thesis. I will argue that some instances of uncontroversially pragmatic domain selection do violate autonomy thesis (82). Consider the pair of sentences (88).

(88)a. John moved into the Shady Manor Apartments with his German Shepherd and his two Great Danes.
b. Everyone objected.

(89) The Queen of England did not object.

There is some pragmatic process which renders (88b) consistent with (89). Plausibly, this process involves the restriction of the domain of the universal quantifier, perhaps to the set of residents of the Shady Manor Apartments. It is moreover plausible that this set is relevant at the level of the discourse. But consider the similar (90).

(90) If John moves into an apartment house with his German Shepherd and his two Great Danes, everyone will object.

(91) If John moves into the Shady Manor Apartments with his German Shepherd and his two Great Danes, the manager of the Mountain-Vu Kourt will not object.

It seems that the status of (91) as an objection to (90) is parallel to the status of (89) as an objection to (88). That is, there is a pragmatic process which renders (91) consistent with (90). But in this case, there is no fixed

domain for the universal quantifier which accomplishes this, for if John moved into the Mountain-Vu Kourt, the manager of the Mountain-Vu Kourt would indeed object. Just as in (87), a domain including a free variable is required, in this case a variable bound by the indefinite NP [an apartment house] in the way studied by Kamp(1981) and Heim(1982).

4. Concluding Remarks on Crosscategorial Semantics

The scope theory of association with focus considers the sentences in (92) semantically transparent, in that surface structure constituency matches semantic function-argument structure; only' and even' have two arguments, the first being an NP translation and the second a VP translation.

(92)a. [[Only John] came]
b. [[Even John] came]

Cases of association with focus such as (93) achieve isomorphy between syntactic and semantic structure at LF, where a focused phrase has been moved to a position where it can serve as the first argument of only/even.

(93) John even likes BILL

In this chapter, the scope theory was inverted; (93) is treated as a prototype in which even has a single argument,

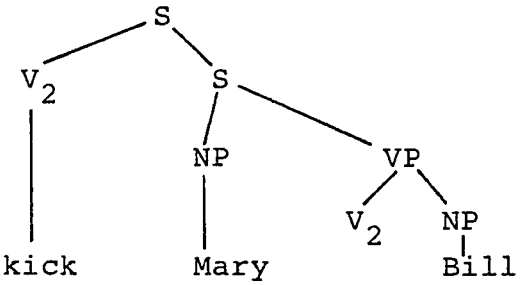
which is of semantic type t. The analysis is extended sentences such as (92b) where even modifies phrases of other semantic type are by positing a crosscategorial family of even-operators based on the primitive operator employed in (93). The possibility of analyzing the crosscategoriality of even and only with a formalism motivated by other cases of crosscategoriality, such as conjunction, is an interesting consequence of the domain selection analysis of association with focus. Notice however that the scope theory does well here also, since it builds structures of quantifier construal at LF, structures for which we have an independently motivated crosscategorial semantics.

Footnotes to Chapter III

[1] There are other exceptions to the PP restriction:
(i) John opened the safe with only a screwdriver
(ii) John talks about only the most TRIVIAL subjects
Note that (i) is not equivalent to (iii).
(iii) John only opened the safe with a screwdriver

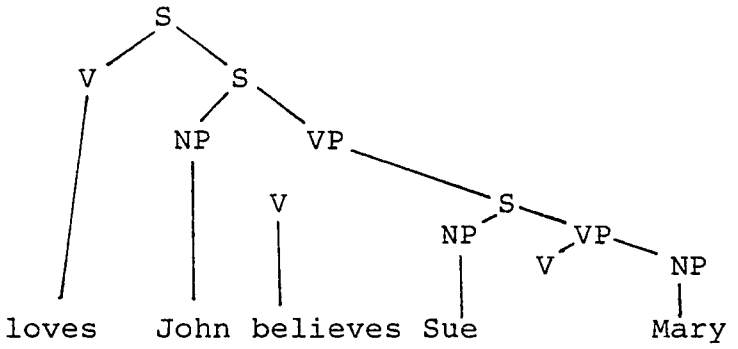
[2] The fact that quantified NPs can occur freely as objects of prepositions is an apparent barrier to an explanation based on Kayne(1981), or other theories of preposition (non-)stranding.

[3] Assigning scope to a quantified NP affects interpretation because, while a quantified NP has type <<s <e t>> t>, the translation of a trace is or contains an individual variable. For other categories, there need not be a type distinction of this kind. For instance, suppose scope assignment for V were syntactically possible:



Both the move V and its trace have type <e <e t>>. When kick' and λRR(m,b) are combined, the latter must be the function. Lambda conversion is permissible, producing an expression, kick'(b)(m), which is the translation of the logical form identical to the surface structure.

The discussion above is incomplete in that it ignores intensionality. In an intensional context, assigning scope to kick could affect interpretation. Suppose



is interpreted as λRbelieve'(j,^R(m,s))(love'), where R is a variable of type <e<e t>>. Lambda conversion is not valid, since R is in an intensional context and love' is not modally closed.

Different results are obtained if the trace is translated as R, where R is a variable of type <s<e<e t>>>. In the expression λRbelieve'(j,^[ˇR](m,s))(^love'), lambda conversion is valid.

[4] This section incorporates material from Partee and Rooth(1983)

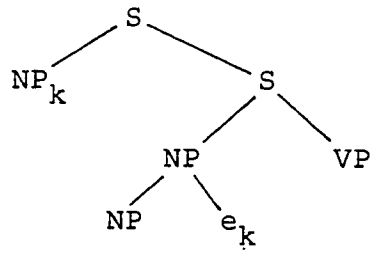
[5] Presumably to avoid treating number agreement, Montague's fragment does not include a rule conjoining NPs with and.

[6] This is the reading of the noun phrase [every book by some Norwegian] which May(1977) terms "inversely linked". May (1977) postulates logical forms phrases like

$[_{NP}$[some Norwegian]$_2$$[_{NP}$every book by t_2]].

He has provided me with correspondence from Stanley Peters suggesting a rule similar to (56) interpreting these structures. I don't know whether sentences like (55), which provide semantic motivation for the NP-adjoined structure, have been noticed before.

[7] This does not exclude the possibility that some category X is or contributes to a quantifier scope island. For instance, May(1977) rules out the structure



as a subjacency violation; it does not follow that an LF phrase where NP is adjoined to NP is illformed or uninterpretable. The same remark applies to a theory where a maximal N projection is a scope island.

[8] Because quantifying in is a variable binding operation, the primitive quantifying in operation must operate on UG meanings for the type t (functions from (assignment function,world) pairs to truth values) rather than PTQ meanings for the type t (truth values). This complicates the algebraic construction, although there is no genuine problem. The discussion of conjunction used a PTQ meaning assignment rather than the UG meaning assignment which I am employing. This is not a problem, since the "official" proposal involves crosscategorial constructors of IL (or ILF) expressions.

The definition of quantifying in operators is from Rooth (1981).

[9] A potential counterexample to the claim that the primitive operation is on the type t is a morphological reflexive operation which identifies the ultimate and penultimate arguments of a V, the subject and direct object according to Bach's (1980) hypothesis.

Primitive type: <<e <e t>> <e t>> e.g. John self-kicked.

Derived types: <<e <e <e t>>> <e <e t>>> e.g. John self-gave to Mary.

<<<s t> <e <e t>>> <<s t> <e t>>>

e.g. John self-told that everything was okay.

[10] (65) is a logical form with two VP nodes, expressing the function-argument relations. We could assume that the S-structure has one VP node.

C H A P T E R I V

"EVEN" AND NEGATIVE POLARITY

1. KKP analysis

The aim of this short chapter is to tie up a loose end regarding the semantics of even. I begin with a review of the analysis of even of Karttunen and Karttunen (1977) and Karttunen and Peters (1979), henceforth KKP; this is largely familiar from chapters II and III. It is argued that KKP's analysis of certain ambiguities as scope ambiguities is incomplete. Fauconnier's (1975) ideas about the semantics of even can be exploited to solve the problems raised.

KKP's proposal is formulated in the analysis of conventional implicature originating in Karttunen and Peters (1975). A phrase of English is associated with two denotations of like type. Where **a** is a phrase, $\mathbf{a}^E$ is the extension of **a** (**a'** in PTQ notation), and $\mathbf{a}^I$ is the conventional implicature for **a**. For instance,

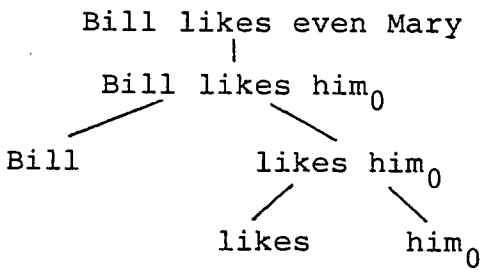
$$[\text{it is John who ridiculed Bill}]^E = \text{ridicule}^E_*(j,b)$$

$$[\text{it is John who ridiculed Bill}]^I = \exists x \text{ridicule}^E_* (x,b)$$

(ridicule^E_* is the $\text{ridicule}'_*$ of PTQ)

The extensions and conventional implicatures of complex phrases are functions of the extensions and implicatures of component phrases.[1] The syntactic part of KKP's analysis of even is a rule substituting the concatenation of even with a focused phrase for a syntactic variable. A typical analysis tree is:

(1)



The syntactic rule introducing even is:

(2) Even Rule

If **b** is a T-phrase [i.e. an NP] and **a** is a t-phrase [i.e. an S] containing an occurrence of HE_n (he_n, him_n, or his_n) then F_{even}(**b**,**a**) is a t-phrase and is derived from **a** by replacing the first occurrence of HE_n by "even **b**" and each of the subsequent occurrences by the corresponding unsubscripted pronoun whose gender matches the gender of **b**.

As was mentioned in chapters II and III, even produces, according to KKP, the conventional implicature (3) in (1).[2]

(3) a. There are other x under consideration besides Mary such that Bill likes x, and

b. For all x under consideration besides Mary, the likelihood that Bill likes x is greater than the likelihood that Bill likes Mary.

(3a) and (3b) are described as the existential and scalar conventional implicatures, respectively. [Bill likes even Mary]^{I} contains several conjuncts. Some of these are the implicatures, if any, contributed by [Bill] and [John likes he_0]. The other conjunct is obtained by applying $even^{I}$ to the extensions of Mary and a lambda abstract of the extension of [Bill likes him_0]:[3]

$$even^{I}(\hat{}Mary^{E},\hat{}\lambda x_0[\text{John likes } he_0]^{E})$$

$even^{I}$ is constrained by a meaning postulate which formalizes the implicature (3):

(4)

$$even_I =$$

$$\hat{}\lambda\mathcal{P}\lambda Q\mathcal{P}\{\hat{}\lambda y[\exists x[*\{x\} \;\&\; -[x = y] \;\&\; Q\,x] \;\&\; -x[[*\,x \;\&\; -[x = y]] \text{ ---> } exceed_e(likelihood_e(Q\,x), likelihood_e(Q\,y))]]\}$$

* is a property of individuals encoding the notion "being under consideration". $\mathcal{P}$ is a variable over NP meanings, and Q is a property variable, the value of which will be the abstract of a sentence meaning. The first conjunct encodes

the existential implicature (2a). The "scalar" implicature is encoded in a way which mimics its paraphrase (2b). KKP are using the PTQ type system; this is why $^{\vee}$ appears before x and y.

Scope Ambiguities

Since the even-rule is an S-level rule eliminating a syntactic variable, and since S is a recursive category, scope ambiguities are predicted. KKP point out that (5) has two readings: "on one reading the sentence implicates, among other things, that there are other books about which it is hard for me to believe that Bill can understand them. On this reading even has the scope given in [(6a)]. The second reading of [(5)] gives us the implicature that there are other books that Bill can understand besides Syntactic Structures. This interpretation is based on the scope assignment in [6(b)]."

(5) It is hard for me to believe that Bill can understand even SYNTACTIC STRUCTURES.

(6) Phrases to which EVEN-rule can apply:
   a. It is hard for me to believe that Bill can understand x
   b. Bill can understand x

The suggestion, then, is that the even-rule can apply at the level of either S in (3). Besides the difference in existential implicatures noted in the quoted passage,there

is a salient difference in scalar implicatures. The scalar implicatures resulting from the scopes in (7) are:

(7) (= (42) of KP)

a. For all x under consideration besides Syntactic Structures, the likelihood that it is hard for me to believe that Bill can understand x is greater than the likelihood that it is hard for me to believe that Bill can understand Syntactic Structures.

b. For all x under consideration besides Syntactic Structures, the likelihood Bill can understand x is greater than the likelihood that Bill can understand Syntactic Structures.

The wide scope reading (a) suggests that Syntactic Structures is an easy book to understand. The narrow scope reading (b) suggests that syntactic structures is a hard book to understand.[4]

2. KKP's Analysis Reformulated

The crosscategorial semantics for even of chapter III incorporated the essence of KKP's proposal about the meaning of even; however, the distiction between extension and conventional implicature was ignored. This can easily be corrected, by simply separating the extension and conventional implicature parts of the even-rule.

(8) Revised F-even

$F_{EVEN}{}^{E}(a) = a$

$F_{EVEN}{}^{I}(a) = \exists p[C(p) \;\&\; {}^{\vee}p \;\&\; p \neq {}^{\wedge}a]$
$\;\&\; \forall p[[C(p) \;\&\; p \neq {}^{\wedge}a] \;\text{--->}$
$\text{exceed}_{e}(\text{likelihood}'(p)$
$\text{likelihood}'({}^{\wedge}a))]$

Since <u>even</u> does not affect extensions, $F_{EVEN}{}^{E}$ is the identity function. $F_{EVEN}{}^{I}$ is similar to KKP's $even_{i}$, except that it operates on an expression of type t, rather than on an (NP intension, S abstract) pair. Crosscategoriality and domain selection are handled as in chapter III.

KKP's scope analysis of the ambiguity of (3) can be preserved. Assuming that [even Syntactic Structures] is an NP, the ambiguity can in fact be analyzed as a simple NP scope ambiguity. The reading which KKP obtain by applying the even-rule at the maximal S level is obtained by assigning scope in LF to $[_{NP}$even Syntactic Structures]:[5]

$[_{S}$[even Syntactic Structures]$_{8}$
$[_{S}$ it is hard to believe that can understand $e_{8}]]$

Scope Fixing

The scope fixing phenomenon discussed in chapter III is a problem for this analysis, both in its original and revised versions. Recall that the ambiguity of (9a), which like the ambiguity of (5) is analyzed as an NP scope ambiguity, disappears when only is moved.

