ON THE SYNTAX OF DISJUNCTION SCOPE*

0. Introduction

Recent work in theoretical linguistics, particularly within the Government-Binding theory of Chomsky (1981, 1982), has suggested that many aspects of syntactic representation might be "deducible" from the semantic properties of lexical items taken together with certain very general syntactic rules and principles, e.g., the rule Move alpha and the principles of Case and Government theory. This notion is of interest to linguists and psychologists for a number of reasons. If successful the approach would shed light on the issue of language acquisition. Under such a theory the task of the language learner largely reduces to the job of acquiring or identifying the meaning of lexical items, with syntactic structure being 'projected' from these meanings according to principles and operations given as part of the learner's universal biological endowment. Hence the information required for language acquisition is radically simplified. Moreover, such a theory holds out the promise of a more integrated and empirical approach to semantic studies. Given a well-grounded theory of syntactic principles, semantic analyses can be constructed and evaluated with an eye toward a deduction of observed syntactic behavior.

In this paper I present an analysis of disjunction in English which illustrates how certain aspects of the syntactic behavior of the elements either and whether might be seen to follow from the semantics of disjunction. I begin by examining data concerning the interpretation of or and show that scope of disjunction is tied in an intimate way to the syntax of either and whether. On the basis of this, I propose an analysis within GB wherein or scope is assigned syntactically through the movement of 'scope indicators', including either, whether and a phonologically null indicator O. As I argue, this proposal allows us to account for a number

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of interesting facts about English, e.g., why or-scope obeys island constraints, why either and whether designate scope within different syntactic domains, why indirect questions involving if show or scope interpretations similar to those involving whether. I then show how the syntactic analysis presented here can be tied to the explicit model-theoretic semantics for disjunction proposed by Rooth and Partee (1982). This view allows us to shed light on a puzzle regarding the interpretation of or in conditionals, on the interaction of disjunction and negation, and on certain asymmetries in the behavior of conjunction and disjunction.

1. Disjunction as a scopal element

Rooth and Partee (1982) (henceforth R & P) discuss some interesting facts concerning the interpretation of disjunction in English which suggest that or has the properties of a scope-bearing element. The scopal properties of or are illustrated by example (1) below (R & P's (13)):

(1) Mary is looking for a maid or a cook.

This sentence shows three apparent readings in connection with the disjoined object noun phrase a maid or a cook. First, there is a de dicto reading in which Mary is searching for a servant and would be satisfied with any individual x meeting the description "x is a maid or x is a cook". Example (2a) represents this reading in informal logical notation:

(2)a. Mary is looking for ((a maid) or (a cook)).

Second, there is a de re reading of the conjoined phrase in which there is some particular individual x who is either a maid or a cook such that Mary is seeking x:

(2)b. for some x, a maid or a cook, Mary is looking for x.

And finally, there is a reading in which either Mary is looking for an individual x satisfying the description "x is a maid" or else she is looking for any individual x satisfying the description "x is a cook":

(2)c. Mary is looking for (a maid) or Mary is looking for (a cook).

Under this interpretation, (1) is understood rather like a 'disjunction reduction' of two clauses: the or appearing inside the noun phrase object of look for is interpreted as a sentence-level connective. The disjunction is read, in effect, as distributed over the entire clause. As R & P point out, this second de dicto reading, which they refer to as the "wide scope or reading" is suggested by the continuation to (1): "...but I don't know which."
Interpretations like (2c), in which disjunction is understood as holding between phrases larger than those actually conjoined by *or* in surface syntax, are also observed in more complex examples involving multiple embeddings under intensional operators. In such sentences, the number of scopal *or* readings increases in much the same way that scopal readings of quantified NPs do. To illustrate this with another one of R & P’s examples, consider (3) below (R & P’s (18)):

(3) John believes that Bill said that
Mary was drinking or playing video games.

Here there are three readings of the disjunction corresponding to the three possible scopes for *or* vis-a-vis *believe* and *say*. First, there is a narrow interpretation in which *or* is distributed over the lower-most S, within the scope of both intensional verbs. On this reading John holds Bill to have alleged that Mary was engaged in either one of two activities, drinking or video game-playing. Again employing informal logical notation, we may represent this as in (4a):

(4a) John believes Bill said [drink(m) or p.vg.(m)]

Second, there is an intermediate scope reading in which disjunction is distributed over the middle clause – outside the scope of *say* but inside the scope of *believe*:

(4b) John believes that [[Bill said drink(m)]] or
    [Bill said p.vg.(m)]

Under this interpretation John believes that Bill either said Mary was drinking, or else he said that she was playing video games (John may not be sure which).

Finally, there is a wide-scope reading where *or* distributes over the entire matrix clause, and is thus read outside the scope of either intensional verb. According to this last reading, John either believes that Bill said Mary was drinking or else he believes that Bill said she was playing video games (the speaker may not be sure which):

(4c) John believes Bill said [drink(m)] or
    John believes Bill said [p.vg.(m)]

2. *Either* and *whether* as scope indicators

2.1. *Either*

The scopal interpretation of disjunction shows interactions with the presence and position of certain syntactic elements in English. Consider
the examples in (5), which are distinguished from (1) (reproduced below) simply by the presence of the element *either*:

(1) Mary is looking for a maid or a cook.

(5)a. Mary is looking for either a maid or a cook.
    b. Either Mary is looking for a maid or a cook.

*Either* is typically analyzed as an optional part of a ‘discontinuous constituent’ of disjunction, much like the *both* which appears as an optional ‘discontinuous constituent’ of conjunction in examples like *John is looking for (both) a maid and a cook*. As (5a, b) illustrate, *either* can appear immediately adjacent to its associated disjunction, or ‘displaced’ to some other site, e.g., S-initial position.

The presence and distribution of *either* has not been generally assumed to influence the interpretation of disjunction in any way. Nonetheless, when (5a, b) are considered carefully it seems that the difference in syntactic position of *either* does in fact correlate with an interesting difference in the interpretive possibilities for the two examples. Earlier we noted three possible readings of example (1): a *de dicto* and a *de re* reading of the usual sort (2a, b), together with a ‘wide scope or’ reading (2c), brought out by the continuation “...but I don’t know which.” Now in (5a), where *either* appears syntactically as part of the disjoined phrase, all three of these readings are apparently preserved: (1) and (5a) are fully synonymous in my judgment. However in (5b), where *either* is displaced from the disjoined phrase to a clause-initial position, one