(9)a. We are required to study only PHYSICS
b. We are required to only study PHYSICS

It is therefore interesting that the ambiguity of (5) is preserved when even precedes the embedded verb:

(10) It is hard for me to believe that Bill can even understand SYNTACTIC STRUCTURES.

My analysis predicts non-ambiguity in (10), just as in (9b). Given my chapter III analysis, even must be functioning either as an S adverb or as a VP adverb, mapping an S denotations to S denotations or VP denotations to VP denotations. It does not create a generalized quantifier (in this case a generalized proposition quantifier or a generalized property quantifier). As explained in footnote 3 of chapter III, no ambiguity is predicted, even if scope assignment is possible for phrases other than NP.

KKP did not analyze occurrences of even remote from the focused phrase (that is, they did not provide an analysis of

association with focus), so no prediction about (10) is made. However, the difference between even and only appears problematic. Some other examples show that a scope fixing effect can in fact be demonstrated for even. The sentences in (11) are consistent with a situation where one person cleaned the bathroom and some other place. They are also consistent with a situations where the person who cleaned the bathroom cleaned nothing else, although other places were cleaned.

(11)a. Someone even cleaned the BATHROOM
b. Someone cleaned even the BATHROOM

This does not demonstrate an ambiguity, but in fact one is predicted, since both sentences have derivations with both of the possible scopes for someone relative to even. The derivations with wide scope for someone with respect to even produce implicatures consistent with the first kind of situation, but not the second.[6] (12) is like (11b) in that it is consistent with situations where the person who has promised to clean the bathroom has not cleaned anything else, and is not committed to cleaning anything else.

(12) Someone promised to clean even the BATHROOM

However, when even is displaced, this is no longer true:

(13) Someone promised to even clean the BATHROOM

(14)a. Someone expected the DA to indict even MARY
b. Someone expected the DA to even indict MARY

(13) seems appropriate if some people have agreed to each clean various rooms not including the bathroom, and one promises to clean the bathroom in addition. It doesn't seem appropriate in the situation described above, where the bathroom-cleaner isn't cleaning anything other than the bathroom. What this means is that even can not take scope over someone. (14) is a similar pair of examples. Only (14a) is consistent with the DA's indicting exactly one person. This demonstrates the scope-fixing phenomenon for even. The reason for looking at the scope of even with respect to the quantified subject is that this makes the readings easier to distinguish. In principle, scope fixing effects for the scope of even with respect to the embedding verb should be present as well.

Why is a scope fixing effect observed for even in some contexts but not in others? The explanation, I suggest, is that the ambiguity of (10) is not a scope ambiguity. The contexts in which an ambiguity of the kind discussed by KKP is observed for even in auxiliary position appear to be exactly the negative polarity contexts. This claim is illustrated in (15) and (16). The first element in each pair contains a negative polarity item like "lift a finger". The second element of each pair in (15) is a sentence which KKP would analyze as having wide scope for even.

(15) Negative polarity (downward entailing) contexts
a. negation: Mary didn't lift a finger to help Bill
Mary didn't even read SYNTACTIC STRUCTURES

b. [$_{NP}$every -----]:

Every person who lifted a finger to help John was rewarded when he became a millionaire.

Every linguist who had even read SYNTACTIC STRUCTURES was immediately hired by a multinational corporation.

c. negative attitude predicates (doubt, be surprised)

I'm surprised that Mary gave you a red cent.
I'm surprised that Mary has even read SYNTACTIC STRUCTURES

(16) non-downward entailing contexts

a. *Someone promised to ever clean the bathroom
unambiguous:
Someone promised to even clean the bathroom

b. *Someone expected the DA to ever indict Mary

unambiguous:
Someone expected the DA to even indict Mary

c. [$_{NP}$some ----]

*Some people who had lifted a finger to help John were rewarded when he became a millionaire.

unambiguous:
Some linguists who had even read SYNTACTIC STRUCTURES were immediately hired by multinational corporations.

The absent wide scope readings for the second elements (16a) and (16b) have already been explained. A wide scope reading for (16c) would not suggest that the linguists who were hired had read more than one thing.

In outline, the analysis which I will adopt is that the

ambiguity of (10), and of the second elements in (15) is not a scope ambiguity, but a lexical ambiguity between normal and negative polarity versions of even. This accounts for the absence of ambiguity in non-downward entailing contexts, since negative polarity items can not occur there. However, when as in (5) even is part of an NP constituent, a wide scope derivation is predicted, in addition to the negative polarity one. Below, it is shown that negative polarity and wide scope derivations can in fact produce different implicatures.

That polarity is relevant to the analysis of even is implicit in Fauconnier (1975). His proposal about even is embedded in an analysis of negative polarity and of what he calls quantificational superlatives. He begins by noting that superlatives sometimes appear to be equivalent to universal quantifiers.

(17) a. The faintest noise bothers my uncle
b. Every noise bothers my uncle

Fauconnier analyzes this by proposing that "a pragmatic scale, ranging from faint to loud, along the dimension noise, is associated with the predicate bother."

(18) a.

b. Associated axiom:
$(\forall x)(\forall y)[\ x < y\ \&\ x$ bothers my uncle $\rightarrow$ y bothers my uncle]

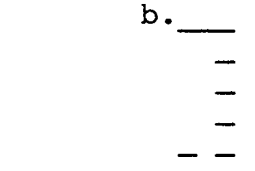
Suppose that, for all noises x_1 and x_2 on the scale, if x_1 is lower on the scale than x_2 and x_1 bothers my uncle, then x_2 bothers my uncle. Suppose further that the faintest noise is at the bottom of the scale, and that the faintest noise bothers my uncle. Then it follows that every noise bothers my uncle.

Fauconnier analyses <u>any</u> by means of the scale concept. He suggests that (19) is analyzed in the same way as (17a). This apparently means that, in the context (19) <u>any noise</u> has the same content as <u>the faintest noise</u>.

(19) Any noise bothers my uncle

<u>even</u> is given a scale analysis as well. The function of <u>even</u> in (20) is to "mark the existence of a pragmatic propability scale, with Alceste as a low point with respect to the schema <u>x came to the party</u>".

(20) a. Even Alceste came to the party

b. 

c. Associated axiom:
$(\forall x)(\forall y)[\ x < y\ \&\ $ x came to the party $\rightarrow$ y came to the party$]$

The scale is to have the property mentioned above: if x_1 is below x_2 and x_1 came to the party, then if x_1 came to the party, x_2 came to the party. The relevance of the scale idea to the present discussion is that Fauconnier suggests that, in negative polarity contexts, the opposite end of the scale may be invoked. (21) is held to be semantically analogous to (22).

(21) My uncle isn't bothered by any noise.
(22) My uncle isn't bothered by the loudest noise.
(23) $\neg\exists x$[x is a noise and x bothers my uncle]

Combined with the premise (18b), (22) entails (23), which is the desired meaning for (21). Fauconnier does not explicitly discuss occurrences of <u>even</u> in negative polarity contexts, but his analysis of the negative polarity cases suggests that he would analyze <u>even</u> in negative polarity contexts as invoking the end of the scale opposite from that which it invokes in other contexts. (24a) would be analyzed as indicated in (24b).

(24) a. John doesn't't like even Alceste

b. ___ Alceste
   –
   –
   –
  – –

c. (∀x)(∀y)[x < y & John likes x ---> John likes y]

Given the premise (24c), it follows that John doesn't like anybody.

The point of the above discussion is the idea that even can have in negative polarity contexts a meaning different from but related to its normal meaning. I will express this idea in the KP formalism.

An issue which is I believe independent of the differences between the formalisms employed by F and KKP is a disagreement about what the implicature induced by even is. According to KKP, "Even Alceste came to the party" implicates in part that some relevant person distinct from Alceste came to the party. According to Fauconnier, it implicates (through the mediation of the scale and its associated axiom) that every relevant person came to the party. The following discourse seems normal to me:

(25) The test consisted of 10 questions of increasing difficulty. Because they had gone through the homework the night before, Mary and Sue managed to answer the first one. Sue even answered question TWO.

Fauconnier would be forced to claim that only the first two

questions are under discussion here. Since this seems convoluted to me, I will retain KKPs formulation.[7] I implement the idea that there is a negative polarity version of even by providing an additional translation rule $F_{EVEN-NEG}$ similar to the F_{EVEN} defined above. The first conjunct in (26a) says that some relevant proposition distinct from **a** is false, rather than true as in (26b). The second conjunct says that **a** is the most likely of the relevant propositions, rather than the least likely as in (26b).

(26) a. $F_{EVEN-NEG}(\mathbf{a}) = \exists p[C(p) \;\&\; \neg{}^{\vee}p \;\&\; p \neq {}^{\wedge}\mathbf{a}] \;\&$
$\neg p[[C(p) \;\&\; p \neq {}^{\wedge}\mathbf{a}] \dashrightarrow \text{exceed}'(\text{likelihood}'({}^{\wedge}\mathbf{a})), \text{likelihood}'(p)]$

b. $F_{EVEN}(\mathbf{a}) = \exists p[C(p) \;\&\; {}^{\vee}p \;\&\; p \neq {}^{\wedge}\mathbf{a}] \;\&$
$\forall p[[C(p) \;\&\; p \neq {}^{\wedge}\mathbf{a}] \dashrightarrow \text{exceed}'(\text{likelihood}'(p), \text{likelihood}'({}^{\wedge}\mathbf{a}))]$

These definitions produce the implicatures (28) and (29) for the embedded S in (27). The appropriate intensional logic expression has been substituted for C. $even_n$ and $even_p$ are the negative polarity and normal versions of even respectively.

(27) Its hard to believe that John even understands $[\text{Syntactic Structures}]_F$

(28) Negative polarity even

$$[\text{John even}_n \text{ understands } [\text{Syntactic Structures}]_F]^I \equiv$$

$$\exists p[\exists y[p = \hat{}\text{understand}'(j,y)] \;\&\; -\check{}p \;\&\; p \neq \hat{}\text{understand}'(j,s)] \;\&$$
$$\forall p[\exists y[p = \hat{}\text{understand}'(j,y)] \;\&\; p \neq \hat{}\text{understand}'(j,s)] \;\dashrightarrow\; \text{exceed}'(\text{likelihood}'(\hat{}\text{understand}'(j,s)),\ \text{likelihood}'(p))]$$

(29) Normal even

$$[\text{John even}_p \text{ understands } [\text{Syntactic Structures}]_F]^I \equiv$$

$$\exists p[\exists y[p = \hat{}\text{understand}'(j,y)] \;\&\; \check{}p \;\&\; p \neq \hat{}\text{understand}'(j,s)] \;\&$$
$$\forall p[\exists y[p = \hat{}\text{understand}'(j,y)] \;\&\; p \neq \hat{}\text{understand}'(j,s)] \;\dashrightarrow\; \text{exceed}'(\text{likelihood}'(p)),\ \text{likelihood}'(\hat{}\text{understand}'(j,s))]$$

Assuming with Karttunen and Peters that the complex predicate its hard to belive that is a conventional implicature hole, (28) and (29) are inherited as implicatures of (27). Accordingly, the negative polarity implicature is that some proposition of the form "John understands y" distinct from "John understands Syntactic Structures" is false, and that "John understands Syntactic Structures" is the most likely proposition of this form. The implicature associated with the normal version of even is that some proposition of the form "John understands y" distinct from "John understands Syntactic Structures" is true, and that "John understands Syntactic Structures" is the least likely proposition of this form.

These implicatures seem intuitively correct.

3. A Difference in Implicatures

So far I have argued that KKP's scope analysis is not the complete story, while granting that the implicature which their analysis generates for the examples they discuss is the correct one. I argued that (27) has a negative polarity derivation, but not a wide scope derivation. However, the similar (4) has both negative polarity and wide scope derivations. The negative polarity conventional implicature is (28). It turns out that the wide scope implicature is different:

(30) $\exists p[\exists y[p = \hat{}$ its-hard-to-believe'($\hat{}$understand'(b,y))] & $\forall p$
& $p \neq \hat{}$its-hard-to-believe'($\hat{}$understand'(b,s))] &
$\forall p[[\exists y[p = \hat{}$ its-hard-to-believe'($\hat{}$understand'(b,y))] &
$p \neq \hat{}$its-hard-to-believe'($\hat{}$understand'(b,s))] --->
exceed'(likelihood'(p),
(likelihood'($\hat{}$its-hard-to-believe'($\hat{}$understand'(b,y)))]

The existential implicature in (30) is that there is a true proposition of the form 'its hard to believe that Bill can understand y' distinct from 'its hard to believe that Bill can understand Syntactic Structures'. This is different from the existential implicature in (28), which says that there is some false proposition of the form 'John understands y' distinct from 'John understands Syntactic Structures'. The question, then, is whether different conventional implicatures are detectable in the sentences (31), which

should both be unambiguous, (31a) having the implicature (28), and (31b) having the implicature (30).

(31) a. Its hard to believe that he even understands SYNTACTIC STRUCTURES
b. Its even hard to believe that he understands SYNTACTIC STRUCTURES

The putative difference between (31a) and (31b) is that (31a) implicates that there is something distinct from Syntactic Structures that John doesn't understand, while (31b) implicates merely that there is some such thing that it is hard to believe that John understands. Presumably participants in a conversation who have agreed that a proposition is false will find it hard to believe. But participants in a conversation can have agreed that a proposition is hard to believe without having agreed that it is false. Thus the predicted implicatures of (31a) and (31b) are different in principle, given the Stalnaker-style interpretation of conventional implicature employed by KKP. However, the distinction is so subtle that I am unable to say whether or not it is verified in intuition.

We have seen that the negative polarity and wide scope readings in theory produce different conventional implicatures, although the difference has proven difficult to detect in intuition. This is true of the many cases aside from the one discussed above. However, there are, I believe, examples which produce distinctions confirmed in

intuition. keep ... from appears to be a conventional implicature hole (i.e. it passes on the implicatures of its arguments). For instance "Mary kept John from also seducing TOM', like "John also seduced TOM', implicates that Bill seduced someone distinct from Tom. keep ... from is a negative polarity trigger judging by (32). Thus it admits derivations with negative polarity even:

(32) The censorship committee kept John from ever reading Syntactic Structures

(33) The censorship committee kept John from reading even$_n$ Syntactic Structures

The inherited implicature of (33) is that there is a book other than SS which John did not read, and that SS is a maximally likely book for John to read, among the relevant ones. This differs from the implicature associated with the wide scope derivation: this includes the implicature that there is a book distinct from SS that the censorship committee kept John from reading. Thus, the KKP scope proposal has the consequence that the conventional implicature of (33) would not be satisfied by the assumptions set up by the discourse:

(34) Because they had been stolen from the library, John couldn't read "The Logical Structure of Linguistic Theory" or "Cartesian Linguistics". Because it was always checked out, he didn't read "Current Issues in Linguistic Theory".

The speakers I have polled find (33) acceptable in this

context. (35), on the other hand, has only the wide scope derivation, and should be odd in the context (34).

(35) The censorship committee even kept John from reading SYNTACTIC STRUCTURES

I believe this is correct, although the possibility of broader foci corrupts the data; the broadest focus reading, which can be paraphrased: "even the following thing happened: the censorship committee kept John from reading syntactic structures", does of course not implicate that the committee kept John from reading any books other than Syntactic Structures. (36) has the narrow scope negative polarity derivation, and seems compatible with (34), as predicted.

(36) The censorship committee kept John from even reading SYNTACTIC STRUCTURES

A parallel set of examples is (37). (37b) seems odd since it implicates that there was something else that John refused to do, although this has not been established in the discourse. (37c) implicates that there was something else that he didn't do; this is established, or at least suggested, in the context (37a).

(37) a. context: Nobody wanted John to help prepare the food, and the question did not arise. But we were irritated when

b. ... John even refused to DO THE DISHES
c. ... John refused to even DO THE DISHES

4. Conclusion

KKP's scope analysis is incomplete. Scope fixing behavior of even in auxiliary position can be demonstrated by examining non-negative polarity contexts. Given scope fixing, it is problematic that in sentences with negative polarity triggers and even in auxiliary position, ambiguity remains. The suggested resolution of this problem derived from Fauconnier (1975) is that there is a negative polarity version of even. Sentences where wide scope and negative polarity derivations produce detectably different conventional implicatures support the negative polarity analysis.

While the proposed ambiguity in even is descriptively superior to KKP's scope proposal, it isn't very satisfying. The same is true of well-motivated ambiguity analyses of any (Ladusaw(1979), Linebarger(1980), and of until (Ladusaw(1979)). While it may be desirable to link the two sides of the ambiguity in a more systematic way, perhaps employing Fauconnier's scale notion, this would remain an ambiguity analysis. Part of the reason that my two semantic

rules for even look less symmetric than the Fauconnier-style scale analysis is the disagreement about the conventional implicature induced by even which I mentioned. Granting that some improvement may be possible here, it is important to realize that Fauconnier-style scale analysis would still be an ambiguity analysis: it must be stated that the opposite end of the scale can be invoked in negative polarity contexts.[8]

Footnotes to Chapter IV

[1] In addition, a "heritage function" a^h is associated with a functor phrase **a**. One conjunct in conventional implicature of a complex phrase is obtained by applying the heritage function for the functor to the conventional implicatures of the arguments.

[2] In chapter III, I substituted unlikely'(^like'(b,m)) for (3b). Either of these can be criticized, as someone suggested to me, for their "meretricious exactitude", but they do allow an analysis to get off the ground. Kempson(1975) argued that the existential implicature (3a) should be dropped. Some of her examples may be corrupted by the possibility of S-scope for even. In any case, KKP's analysis is only weakly tied to their specific claim about the lexical semantics of even.

[3] KKP's even-rule is similar to the scope theory outlined in chapter II. Note in particular that, in the translation, the focused phrase is an argument.

[4] KKP are apparently assuming that it is hard to believe passes on the conventional implicature of Bill can understand even Syntactic Structures, i.e. that it is hard to believe is a conventional implicature hole in the terminology of Karttunen (1973), so that (7b) is an implicature of (5).

[5] Below it is argued that (5) has another derivation involving a negative polarity version of even which produces a meaning similar to KKP's wide scope meaning. The wide scope derivation will still be possible, since it follows from the NP scope mechanism. This is why I described KKP's analysis as incomplete, rather than incorrect.

[6] The reading with wide scope for someone actually poses a problem for Karttunen and Peters' analysis, as they point out. Since extensions and conventional implicatures are totally separate, there is no way for a quantifier, such as the existential quantifier in the example, to bind a variable in both components of meaning. The reading with wide scope for someone can be obtained by quantifying in this NP. This produces the following extension and implicature expressions. (Simplifying assumption: the-bathroom' = b.)

$[\text{someone}_2[\text{even}[e_2 \text{ cleaned the bathroom}]]]_e \equiv$

$\exists x$[person(x) & clean(x,b)

[someone$_2$[even[e_2 cleaned the bathroom]]]$_i$ ≡

$\exists x$[$\exists y$[y ≠ b & clean(x,y)] &
-y[y ≠ b ---> exceed$_e$(likelihood'(^clean'(y,b)),
likelihood'(^clean'(x,b)))]]

The existential quantifiers in the extension and implicature expressions are entirely independent.

Since this is a general problem about the interaction of quantifiers and conventional implicatures it remains in my analysis of even. I nevertheless base arguments on these examples. This is partially justified by the fact that Cooper(1983) and Heim(198) have proposed solutions to the quantifier problem which retain many features of Karttunen and Peters' system.

[7] One could go further and object to the universal quantifier in KKP's scalar implicature. (25) does not seem to implicate that question 2 was the most difficult of the ten questions, merely that it was more difficult than the other question which was answered. One way of weakening the implicature produced by (8) is to collapse the scalar and existential implicatures, retaining the existential quantifier:

$F_{EVEN}{}^{I}$(a) =

$\exists$p[C(p) & p & p ≠ ^a & exceed'(likelihood'(p),
likelihood'(^a))]

Fauconnier states that this "universal but one" presupposition was employed in Horn (1969). In fact, Horn proposed the existential presupposition later adopted by KKP.

[8] As for the scale analysis of any, it doesn't seem to me that it differs from an analysis such as Ladusaw's which postulates an ambiguity between negative polarity existential any and "free choice" universal any. In Fauconnier's proposal, any can invoke the top end of a scale in a negative polarity context. For instance, in "I doubt that anyone came", anyone invokes the top end of a scale associated with the axiom:

x < y & x came ---> y came

What the scale is depends on context; in Fauconniers words, the scale is "arbitrary". In "I doubt that anyone brought tequila", anyone invokes the top end of a scale

associated with the axiom:

x < y & x brought tequila ---> y brought tequila

One way of expressing this is that, in the sentence schema

I doubt that **a** (anyone),

a fills in a predicate slot in the semantic material associated with anyone. On the resulting scale, anyone is associated with an individual (perhaps an abstract one) such that, if there exists an x that came, then the individual associated with anyone came.

This is exactly what a theory employing the PTQ analysis of NPs translating negative polarity any as an existential is saying. anyone, having the IL translation $P_x[person\ x\ \&\ P\ x\ ]$ has a predicate slot, the value of which depends on the context in which anyone occurs. And while one may or may not want to call anyone' an abstract individual, the inference mentioned above is certainly valid.

In a similar way, it can be shown that Fauconnier's analysis of "free choice" any is equivalent Ladusaw's proposal, employing the PTQ analysis of NPs, that it is a universal determiner.

I don't wish to trivialize Fauconnier (1975), which contains much material I have not discussed. For instance, it is pointed out that certain quantificational superlatives, like negative polarity any, can occur in there sentences:

a. There isn't the faintest noise that bothers my uncle

b. There isn't the any noise that bothers my uncle

This is interesting, given the restrictions on definites in there sentences. Fauconnier assimilated b. to a.; while he presented this as an argument for treating the two in the same way, this did not explain why a. is okay. The existential analysis of any explains why b. is okay, but has nothing to say about a.

C H A P T E R V

ADVERBS OF QUANTIFICATION

Lewis(1975) calls adverbs such as always, usually, and frequently "adverbs of quantification". In the context of these adverbs, we observe an effect on truth conditions when focus is shifted.

(1)a. In Saint Petersburg, officers always escorted BALLERINAS
b. In Saint Petersburg, OFFICERS always escorted ballerinas

If some officers ever escorted some non-ballerinas, (1a) is false but (1b) may still be true. If some non-officers ever escorted some ballerinas, (1b), is false but (1a) may be true. While the examples with bare plurals are the most compelling, ordinary individuals behave in the same way:

(2)a. MARY always takes John to the movies
b. Mary always takes JOHN to the movies

I extend Jackendoff's terminology and say that adverbs of quantification associate with focus. While examples with always are the clearest, other frequency adverbs associate with focus as well:

(3) c. MARY usually takes John to the movies
d. Mary usually takes JOHN to the movies

Presumably the the difference between always and the other adverbs of quantification can be traced to the fact that usually, frequently, etc., like the determiners most and many, are vague.

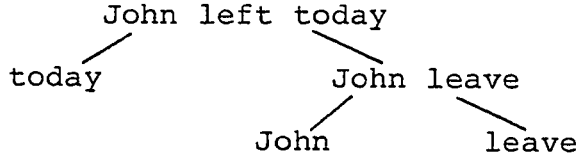
To provide an analysis of this phenomenon, it is necessary to work with an explicit semantics for these adverbs; my proposal is a straightforward modification of Stump (1981). It is argued that attention to focus yields, in addition to a treatment of (1) - (3), a simplification in Stump's analysis of temporal adverbial clauses. The chapter closes with a discussion of how my proposal might be executed in an alternative model of quantification.

1. Stump's Analysis of Temporal Adverbs

Stump's point of departure is the problem about the interaction of tense with frame temporal adverbs like yesterday and on April 5,1984 pointed out in Dowty (1979).[1] In sentences like (4a), the past tense and the frame adverb do not have detectable scope with respect to each other; rather, they seem to place restrictions on a single time variable. Dowty(1979) handled this by postulating a rule which introduced tense and a time adverb simultaneously.

The resulting derivation tree (4b) is associated with an IL translation equivalent to (4e).

(4) (Dowty(1979), p 328)
a. John left today
b.



c. translation of time adverb: $\lambda P_t \exists t[t \subseteq \text{today}' \ \& \ P_t\{t\}]$
[John leave]': leave'(j)
types: t and today' have type i, the type of time intervals, PAST has type <i t>, and P_t has type <s <i t>>.
d. semantic rule combining a frame adverb denotation **a** with an S denotation **b**:
a($\hat{}\lambda$t[PAST(t) & AT(t,**b**)])

e. $\exists t[t \subseteq \text{today}' \ \& \ \text{PAST}(t) \ \& \ \text{AT}(t,\text{leave}'(j))]$

While this treatment allows tense and one frame adverb to restrict a single time variable, Dowty points out that it does not provide the correct semantics for sentences like (5), where tense and two or more frame adverbs appear to be restricting a single time variable:

(5) (Dowty (1979), p 328)
I first met John Smith at two o'clock in the afternoon on Thursday in the first week of June in 1942.

This criticism is related to the fact that the interaction of tense and frame adverbs is not treated compositionally; since there is no discrete rule adding a frame adverb to an S, frame adverbs can not be added

recursively.

Several solutions to this problem have been proposed.[2] Stump employs a device also suggested in Bach(1980). At intermediate derivational stages, sentences have the semantic type <i t>, rather than t. It is argument position of these S denotations, termed temporal abstracts, which serves as the implicit variable which is restricted by successive frame adverbs.

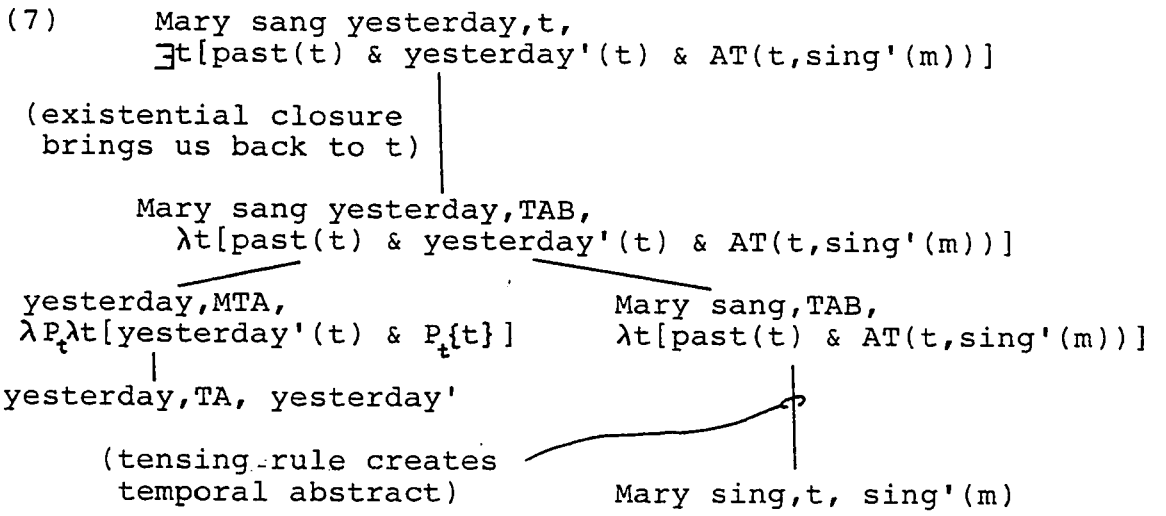
Stump employs the following syntactic categories:

(6) Stump's categories

Category label	Description	Semantic Type	Phrases of this category
t[-tns]	Tenseless sentence	t	[John dance]
TAB	Temporal abstract; derived from t[-tns] by tensing rule	<i t>	[John danced]
TA	Frame adverb	<i t>	primitive: yesterday, today derived: [when John danced]
MTA	Main tense adverb, or ad-TAB. Derived from TA.	<<i t><i t>>	yesterday,today, [when John danced]
t[+tns]	Tensed sentence; derived from TAB by existential closure rule	t	[John danced]

A typical derivation tree (consisting of a phrase, its

syntactic type, and its IL translation) is:



A TAB is created by a tensing rule; the semantics for this rule employs the tense logical operator AT.[3] The TA and TAB each denote (a characteristic function of) a set of intervals. The promotion rule creating an MTA, and the rule combining the MTA with the TAB, which is a rule of function application, have the effect of intersecting these sets.[4] More MTAs could be added, placing further restrictions on the variable t in the body of the temporal abstract. The semantic components of the rules employed in (7) are:

(8) Semantic rules

(i) Past tense tensing rule: $\lambda t[past(t) \& AT(t, \mathbf{b})]$, where **b** is the t translation.

(ii) Promotion of TA to MTA: $\lambda P_t \lambda t[P_t\{t\} \& \mathbf{a}(t)]$, where **a** is the TA translation.

(iii) MTA + TAB rule: $\mathbf{a}(\hat{}\mathbf{b})$, where **a** is the MTA translation and **b** is the TAB translation.

(iv) Existential closure rule: $\exists t\mathbf{b}(t)$, where **b** is the TAB translation.

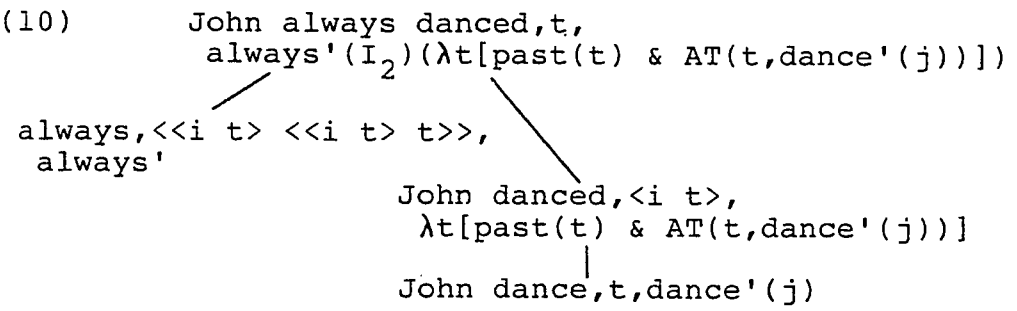
The analysis of adverbs of quantification (Stump calls them relative frequency adverbs, or RFAs) is based on TABs as well. The semantic type for RFAs is related to the analysis of NP denotations as generalized quantifiers. If a is a semantic type, then <<a t><<a t> t>> is the type of (extensional) generalized a-quantifiers. RFAs have semantic type <<i t><<i t> t>>, the type of generalized i(nterval)-quantifiers. The semantics for some RFAs is indicated in (9).

(9)

RFA	truth condition	corresponding determiner
always'(a)(b)	$\|a\| \subseteq \|b\|$	every
never'(a)(b)	$\|a\| \cap \|b\| = \emptyset$	no
sometimes'(a)(b)	$\|a\| \cap \|b\| \neq \emptyset$	some
usually'	? the cardinality of $\|a\| \cap \|b\|$ exceeds th cardinality of $\|a\| - \|b\|$	?most

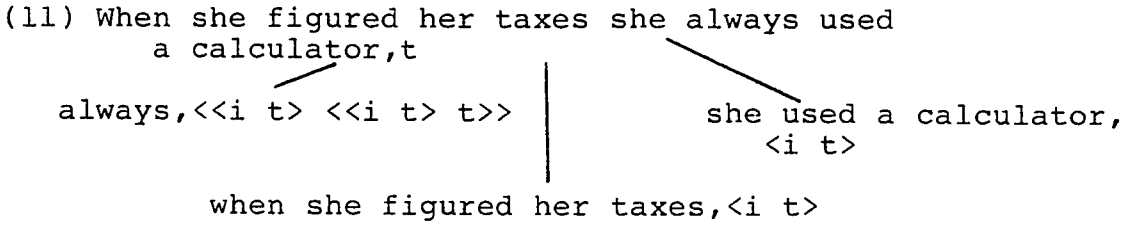
RFAs are introduced by a pair of rules; the distinction between these rules is whether both arguments of the RFA, or merely the second argument, correspond to phrases in the syntax. (10) is a derivation where only the second argument corresponds to a syntactic phrase; in the semantics, the first argument position is filled by a variable I_2. The idea is that the times which are relevant to the truth of "John always danced" must be recovered from a context of use; I_n plays the same role in Stump's analysis as the domain variable C in chapter II.

(10)



In the other kind of derivation, the first argument position is filled by a TA, such as the derived TA [when she figured her taxes] in (11). Note that a TA, having the semantic type <i t>, is an appropriate argument for an RFA.

(11)



(12) Translation:

always'(λt[past(t) & AT(t, she-figure-her-taxes')])
(λt[past(t) & AT(t,Jane-use-a-calculator')])

Given (9), (12) requires that the set of past intervals where she figured her taxes be a subset of the set of past intervals where she used a calculator. The rules covering the derivations (10) and (11) are:[5]

(13)a. Semantic rule combining an RFA (relative frequency adverb) meaning **a** with a TAB meaning **b**:

$$\mathbf{a}(I_n)(\mathbf{b})$$

Here I_n is a free variable, the value of which is to be fixed by a context of use.

b. Semantic rule combining an RFA (relative frequency adverb) meaning **a** with a TAB meaning **b** and a TA meaning **c**:

$$\mathbf{a}(\mathbf{c})(\mathbf{b})$$

In (13a) the first argument is a free variable; in (13b) the first argument is a TA meaning.

A further set of relevant rules are those creating derived TAs, in particular <u>when</u>-clauses such as [when she figured her taxes]. Since these rules are intricate, I will supply the translations of derived TAs without explaining their derivation.

2. Extension of Stump's Analysis

We now turn to the analysis of examples like (2), repeated below.

(14)a. MARY always took John to the movies
b. Mary always took JOHN to the movies

A derivation employing (13) produces the denotation (15) for (14a) and (14b).

(15) always'(I_2)
(λt[past(t) & AT(t,take-to-the-movies'(m,j))])

There is a provocative connection between the influence of focus on truth conditions in (14) and the domain selection analysis of the interaction of focus with only and even. In (15) the domain of quantification is a free variable. In the analysis of only and even, a free variable was identified with the p-set corresponding to the argument of the adverb. However, the semantic type of the argument of always is <i t>; hence its p-set is a set of sets of time intervals, (16) in the case of (14a).

(16) $\{\lambda t[past(t) \ \& \ AT(t,take\text{-}to\text{-}the\text{-}movies'(y,j))] \mid y \in E\}$

I_2 can not be identified with this set, sence I_2 denotes a set of time intervals, not a set of sets of time intervals. However, an object of the required type can be obtained as the union of (16):

(17) $\bigcup\{\lambda t[past(t)$ & AT(t,take-to-the-movies'(y,j))] | $y \in E\}$

A time interval t is in the set (17) if, for some individual y, t is in the denotation of $\lambda t[past(t)$ & AT(t,take-to-the-movies'(y,j))]. Thus (17) is the set of intervals where someone took John to the movies. Supplying this as the value of I_2 in (15) produces the a meaning which can be described: at every interval where someone took John to the movies, Mary took John to the movies. This seems to be correct. A possible point of dispute is whether (14a) is really consistent with, say, Mary and Sue having once taken John to the movies simultaneously. Intuitions are not clear on this point.

Similarly, the union of the p-set for (14b) is the set of intervals where Mary took someone to the movies. With this as the value for I_2, we obtain the meaning: at all time intervals at which Mary took someone to the movies, Mary took John to the movies.

As I pointed out, there is a gross similarity between this idea about the interaction of focus with frequency adverbs and the chapter II proposal about association of focus with only and even: in both cases, focus determines a domain of quantification. But the two treatments differ at the technical level: in the frequency adverb case it is the union of the p-set, not the p-set, which is supplied as the

value of a context variable. I defer discussion of possible improvements in this situation, turning to a criticism of Stump's analysis of temporal adverbs as arguments of relative frequency adverbs.

Some Criticisms of Stump's Analysis

So far, I have suggested that, by supplementing Stump's rule (13a) with a principle determining the value of the free domain of quantification variable, we obtain an account of (1) - (3). In the other kind of derivation postulated by Stump, the first argument of an RFA was was a explicitly supplied as a TA denotation. There are conceptual and empirical objections to (13b),the rule which licenses these derivations.

A. By postulating a rule in which a TA denotation is an argument of an RFA denotation, we claim that the following sentences have radically different function-argument structures.[6]

(18) a. When John walked to school, he whistled
b. When John walked to school, he always whistled

In (18a), [he whistled]' is an argument of the MTA meaning [when John walked to school]'. In (18b), [he whistled]' and [John walked to school]' are both arguments of always'. This is curious: semantically, (18a) and (18b)

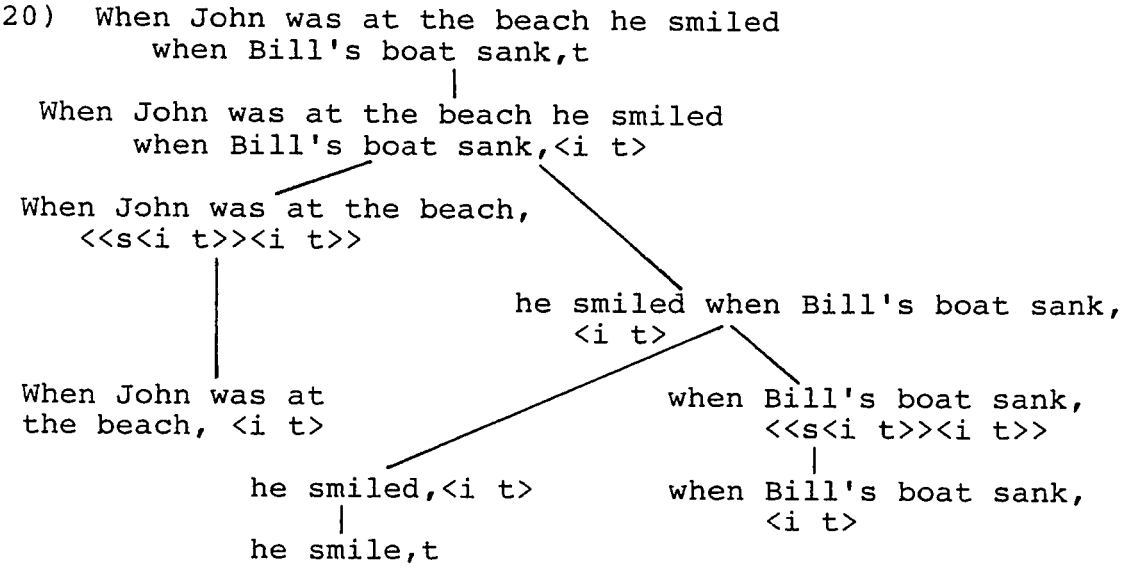
are put together in different ways, yet there seems to be no syntactic distinction in the role of the when-clause.

B. The rule (19) does not accommodate multiple TAs, yet two TAs can provide the domain of quantification for an RFA:

(19) When John is at the beach, he always squints when the sun is shining

This recapitulates the objection against the Dowty(1979) analysis mentioned above. The motivation for introducing temporal abstracts was to allow frame adverbs to combine recursively:

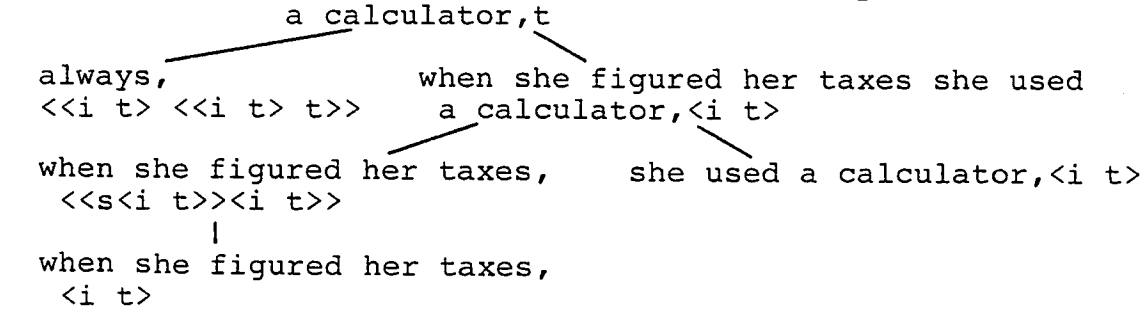
(20)



But since in a sentence with an RFA, the TA is an argument of the RFA, a recursive derivation is not possible. Apparently a schema is required.[7]

C. Stump's rules, reviewed above, allow the derivation:

(21) When she figured her taxes she always used a calculator,t



Translation:

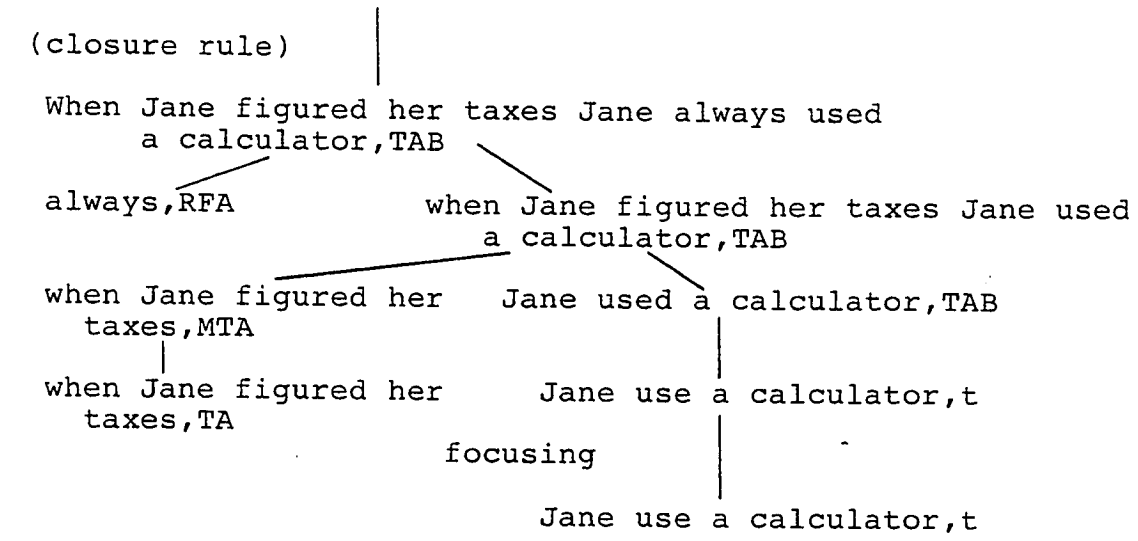
$$\text{always}'(I_n)(\lambda t[\text{past}(t) \;\&\; \text{AT}(t,\text{she-figure-her-taxes}') \;\&\; \text{AT}(t,\text{she-use-a-calculator}')])$$

This means: all relevant intervals are past intervals where she figured her taxes and used a calculator. But in fact, the sentence has no such reading. Thus, while Stump's rules allow an initial when-adverbial to be the first argument of an RFA, they also allow derivations of the usual kind, in which an initial when-adverbial combines with a TAB.[8]

The above problems derive from the assumption that sentences like [when she figured her taxes she always used a calculator] are instances of a construction involving a functor RFA and two arguments, a TA and a TAB. I will argue that this kind of derivation is not necessary; the sentences which Stump derives in this way can be handled by the association with focus mechanism outlined above. I suggest that in <u>when she figured her taxes, she always used a</u>

calculator, always is "associates" with a broad focus, either on the VP [used a calculator], or on the S [she used a calculator]. Consider the derivation:

(22) When she figured her taxes Jane always used a calculator,t



The ILF translation of the TAB [when Jane figured her taxes Jane used a calculator] is:

(23) $\lambda t[past(t)$ & AT(t,figure-her-taxes'(j))
& AT(t,[use-a-calculator'(j)]$_F$)]

According to the treatment of association with focus I sketched, (23) determines both arguments of always'. The second argument is (23), while the first argument is union of the p-set for (23). In (23), the translation of the main clause [Jane use a calculator] is subscripted with the ILF focusing symbol F. Below I show that this has the effect of neutralizing the main clause translation in the first argument of always'. The meaning for (22) produced when the

union of the p-set for (23) is supplied as the first argument of always' is: every past interval at which Jane figured her taxes is a past interval at which Jane figured her taxes and used a calculator. This differs from Stump's denotation in that the condition AT(t,figure-her-taxes'(j)) is a conjunct in the second argument; however, the denotations are equivalent.[9]

Verifying that (22) has the meaning I claimed requires a computation of the p-set for (23). The p-set for (23) includes characteristic functions corresponding to various propositions in the place of [use-a-calculator'(j)]. One proposition is the necessarily true proposition; let p_n be a constant of type t denoting 1 at any index. One element of the p-set for (23) is (the normal denotation of) (24a).

(24)a. $\lambda t[past(t) \ \& \ AT(t,figure\text{-}her\text{-}taxes'(j)) \ \& \ AT(t,p_n)]$

b. $\lambda t[past(t) \ \& \ AT(t,figure\text{-}her\text{-}taxes'(j)) \ \& \ AT(t,q)]$

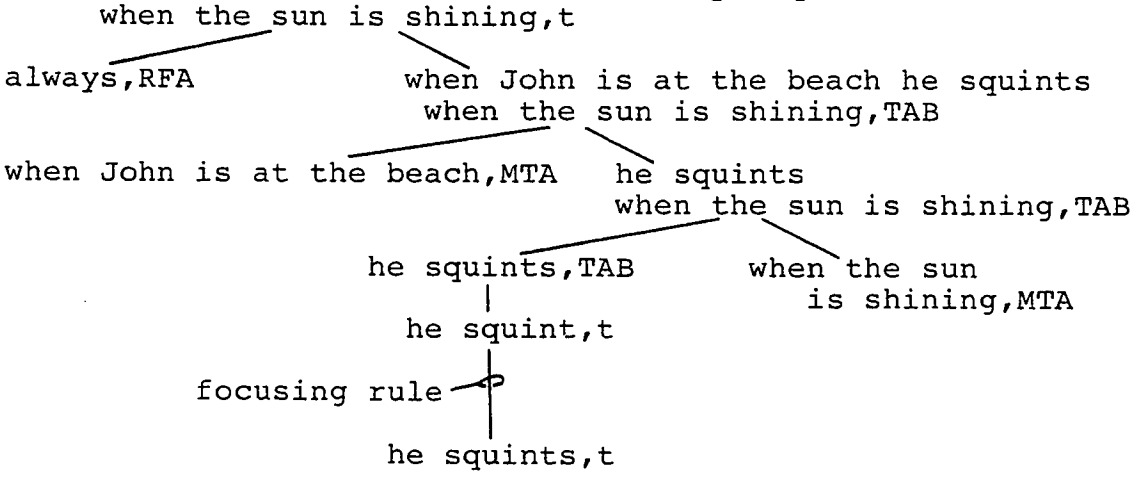
c. $\lambda t[past(t) \ \& \ AT(t,figure\text{-}her\text{-}taxes'(j))]$

Since p_n is true at any index, other propositions in the place of p_n produce (characteristic functions of) smaller sets of intervals. That is, if t' is in the extension of (24b) at an index, then it is in the extension of (24a) at that index. It follows that the union of the p-set for (23) is (the normal denotation of) (24a). Moreover, since p_n is

true at any index, (24a) is equivalent to (24c). So the union of the p-set for (23) is (24c), as claimed above.

The analysis proposed above answers the objections to Stump's analysis. Time adverbs have their normal semantic role; they combine with TABs, rather than being arguments of RFAs. This allows two or more time adverbs to be included:

(25) when John is at the beach he always squints



The semantic derivation for (24) is parallel to the semantic derivation for (22).

3. Differences Between Initial and Final Adverbs

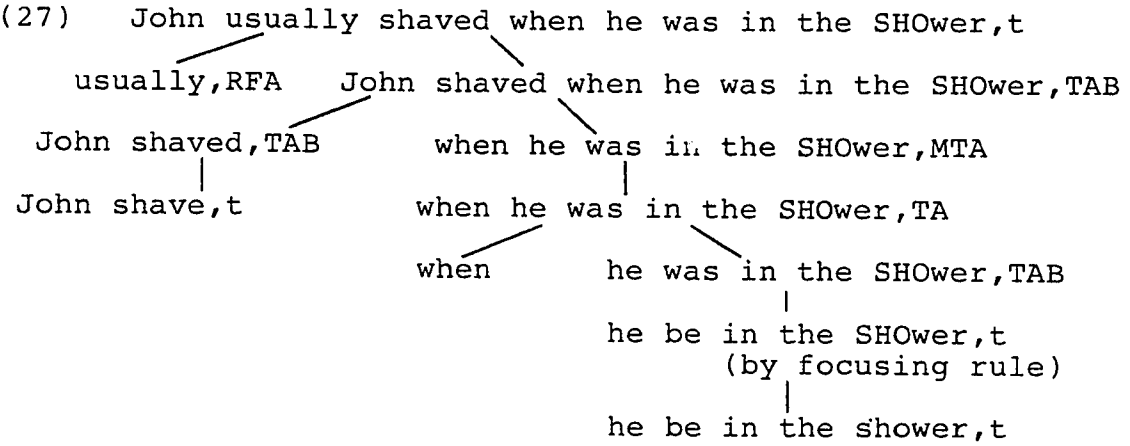
Above I mainly discussed sentences with initial time adverbs. A sentence with a final time adverb, such as (26b), can be analyzed in the same way as the corresponding sentence with an initial time adverb, in this case (26).

(26) a. When he's in the shower, John usually SHAVES
b. John usually SHAVES when he's in the shower
c. John usually shaves when he's in the SHOwer
d. When John shaves, he's usually in the shower

The fact of interest is that the string "John usually shaves when he's in the shower" is ambiguous; to some degree, the readings are intonationally distinguished. (26c), with prominence on the time adverb, is a close paraphrase of (26d).

The explanation for the difference in readings between (26b) and (26c) is immediate. (26b) has a derivation parallel to (22), with focus on the main clause. Suppose that (26c) has a derivation with focus falling within the <u>when</u>-clause, following the intonational evidence.

(27)



(28) $\lambda t[past(t) \ \& \ AT(t,[in(j,s)]_F) \ \& \ AT(t,shave'(j))]$

(28) is the ILF translation of the TAB [when John shaved he was in the shower]. Since the translation of [he

be in the shower] is focused, it is neutralized in the first argument of usually'.[10] The resulting meaning is: at most intervals where John shaves, John shaves and is in the shower; this is the desired meaning.

Why then is it that no intonational rendering of (26a) has the meaning of (26c) and (26d)? To see why this is a problem, it is important to note the TA has scope inside the RFA in the derivation contemplated for (26a):

(29) when he is in the shower John usually shaves,t

usually,RFA when he is in the shower John shaves,TAB

when he is in the shower,MTA John shaves,TAB

when he is in the shower,TA John shave,t

focusing

John shave,t

If the initial time adverb [when he is in the shower] were outside the scope of the RFA, there would be an explanation for the failure of the RFA to associate with it. But if (29) is a possible derivation for (26a), we could obtain the (26c) reading by shifting the focus to [he is in the shower].

The discussion in Chapter III of variable binding and association with focus offers a possible explanation for the facts discussed above. According to the proposals in that chapter, a focusing adverb translation in the body of a

lambda abstract fails to "capture" a focus in the argument of the abstract. An example was the ILF translation of [even John likes BILL] given schematically below:

(30) $\lambda P[$ --- R(--- P ---) --- $](\hat{}\text{like}'([b]_F)$

In this case the restriction R operator associated with even failed to capture the focus within the argument of the lambda abstract.

Jackendoff(1972) pointed out that even does not associate with a preposed phrase. In (31) even can not associate with the preposed object of likes.

(31) JOHN Mary even likes

This follows from the chapter III proposal if the preposed phrase is in a position outside the scope of even in LF:

(32) $[\text{John}_{F,2}[_S\text{even}[\text{John likes } e_2]]]$

Suppose the semantics for the construction is described by a lambda operator, so that the ILF translation of (32) has the form:

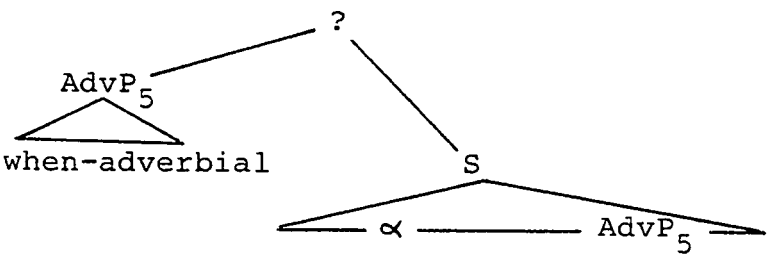
(33) $\lambda x[$ -------- $]([j]_F)$

Then as in (30), the restriction operator associated with even fails to capture the focus.

The failure of usually to associate with the initial

time adverb in [when he's in the SHOwer John usually shaves] can be captured in the same way. Suppose that an initial when-adverbial is in a topic position outside the scope of an adverb in the auxiliary.

(34)



frequency adverb trace of when-adverbial

As before, the semantics for the construction is given by a lambda operator:

(35) $\lambda v_5 S'(AdvP')$
(Here v_5 is a variable over TA meanings.)

Then the translation of <u>always</u> within the S translation will fail to capture a focus in the initial when-adverbial.

4. <u>Adverbs of Quantification as Unselective Quantifiers</u>

The discussion above based on Stump's analysis of adverbs of quantification, which holds that they have two arguments of type <i t>. However, a number of analyses deriving from Lewis(1975) claim that the arguments of a quantificational adverb have type t. The purpose of this section is to show that the results obtained above are not

tied to Stump's analysis.

Lewis's proposal is that adverbs of quantification are "unselective quantifiers", quantifiers which can bind any number of variables. This idea was used in Lewis(1975), Kamp(1981), and Heim(1982) to analyze "donkey sentences" such as (36).

(36) If a man owns a donkey, he always beats it

Because I want to discuss the analysis of <u>when</u>-clauses in Hinrichs(1981) and Partee(1984), which employs Kamp's discourse representation formalism, I will base my discussion on Kamp(1981). Kamp proposes a truth definition by translation. An intermediate level of representation, discourse representation structure, mediates between syntax and model-theoretic interpretation. (37b) is the discourse representation (DR) associated with the sentence (37a).

(37)a. Pedro owns a donkey

b.

x. y.
Pedro owns a donkey
x owns a donkey
x = Pedro
donkey(y)
x owns y

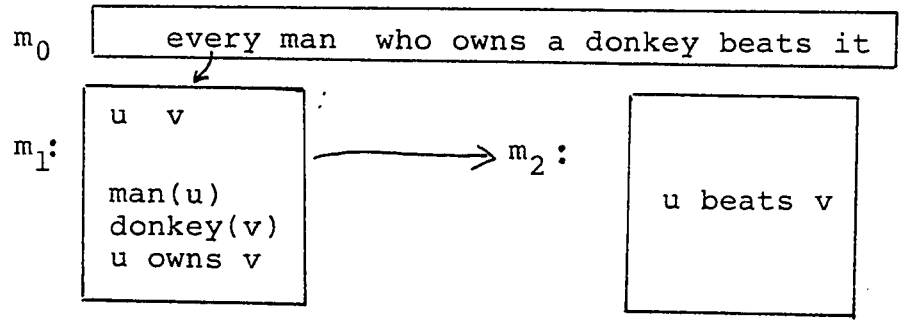
A DR is constructed by syntax-sensitive rules which

decompose a sentence or sequence of sentences into a set a of formulas of an extended fragment of English. In the course of DR construction, symbols known as "reference markers" or "discourse referents", which are a kind of variables, are substituted into NP positions. In (37b) a discourse referent y is substituted for the indefinite NP a donkey; a central tenet of Kamp's and Heim's proposals is that indefinites are translated as free variables. A set of discourse referents, known as the DR universe, is listed at the top of a DR. DRs are interpreted in a model by means of a recursive definition analogous to a Tarskian satisfaction definition.

Conditionals and and universally quantified NPs are associated not with simple DRs, but with structured sets of DRs, known as discourse representation structures (DRSs). The representation for (38a) is (38b).

(38)a. Every man who owns a donkey beats it

b.



A formula including a universal NP is associated with a pair

of DRs. In the example, [every man who owns a donkey beats it] is associated with the pair consisting of the "antecedent box" m_1 and the "consequent box" m_2.

While the language of DRSs is a perspicuous notation, it is convenient in the present context to substitute for it an extension of ILF. The following formation rules are adapted from the first-order language L_K defined in Chierchia and Rooth (1984).

(39)a. If $\mathbf{a},\mathbf{b} \in ME_t$, and $a_1,\ldots,a_j,b_1,\ldots,b_k$ are individual variables, then

$$al,\ldots,aj[\mathbf{a}]bl,\ldots bk[\mathbf{b}] \in ME_t$$

b. If $\mathbf{a} \in ME_t$, and $a_1,\ldots,a_j$ are individual variables, then $al,\ldots,aj[\mathbf{a}] \in ME_t$

(39a) is a notation for universal quantification, and (39b) is a notation for existential quantification. The latter is required because the truth definition for a top-level DR such as m_0 in (38) existentially quantifies the variables in the universe for that DR. In the formula corresponding to a DRS, formulas in a DR are conjoined, universals are represented by means of (39a), and (39b) is employed at the top level. The formulas corresponding to (37) and (38) are:

(40)a. $_{x,y}$[x=p & donkey'(y) & own'(x,y)]

b. [$_{u,v}$[man'(u) & donkey'(v) & own'(u,v)][beat'(u,v)]]

So far I have not discussed the satisfaction definition for DRSs. Kamp's original definition employed partial assignment functions. Since the truth definition for ILF was given in terms of total assignment functions, I will adopt the satisfaction definition employing total assignment functions suggested by Chierchia and Rooth.

(41)a. $a1,\ldots,aj[\mathbf{a}]_{b1,\ldots bk}[\mathbf{b}] :G_{E,W,J}xWxJ \dashrightarrow 2$

$(g,w,j) \rightsquigarrow 1$

if for every assignment function g' differing from g at most on $a_1,\ldots,a_j$ such that $|\mathbf{a}|(g',w,j) = 1$, there is an assignment function g" differing from g' on at most $b_1, \ldots, b_k$ such that $|\mathbf{b}|(g",w,j) = 1$

$\rightsquigarrow$ 0 otherwise

b. $a1,\ldots,aj[\mathbf{a}] :G_{E,W,J}xWxJ \dashrightarrow 2$

$(g,w,j) \rightsquigarrow 1$ if for some assignment function g' differing from g at most on $a_1,\ldots,a_j$ $|\mathbf{a}|(g',w,h) = 1$

$\rightsquigarrow$ 0 otherwise

We now turn to the discourse representation analysis of tense and <u>when</u>-clauses. The primary innovation suggested in Kamp(1979) is that events, rather than moments or intervals of time, should be regarded as primitive. Hinrichs(1981) developed a DR-based fragment of English tense and aspect incorporating this proposal, together with some ideas about temporal discourse derived from Reichenbach(1947) and Bauerle(1979), particularly the notion of reference time.

Subsequently Partee(1984) extended Hinrichs' fragment to provide an analysis of always restricted by when-clauses.

In Hinrichs' system, atomic formulas are classified into events, states, and processes. In the processing of a past tense narrative such as (42a), atomic formulas are associated with discourse referents (e_i's for events, s_i's for states). These variables are ordered by relations of precedence (symbolized by <) and overlap (symbolized by O).

(42)a. John got up.
e_1
He went to the window and raised the blind.
e_2 e_3
It was light out.
s_1

b.

e_1 e_2 e_3 s_1 x
$e_1 < e_2 < e_3$
e_3 O s_1
x = John
e_1: [x get up]
e_2: [x go to the window]
e_3: [x raise the blind]
s_1: [it be light out]

(42b) is a simplified DR; in Hinrichs' actual formulation, a reference time (actually a reference event)

follows each event e_i. To simplify the exposition, I will leave out reference times. For the interpretation of the notation

e_i: 

in event models the reader is referred to Kamp(1979) and Hinrichs(1981). Since I believe the point I am making is independent of the question whether event or interval models should be employed, and to control the complexity of the exposition, I will employ a conventional interval semantics. (43) is my version of (42b).

(43) $_{e1,e2,e3,s1,x}$[x=j & e_1<now & AT(e_1,run'(x))
& e_2<now & e_1<e_2 & AT(e_2,go-to-the-window'(x))
& e_3<now e_2<e_3 & AT(e_3,raise-the-blind'(x))
& s_1<now e_3Os_1 & AT(s_1,it-be-light-out')]

In Stump's analysis, MTAs placed restrictions on the argument of a TAB. In an analysis employing free event or interval variables, restrictions are placed on these variables. (44b) is a simplified version of Hinrichs' DRS representation for (44a).

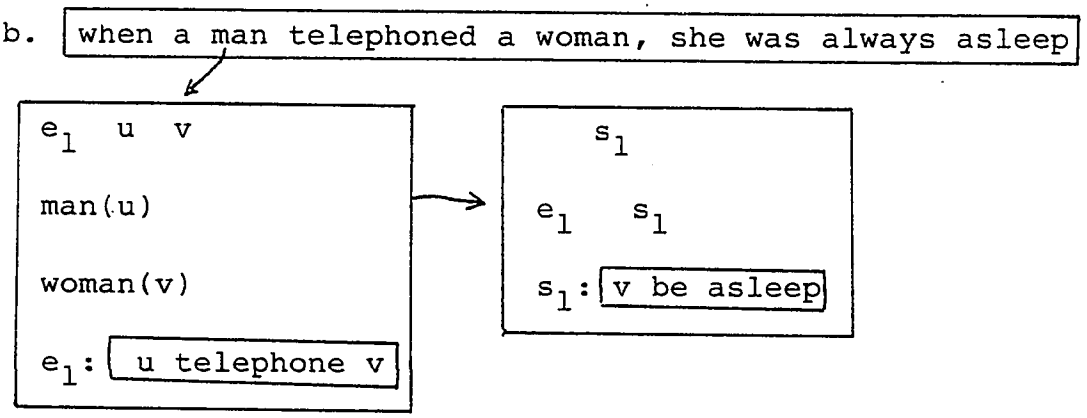
(44)a. When John telephoned Mary, she was asleep
b. $_{e,u,v,s}$[past(e) & u=j & v=m & AT(e,telephone'(u,v))
& past(s) & eOs & AT(s,be-asleep'(v))]

The variable s associated with the main clause is restricted by the condition eOs relating it to the variable

e associated with the when-clause. Note that all the variables in (44) are existentially quantified.

We can now turn to the analysis of always and when-clauses. Partee informally presents a rule sensitive to the conjoint presence of always and a when-clause. always triggers box splitting. The translation of the when-clause is placed in the first box; the translation of the main clause goes into the second box. (45b) is a DRS representation for (45a), simplified in that reference times have been eliminated. In (46), (45b) is rendered in my notation.

(45)a. When a man telephoned a woman, she was always asleep

b. 

(46) $$\begin{aligned} &e_1,u,v[e_1 < \text{now} \ \&\ \text{man}'(u) \ \&\ \text{woman}'(v) \ \&\ \\ &\qquad \text{AT}(e_1,\text{telephone}'(u,v))] \\ &s_1[\text{AT}(s_1,\text{be-asleep}'(v) \ \&\ s_1 \ \text{O} \ e_1] \end{aligned}$$

Let us consider some similarities and differences between this treatment and Stump's. A similarity is that the when clause is placed in the first box (Partee) or first argument

of always (Stump). A difference is that, while Stump treated always' as a generalized interval quantifier, in (46) the interval variable e_1 has the same status as the individual variable v; time has no special status. The unselective quantifier analysis is superior in that Stump's rules do not handle the donkey-anaphora phenomenon. On the other hand, the version of DR theory presented in Kamp(1981) is limited to a notation for universal quantification. But there is no real barrier to treating other quantifiers, such as those expressed by the determiner most and the adverb of quantification frequently, in a similar way.[11] A more significant difference lies in the role of the intermediate language. In standard MG fragments such as Stump's, the intermediate language IL is eliminable. This can be seen to follow from the following: (i) IL is given a compositional interpretation, i.e. the interpretation in a model of a complex phrase is a function of the interpretations of component phrases (ii) the rules which construct the IL interpretation of an English phrase out of the IL translations of component phrases do not refer to the internal structure of those IL translations (iii) the IL translations of English phrases are IL phrases, i.e. meaningful expressions of IL. An important question about DR theory is whether the intermediate language is eliminable. In particular, the role of the DR universe (selection

indices) deserves attention; it would seem copying the indices of certain variables into the DR universe requires examining the form of a component phrase. Heim(1982) studied this question and found that selection indices could be eliminated given her file-change semantics system of interpretation. This point is relevant to the examples discussed below.

I now turn to association with focus. Above, the first argument of an adverb of quantification was taken to be the union of the p-set associated with its TAB argument. This no longer works since in the DRS treatment the argument of always has semantic type t rather than type <i t>. The appropriate modification is to take the disjunction, rather than the union, of the p-set associated with the second argument. This is made precise in (47).

(47) Definition

a. If **a** ME_t, then [V**a**] ME_t.

b. $|V\mathbf{a}| : G \times W \times J \dashrightarrow 2$

$(g,w,t) \rightsquigarrow 1$ if for some $h \in \|\mathbf{a}\|$, $h(g,w,t) = 1$

$\rightsquigarrow 0$ otherwise

To show that the association with focus analysis works in the DRS system, I will examine a sentence with focus on NP, and one with an initial when-clause, where focus is assumed to fall on the main clause. I assume that when always combines with a sentence with translation **a**, **a** goes into the second box and [V**a**] goes into the first box.

Suppose (48b) is the translation of (48a); then (48d) is the translation of (48c). Similarly, (49b) is the translation of (49a); it follows that (49d) is the translation of (49c).

(48)a. [Mary took JOHN to the movies]
b. past(e) & AT(e,take-to-the-movies'(m,$[j]_F$))
c. [Mary always took JOHN to the movies]
d. $_e$[V[past(e) & AT(e,take-to-the-movies'(m,$[j]_F$))]]
[past(e) & AT(e,take-to-the-movies'(m,$[j]_F$))]

(49)a. when someone telephoned Mary she was asleep
b. past(e) & person'(x) & y=m & AT(e,telephone'(x,y))
& [past(s) & e $\subset$ s & AT(s,be-asleep'(y))]$_F$
c. [when someone telephoned Mary she was always asleep]
d. $_{e,x,y}$[V[past(e) & person'(x) & y=m &
AT(e,telephone'(x,y)) &
[past(s) & e $\subset$ s & AT(s,be-asleep'(y))]$_F$]]
$_s$[past(e) & person'(x) & y=m &
AT(e,telephone'(x,y)) &
[past(s) & e $\subset$ s & AT(s,be-asleep'(y))]$_F$]

To show that (48c) and (49c) have the right meanings, the denotations of the expressions in the first boxes of (48d) and (49d) are computed.

$\|$ past(e) & AT(e,take-to-the-movies'(m,$[j]_F$))$\|$, the p-set associated with (48a), is the set of functions h with domain GxWxJ, such that for some y in the domain of individuals, h(g,w,j) = 1 iff

(i) g(e) < j and
(ii) Mary took y to the movies in w at g(e).

Then | V[past(e) & AT(e,take-to-the-movies'(m,$[j]_F$))]|
maps (g,w,h) to 1 iff

(i) g(e) < j and
(ii) $\exists$y[Mary took y to the movies in w at g(e)]

In conjunction with the truth definition (32), this produces the desired meaning for (48c).

We now turn to (49c). The computation for

$$\text{past}(e) \;\&\; \text{person}'(x) \;\&\; y=m \;\&\; \text{AT}(e,\text{telephone}'(x,y)) \;\&\; [\text{past}(s) \;\&\; e \circ s \;\&\; \text{AT}(s,\text{be-asleep}'(y))]_F \quad ,$$

the p-set associated with (49a), is entirely parallel to the computation for (23); the focused formula is neutralized, and the p-set is the unit set of

(50) $|\text{past}(e) \;\&\; \text{man}'(x) \;\&\; \text{woman}'(y) \;\&\; \text{AT}(e,\text{telephone}'(x,y))|:G_{E,W,J}xWxJ \dashrightarrow 2$

If $\|\mathbf{a}\|$ is the unit set of $|\mathbf{a}|$, $|\forall\mathbf{a}|$ is $\mathbf{a}$. So the the formula in the first box in the translation of (49d) is equivalent to (50). Referring to the truth definition (32), (49c) is true at (g,w,j) iff for every assignment function g' differing from g on at most e,x, and y such that g(e) < j and g(x) is a man and g(y) is a woman at (w,j) and g(x) telephoned g(y) in w at g(e), there is an assignment function g" differing from g' at most on s, such that (i) the above conditions on e,x, and y are satisfied and (ii) g(s) < j, s overlaps e, and g(y) is asleep in w at g(s). That is, any interval e where a man x telephoned a woman y overlaps an interval s where y was asleep. This is exactly the the result which was obtained in the version of Partee's proposal which I presented.

These examples suggest that the results obtained in

Stump's system extend to the DR analysis of quantification and when-clauses. The argument is not complete in that explicit rules deriving ILF translations were not presented. In particular, one thing which was not explained about (48) and (49) was how the selection indices are determined. Notice that if (49d) were replaced by

(51) $_{e,x,y,s}$[V[past(e) & person'(x) & y=m &
AT(e,telephone'(x,y)) &
[past(s) & e ○ s & AT(s,be-asleep'(y))]$_F$]]
[past(e) & person'(x) & y=m & AT(e,telephone'(x,y)) &
[past(s) & e ○ s & AT(s,be-asleep'(y))]$_F$]

we would get the wrong reading for (49c), one which required that every (rather than some) interval s which overlaps a given interval e where someone telephoned Mary be an interval where Mary was asleep.

It isn't clear how to prevent s from being entered in the set of quantified indices of the first box. Note that e must be included in order to obtain the right meaning and that, like e, s occurs in the first "box" of (49d). We would like to tie the distinction between e and s to the fact that s is included in a focused phrase. This finds motivation in the definition for $\| a_F \|$ as the set of constant meanings of appropriate type. A constant meaning does not depend on the assignment function parameter, and is thus semantically variable free. So in a semantic sense, there is no occurence of s in

$$V[past(e) \;\&\; person'(x) \;\&\; y=m \;\&\; AT(e,telephone'(x,y)) \;\&\; [past(s) \;\&\; e \circ s \;\&\; AT(s,be\text{-}asleep'(y))]_F]]$$

The problem is that, in discourse representation theory the DR universe of a DR (the set of "selection indices" in Heim (1982)) is generated by syntactic processing rules. It could be stated in the DR construction rules that variables associated with material inside a focused phrase is under certain circumstances not entered in the DR universe. But to do this would be to stipulate something which should follow from the semantics of F and V.

The proposal for eliminating selection indices in chapter III of Heim(1982) is relevant here. The general point is that we can get information about the variables in a phrase by examining its denotation in the model, in the semantics employed here a function from assignment functions, worlds and times to extensions. The meanings assigned in Heim's file-change semantics contain additional information which distinguishes quantified variables from non-quantified ones arising as translations of pronouns and definite descriptions. She shows that given this semantics, the information encoded in selection indices is redundant. The hope here is that, given a semantics-based approach to selecting quantified variables, the fact that the variable s in the first box of (49d) is "invisible" can be explained in

a principled way.

Review

I argued that my association with focus proposal was consistent with an analysis of always as an unselective quantifier by showing how it might be executed in a version of Kamp's discourse representation formalism. The simplification in Stump's analysis of when-clauses appears to extend to Partee's analysis of always restricted by a when clause, although caution is appropriate here since my discussion employed a truncated version of of temporal discourse representation structures in which reference times were omitted.

5. Conclusions and Further Questions

I close with some remarks about how the analysis of this chapter fits in with the proposal in chapter II, and about issues raised by the discussion of adverbs of quantification restricted by when-clauses.

General Theory of Association with Focus

The analyses of association with focus in chapter II and in this chapter are similar in that focus determines a domain of quantification. In the analysis of focusing

adverbs, a p-set was employed as a domain of quantification. In this chapter, the association of focus with adverbs of quantification was accounted for by letting the union of a p-set to be a domain of quantification. It would be desirable to have a more uniform theory, particularly in view of the suggestion in chapter II that restriction to a focus-influenced domain is part of a more general phenomenon of restriction of domains of quantification to pragmatically determined sets.

A unification at a technical level is possible; we can build the right kind of quantification into the meaning of an adverb of quantification. Let A_0 be the denotation that Stump assigns to an adverb of quantification A. Let A' be (52), where Q_t is a variable of type <i t>.

(52) $A_0(\lambda t \exists Q_t[C(Q_t) \ \& \ Q_t(t)])$

(52) includes a quantification over "relevant characteristic functions of sets of intervals". If C in (52) is identified with the p-set for a TAB argument of an adverb of quantification, we obtain the desired results. In the derivation for (53a), always' combines with (53b). The p-set corresponding to (53b) is the set of characteristic functions $\{\lambda t[past(t) \ \& \ AT(t,take\text{-}to\text{-}the\text{-}movies'(m,y))] \mid y \in E\}$. If this is taken as the value of C in (53c), we obtain the right first argument: the set intervals t where Mary

takes someone to the movies.

(53)a. Mary always takes JOHN to the movies
b. [Mary takes JOHN to the movies]':
$\lambda t[past(t) \ \& \ AT(t,take\text{-}to\text{-}the\text{-}movies'(m,[j]_F))]$
c [Mary always takes JOHN to the movies]':
$always_0(\lambda t \exists Q_t[C(Q_t) \ \& \ Q(t)])$
$(\lambda t[past(t) \ \& \ AT(t,take\text{-}to\text{-}the\text{-}movies'(m,[j]_F))])$

This procedure of taking the p-set corresponding to the argument of an adverb to be the value of the domain of quantification variable C included in the meaning of that adverb is exactly the one which was employed in chapter II. However, a quantifier over propositions seems to be a natural part of the meaning of even and only. I described the unification suggested above as technical because the existential quantification over sets of time intervals in (52) is not motivated in the same way.

Other Adverbials

In Stump's analysis, a syntactic rule combines an adverb of quantification with a TA and a TAB. I showed that derivations of this kind were not required given an association with focus mechanism which had some independent motivation. The implicit claim of this argument is that there is nothing special about TAs. The passage in Stump(1981) which introduces his semantics for adverbs of quantification is of interest here.

> "..sentence (218) is not simply understood to mean that something which happens often is that Jane uses a calculator to figure her taxes;
>
> (218) Jane often uses a calculator to figure her taxes
>
> (218) would in fact be consistent with Jane's using a calculator only very infrequently, if she happened to figure her taxes very infrequently (say, once a year). (218) is instead felt to mean that the intervals at which Jane uses a calculator appear often in the sequence of intervals at which she figures her taxes."
>
> "In sentences like (218), the relevant sequence [i.e. the domain of quantification] is implicit. It can, however, be explicitly designated by a temporal adverbial; in (219) for example, the adverbial when she's figuring her taxes picks out the sequence of intervals relative to which often is interpreted.
>
> (219) When she's figuring her taxes, Jane often uses a calculator."
>
> (p.179-180)

(218) is described as a sentence where the domain of quantification must be recovered from a context of use, while in (219) the domain of quantification is explicitly specified. But there is no reason to draw a distinction between (218) and (219). Note that, when the rationale clause in (218) is preposed, it unambiguously restricts often:

(54) To figure her taxes, Jane often uses a calculator

This sentence should be analyzed as having focus within the main clause, perhaps on the VP: when Jane does something to figure her taxes, she often uses a calculator to figure her

taxes.

An interesting property of (218) is that it can in fact be understood to mean that something which happens often is that Jane uses a calculator to figure her taxes; this reading is perhaps more evident in (55).

(55) Jane often user her calculator to compute prime numbers

This reading can be analyzed being associated with a broad focus on the entire argument of often. The corresponding version of (219) does not have this reading, a fact not predicted by my analysis:

(56) Jane often uses a calculator when she's computing prime numbers

I do not have an explanation for this. while-adverbials, which like when-adverbials are analyzed by Stump as TAs, have the reading in question:

(57) Jerry often chewed gum while walking down the steps

That is, (57) can be understood to mean that something which happened often is that Jerry walked down the steps while chewing gum.

Returning to the main point, the rationale clause example (54) confirms the prediction that there should be nothing special about time adverbs.

If-clauses

I mentioned at the beginning of the section on DR theory that Stump's and Partee's discussion of quantificational adverbs restricted by when-clauses (or by frame adverbs in general) is related to Lewis's analysis of quantificational adverbs restricted by if-clauses. My revision in Stump's analysis of adverbs of quantification restricted by frame adverbs should not be regarded as firmly established, since my discussion was based on a small part of Stump's extensive grammar of tense and aspect. However it may not be premature to ask whether this proposal extends to if-clauses.

One of Lewis's points is that an if-clause has no meaning apart from the quantifier it restricts. Kratzer(1979) emphasizes this:

"We have a construction consisting of three parts: the adverb of quantification, the if-clauses, and the modified sentence. That is schematically for one sentence if-clause:

(3) Always
Sometimes
. , if **a**, then **b**
.
.

A sentence like (3) is true if and only if **b** is true in all, some, most ... admissible cases. A case is admissible if it satisfies the if-clause.

The important question is now, whether it is possible to get

the same effect by combining **a** and **b** into one conditional sentence and then taking this conditional sentence to be the sentence modified by the adverb. Following this proposal, we would have:

(4) Always
Sometimes
. ,(if **a**,**b**)
.
.

As DAVID LEWIS shows, there is no way to interpret the conditional sentence "if **a**, then **b**" in a way which makes (4) equivalent to (3) for all the adverbs he considers."

I suggested an analysis for (58a), where <u>always</u> is restricted by a <u>when</u>-clause, which involved a derivation analogous to Kratzer's (4). That this is possible does not reflect a flaw in Lewis's reasoning; any such argument must begin with assumptions about what interpretations are, and my system of interpretation is richer than the one he assumed.

(58)a. John always SHAVES when he is in the shower
b. John always shaves when he is in the SHOwer

(59) John always shaves if he is in the shower

An obstacle to analyzing (59) in a parallel way is that, while the string (58) has two readings, no intonational rendering of (59) has the the (58b) reading (i.e. whenever John shaves he is in the shower).

Recall that the non-ambiguity of sentences with initial <u>when</u>-clauses was accounted for by supposing that an initial the <u>when</u>-clause was outside the scope of the

quantificational adverb, binding a syntactic variable. An explanation along these lines is not attractive for (59), since neither (59) nor the corresponding sentence with an initial if-clause has the ambiguity of (58).

Haiman(1978) (a paper entitled Conditionals are Topics) suggests an analysis of conditionals which may provide a uniform account of when- and if- clauses. He argues that clauses he identifies as conditionals in Hua, a Papuan language, have the morphological marking of topics. This is also true in a number of other languages, and Haiman suggests that English if-clauses should be viewed as topics as well. Haiman outlines a semantic treatment of conditionals which takes advantage of their status as topics. Here I will indicate how his suggestion that if-clauses are topics might be intergrated with the theory I have been developing.

My semantic analysis of initial when-clauses relied solely on the assumption that the initial when-clause is outside the scope of always, although it binds a variable inside the scope of always. No semantic content was given to the usage according to which preposed constituents are "topicalized". But it is often suggested that TOPIC and FOCUS are complementary categories. If the feature F could not occur on constituents in syntactic topic positions, or if F did not have the normal semantic effects when occuring

on constituents in syntactic topic positions, the lack of ambiguity in (59) would be explained, since the (58b) reading is associated with a focus on the when-clause.

I will suggest one way of implementing this idea, which I am not committed to. Define an ILF anti-focusing operator N:

(60)a. If $\mathbf{a} \in ME_a$ then $[\mathbf{a}]_N \in ME_a$

b. $|[\mathbf{a}]_N| = |\mathbf{a}|$

$||[\mathbf{a}]_N|| = \{|\mathbf{a}|\}$

N eliminates the effect of any focus in **a** by taking the p-set for **a** to be the unit set of $|\mathbf{a}|$. Pursuing Haiman's hypothesis, suppose that the ILF translation of complement of an <u>if</u>-clause is subscripted with N. Similarly, suppose that the translation of an initial adverbial is subscripted with N. Then these clauses are semantically non-focused, and their meanings will restrict the interpretation of an adverb of quantification in the scope of which they occur.

Footnotes to Chapter V

[1] The term "frame adverb" is from Bennett and Partee(1972).

[2] Bach(1980) and Parsons(1980) proposed solutions similar to Stump's. In Hinrichs(1981), a frame adverb places restrictions on a free "reference time" variable. As formulated, this approach refers to syntactic properties of an intermediate logical language, a version of Kamp's discourse representations (Kamp 1981). The discourse representation construction rules refer to a current reference time r_p, which changes in the course of the construction process.

Dowty(1982) proposes a truth definition involving two time indices of evaluation. Tenses and frame adverbs place restrictions on the first index. For instance, $|[\text{John left on December 5, 1983}]'|_{i,j} = 1$ implies that i is a subinterval of the day December 5,1983, and that i precedes the "speech time" interval j.

[3] AT transfers the denotation of an expression of type i to the index of evaluation. In the ILF semantics,

$$|AT(a,b)| : G_{E,W,J} \longrightarrow 2$$
$$(g,w,j) \rightsquigarrow |b|(g,w,|a|(g,w,j))$$

$||AT(a,b)||$ is the set of functions h such that for some $h' \in ||a||$ and $h'' \in ||b||$,

$$h : G_{E,W,J} \longrightarrow 2$$
$$(g,w,j) \rightsquigarrow h''(g,w,h'(g,w,j))$$

[4] This device is similar to a rule promoting a predicative adjective (semantic type <e t>) to ad-common noun status (semantic type <<s <e t>><e t>>). The motivation for introducing MTAs seems to be to allow the semantic part of the rule combining a frame adverb with a TAB to be a rule of functional application. I don't see the advantage in this, unless there are MTAs not derived from TAs, analogous to the primitive ad-common noun <u>former</u>.

[5] I am omitting the syntactic component of the rules, since they would require too much explanation. Stump's syntax is a recursive definition of phrases employing a variety of morphological and syntactic functions distinct from concatenation.

(13) is a simplified version of Stump's translation rules. The actual rules are:

(i)a. Semantic rule combining an RFA translation **a** with a TAB translation **b**:

$$\lambda t[\mathbf{a}(I_n)(\lambda t_1[t_1 \subseteq t \ \& \ \mathbf{b}(t_1)])$$

b. Semantic rule combining an RFA translation **a** with a TAB translation **b** and a TA translation **c**:

$$\lambda t[\mathbf{a}(\mathbf{c})(\lambda t_1[t_1 \subseteq t \ \& \ \mathbf{b}(t_1)])$$

Stump's justification for these rules is brief:

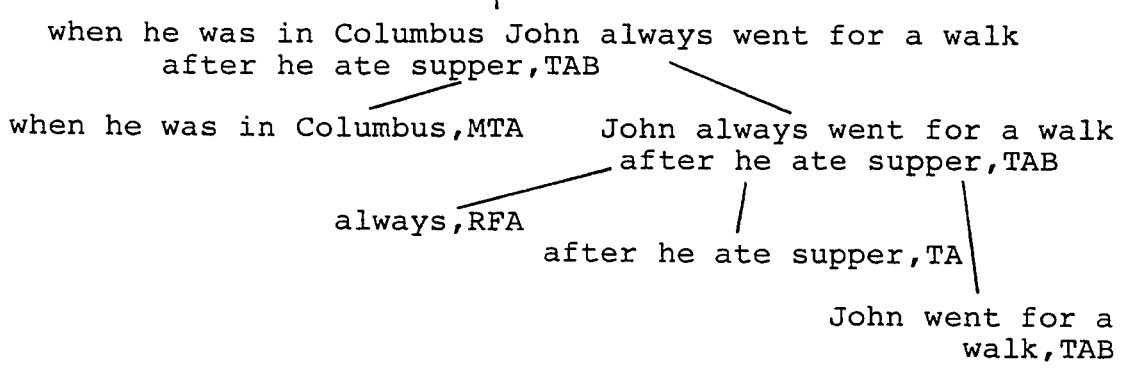
(p188) "The reader may have wondered why the expressoins produced by rules (227) and (228) [the rules combining an RFA with a TAB] must be temporal abstracts rather than sentences. The reason is that main tense adverbs can combine with them. Consider, for example, sentence (238).

(238) When he was in Columbus, John always went for a walk after supper.

(238) can be understood to relate to a single interval at which John was in Columbus; on such an interpretation, the adverb when he was in Columbus intuitively has wider scope than the frequency adverb always. This interpretation could not be induced if (227) and (228) produced sentences rather than temporal abstracts. But according to the present analysis, (238) can be derived as in (239) and thereby assigned the translation (240), which represents the desired interpretation."

The derivation in question has the structure:

(ii) when he was in Columbus John always went for a walk after he ate supper,t



(Stump actually quantifies in John so that it binds he.)

The associated translation is equivalent to:

(iii) $\exists t[past(t) \ \& \ AT(t,John\text{-}was\text{-}in\text{-}Columbus') \ \&$
$always'(\lambda t'\exists t"[t"<t' \ \& \ M(t',t") \ \& \ past(t") \ \&$
$AT(t",John\text{-}eats\text{-}supper')])$
$(\lambda t'[t' \subseteq t \ \& \ past(t') \ \&$
$AT(t',John\text{-}goes\text{-}for\text{-}a\text{-}walk')])$

(M is a relation of temporal proximity which is included in the translation of after.)

Stump does not justify the specific form of the translation rule. It seems to me that the condition t'_t is in the wrong place. (iii) says that there is some past interval t at which John was in Columbus, such that each interval following a past interval at which John ate supper is a past interval contained in t where John goes for a walk. This entails, among other things, that John never ate supper after he left Columbus. To obtain what Stump has in mind, it seems that the subset condition should be included in the first argument of always', rather than the second one.

Furthermore, Stump's argument for an ambiguity can be challenged; the fact that we can have in mind a history where John was in Columbus during a single time span, rather than many unconnected time spans, does not demonstrate an ambiguity in the sentence.

The flaw in the the translation rule (i) and the uncertainty about the motivation for it are the reasons for employing a simplified version of Stump's rules in the text. The important point for present purposes is that Stump did not contemplate replacing derivations like (11) with derivations where a TA has scope over an RFA; (i) was designed to handle a (putatively) separate class of

examples.

[6] The "habitual" reading of (18a) should be ignored. Stump(1981), and Heim (1982) analyzed this as as involving an invisible adverb of quantification, or the equivalent.

[7] Notice that this example is not covered by Stump's provision for giving a frame adverb scope over an RFA, discussed in footnote 5. The example need not "relate" to a single interval where John was at the beach.

[8] This observation is offered as a criticism of Stump's analysis. However, the analysis proposed below has a similar problem with final when-adverbials.

[9] The equivalence in the general case follows from the conservativity property of natural language quantifiers (Barwise and Cooper(1981),van Benthem(1983)):

$$Q(A)(B) \text{ iff } Q(A)(A \cap B)$$

An interesting project which has as far as I know not been undertaken is the classification of adverbs of quantification along the lines of Barwise and Cooper's model theoretic classification of determiners. For instance, is often' strong (like the determiner meaning most') or weak (like the determiner meaning many')?

[10] One aspect of the translation for <u>when</u> which might be challenged is that it is that it is symmetric. That is, the main and subordinate clause translations could be interchanged.

[11] A Kamp/Heim analysis of anaphora and quantification which is as "compositional" as other versions of MG and which has a PTQ-like type structure can be based on Heim's file change semantics.

C H A P T E R V I

OTHER CASES OF ASSOCIATION WITH FOCUS

1. Clefts

Chomsky(1970) and Jackendoff(1972) discuss cleft sentences where a subconstituent of the clefted phrase is focused. These sentences can be considered cases of association with focus.

The cleft (1) can be semantically analyzed into two parts: an individual John' of type e and a characteristic function x[John ate x] of type <e t>. The assertion of (1) is that the individual satisfies the characteristic function. The conventional implicature (presupposition) is that something satisfies the characteristic function.

(1) [it is John that Mary hates]

assertion: $\lambda x_2 \text{hate}'(m,x_2)(j)$
presupposition: $\exists x[\lambda x_2 \text{hate}'(m,x_2)](x)$

Schematically,

(2) It is **a** that **b**

asserts: **b**"(**a**')
presupposes: $\exists x$**b**"(x),

where **b**" is a property formed from **b**' by lambda abstraction.

x might have types other than e. For instance, suppose [swimming] denotes the property swim' in (3); then this cleft would have the semantics (4).

(3) It is swimming that John enjoys

(4) assertion: [λPenjoy'(j,P)](^swim')

conventional implicature: ∃Q[λPenjoy'(j,P)](Q)

In cases where a subpart of the clefted phrase is focused, it seems that a variable in the position of the focused phrase should be existentially quantified. For instance, (5a) presupposes that Mary hates somebody's father, and (5b) presupposes that there is something that John objects to eating.

(5)a. It is JOHN's father that Mary hates
b. It is eating PEAS that John objects to

In order to avoid analyzing the genitive, I will confine my attention to (5b). According to (2), it conventionally implicates:

∃Q[John objects to Q]

We modify this by inserting a domain of quantification C:

∃Q[C(Q) & John objects to Q]

The p-set for the intension of [eating PEAS] is {^eat'(y)|y∈ E}. If, as in chapter II, we take this as the value of C, we obtain (6a). This is equivalent to (6b), the desired conventional implicature with an existentially quantified variable in the position of the focused phrase.

(6)a. $\exists Q[\exists y[Q = \hat{}eat'(y)] \&$
$object(j,Q)]$ b. $\exists y[object(j,\hat{}eat'(y))]$

The great interest of this example is that the mechanism of association with focus invoked is exactly that employed in the analysis of only and even.

2. Dretske's Examples

In chapter I, I introduced a view of what the problem of association with focus was by quoting Dretske(1972), without reviewing the examples he was concerned with. The purpose of this section is to correct this omission, and to indicate how one of Dretske's cases might be analyzed.

Dretske's first example has to do with modificaiton by by mistake:

> Suppose Clyde gave me the tickets. In saying that he gave them to me by mistake we are saying something that has within it an element of ambiguity. If this was a mistake, then wherein does the mistake lie? In giving ME (rather than someone else) the tickets, or in giving THE TICKETS (rather than something else) to me? whether we treat

> (4) Clyde gave me the tickets by mistake
> as true or false will depend on where we locate the contrastive focus of "Clyde gave me the tickets." It will depend on whether we interpret (4) as
> (4a) Clyde gave me <u>the tickets</u> by mistake
> or as
> (4b) Clyde gave <u>me</u> the tickets by mistake
> If Clyde is instructed to give the tickets to Harry, but gives them to me by mistake, (4a) is false but (4b) is true."

This example has the structure of the examples of association with focus previously discussed: in a certain context, a shift in focus is accompanied, it is claimed, by a shift in truth conditions. But it is not clear to me that Dretske's (4a) is actually false in the situation described.[1]

Another class of examples has to do with reasons. The following example of Dretske's has been revised slightly.

> Clyde, a bachelor, has a relationship with Bertha, a busy academic and confirmed bachelor(ette). They see each other once a week, unless she has to work on a grant proposal or attend an interdisciplinary seminar. He learns that he stands to inherit a great deal of money at the age of thirty if he is married. Clyde finds relationship he has with Bertha congenial, and would hate to abandon it for a marriage of the conventional sort. Fortunately Bertha agrees to go through the legal formalities of marriage, it being understood that their relationship will continue exactly as before.

Under these circumstances (7a) is true.

(7)a. The reason Clyde married BERTHA is that he wanted their relationship to continue exactly as before.

b. The reason Clyde MARRIED Bertha is that he wanted their relationship to continue exactly as before.

It seems to me that (7b) is false; reason Clyde MARRIED Bertha was to qualify for the inheritance.

The last example of Dretske's which I will review is similar to the previous one. He perceives a difference in truth conditions between (8a) and (8b). It seems to me that in the circumstances described above, (8a) is true, and (8b) false.

(8) (Dretske's (20))

a. If Clyde hadn't MARRIED Bertha, he would not have been eligible for the inheritance.
b. If Clyde hadn't married BERTHA, he would not have been eligible for the inheritance.

I will try to show the effect on truth conditions in (8) might be explained within the theory of conditionals of Kratzer(1981). One of her central claims is that the vagueness of conditionals is to be captured by adding an additional parameter in the meaning assignment, a "partition function" which assigns a set of propositions to each world, thought of as the set of propositions which are the case in that world. Specifically, a partition function f with domain W (the set of worlds) assigns to each world w a set of world propositions such that $f(w) = w$. That is, f(w)

characterizes w uniquely. Kratzer proposes the truth definition (9a) for conditionals. (Kratzer's official definition does not assume the existence of maximal sets in $A_w(q)$, but agrees with (9b) if maximal sets exist.)

(9) Definitions
   a. Let q be a proposition. Then $A_w(q)$ is the set of consistent subsets of $f(w) \cup \{q\}$ which contain q.

   b. A conditional [if **a** then **b**] is true at w iff **b'** follows from every maximal set in $A_w(\mathbf{a}')$.
   (A set is maximal in B iff it has no proper superset in B.)

The effect of f on the truth of a counterfactual is illustrated by one of Kratzer's examples.

> "Hans and Babette spend the evening together. They go to a restaurant called 'Dutchman's Delight', sit down, order, eat, and talk. Suppose now, counterfactually, that Babette had gone to a bistro called 'Frenchman's Horror' instead. Where would Hans have gone? (I have to add that Hans rather likes this bistro.)"

Specifically, is (10) true?

(10) If Babette had gone to to Frenchman's Horror, then Hans would have gone to Frenchman's Horror.

The idea is that a the partition function is a parameter fixed in part by the utterance situation. Suppose that in this case f(w) includes the fact that Hans and Babette spent the evening together, the fact that they went to Dutchman's

delight, and the other things listed in the quote.

In order for (10) to be true, that Hans went to the Frenchmen's Horror is to follow from certain subsets of $f(w) \cup \{\hat{}\text{Babette-went-to-Frenchman's-horror'}\}$. Since these sets are to include Babette-went-to-Frenchman's-horror' and be consistent, they do not include Babette-went-to-Dutchman's-delight'; the former proposition "kicks out" the latter one. But the fact that Hans and Babette spent the evening together is not kicked out. Suppose that this fact is included in every maximal set in A_w(Babette-went-to-Frenchman's-horror'); then (10) will turn out true. This illustrates the way in which the truth of a conditional depends on f. Relative to an f' such that f'(w) does not include the fact that Hans and Babette spent the evening together, (10) might be false.

Let us now return to Dretske's examples involving Clyde and Bertha. My general idea is that, as in Chapter V, the recursive definition of p-sets makes available, as the disjunction of the p-set for a sentence, a proposition with existentially quantified variables in the position of focused phrases. In the case of [Clyde married BERTHA], this is [Clyde married someone]'. Suppose that this proposition is included in the partition used in evaluating (8b). Since it is consistent with Clyde's not marrying Bertha, [Clyde married someone]' might be present in some of

the maximal sets in A_w([Clyde didn't marry Bertha]'); suppose it in fact is present in one of these sets. Since [Clyde doesn't inherit the money] does not follow from such a set, (8b) turns out false, as desired.

THe p-set union for [Clyde MARRIED Bertha] is the necessarily true proposition, unless the p-set for [MARRIED] is narrowed down to some contextually determined set. This contextually narrowed set might be thought of as the alternative courses of action with regard to Bertha that Clyde might have undertaken. Suppose the story related above makes 'marrying Bertha' and 'continuing to have a relationship with Bertha but not marrying her' the salient alternative actions that Clyde might take. That is, suppose that (11) is the contextually restricted p-set for [MARRIED].

(11) {marry', λx\y[have-a-relationship'(x,y) & -marry'(x,y)]}
(12) {^marry'(c,b), ^[have-a-relationship'(c,b) & -marry'(c,b)]}

The p-set for [Clyde MARRIED Bertha] is then (12). Suppose that the disjunction of (12) is in the partition used in evaluating (8a). Since the disjunction of (12) is consistent with Clyde's not marrying Bertha, it will be an element of some set S in A_w(Clyde-not-marry-Bertha'). That Clyde inherits the money might not follow from S; in fact,

it might be inconsistent with it, if we assume that Clyde's continuing his relationship with Bertha is inconsistent with his marrying someone else.[2] Then (8a) will turn out false.

Notice that the device of restricing p-sets is independently needed to deal with sentences like (13), which would otherwise be a necessary falsehood.[3]

(13) Clyde only intents to DATE Bertha

Furthermore, the truth value of (8a) is sensitive to the discourse context in exactly the way the story told above would lead us to expect. In the context (14a), (8a) (repeated in (14b)) seems false.

(14)a. Clyde could have married Bertha, or not married her and continued as before, or dropped her entirely and married someone else.

b. If Clyde hadn't MARRIED Bertha, he would not have been eligible for the inheritance.

Critical Remarks

Like the analysis of Chapter V, the analysis sketched above relies on the intermediate step of deriving a meaning with existentially quantified variables in the position of focused phrases. Thus it does not confirm the strong form of my theory of association with focus, which claimed that association with focus was a matter of taking a domain of

quantification to be a p-set. The possibility remains that some revision in the semantics for conditionals would correct this.

Another point is that the p-set employed in the analysis of (8a) and (8b) was not the p-set for the antecedent clause (the clause following if), but the p-set for the clause obtained by removing the negation from the antecedent clause.

3. The Big Picture

I have been developing a particular view of how association with focus works. The theory I proposed was an answer to the problem posed in Dretske (1972). That is, I proposed resources for distinguishing snetences (or more generally phrases) which differed in focus, and showed how these resources can be exploited to explicate the semantic effect that focus has in various constructions. In particular, in [CARL likes herring] was associated with a semantic object, a "p-set", which contributed to explicating the truth conditions of (15).

(15) I only claimed that CARL likes herring

The analyses of other association with focus constructions I suggested were of the same general kind, in that they employed p-sets to explain an effect of focus on

truth conditions or conventional implicatures. But not every possible theory of association with focus adheres to Dretske's view of the problem. For instance, the scope theory of association of only with focus I derived from Anderson(1982) claimed that, at the semantically significant level, (16a) is not a constituent of (15). Similarly, (16b) is not a constituent of (17) at LF. So semantic resources for distinguishing (16a) from (16b) are not required.

(16)a. CARL likes herring
    b. Carl likes HERRING

(17) I only claimed that Carl likes HERRING.

Adherence versus non-adherence to Dretske's view of the problem of association with focus seems to me to be an important way of classifying theories of association with focus. This distinction is related to one of the criticisms of the scope theory presented in Chapter II: I said that the scope theory failed to relate association with focus to the discourse function of focus. One might say that it is because the scope theory uses the abstract feature F to distinguish (16a) from (16b), rather than any semantic or pragmatic difference associated with this feature, that the scope theory is defective in this way.

Footnotes

[1] Another of Dretske's examples has to do with advice.

"Clyde: Alex, I need your advice. I have a 1927 Lincoln in my garage that is in mint condition. I haven't driven it for 35 years and it runs perfectly. Schultz, down the street, has expressed an interest in buying it and has offered me $30,000 for it.

Alex: So what is your problem?

Clyde: Well, I thought maybe if I held on to it longer it would become more valuable.

Alex: That isn't very likely. Your car isn't going to appreciate in value much more no matter how long you keep it, and you may never again receive such a fine offer. I advise you to sell it to him.

CLyde takes Alex's advice and sells the car to Schultz. The check he receives from Schultz bounces and when he goes looking for Schultz he finds that he has left town. The car is gone and Clyde has nothing to show for it but a worthless check. The next time he meets Alex the conversation goes as follows:

Clyde: You sure gave me a rotten piece of advice. Schultz took off with my car and left me with a bad check.

Alex: That is too bad, but why are you blaming me?

Clyde: YOU are the one who advised me to sell it to him.

Alex: Now wait a minute. You simply asked me for advice on whether or not you should sell the car for 30,000. You didn't ask me, nor did I advise you, about WHOM to sell the car to. I don't even know Schultz.

Clyde: If you didn't know Schultz, you shouldn't have given me the advice you did. When I asked you whether I should sell my car to Schultz or not, you said (I remember your exact words), 'I advise you to sell it to him.' So stop trying to avoid responsibility.

Alex is being dealt with unfairly. It seems clear that in this case what is true is that

(5a) Alex advised Clyde <u>to sell his car</u> to Schultz <u>for $30,000</u>

but it is not true that

(5b) Alex advised Clyde to sell his car to Schultz for $30,000

Since this is so we can say that the statement

(5) Clyde sold his car to Schultz for $30,000

is such that whether or not Alex advised him to do what is expressed by this statement depends on what the contrastive focus happens to be."

Again, I do not have a clear intuition of a truth conditional effect; the reader is urged to consult Dretske(1972) for a defense of his position on this example.

[2] This might be another fact in f(w), and in S.

[3] Contextually restricted p-sets are also motivated for the type e:

(i) Many people came to the party, but Mary only liked Sue

(ii) As for the men at the party,
Mary only danced with BILL
Of the seven men at he party,

(i) does not seem to exclude the possibility that Mary liked people not at the party. In (ii), a domain of quantification is explicitly supplied.

One way of dealing with contextual restriction of p-sets is to let the p-set for a focused phrase of type a be a free variable of type <a t>.

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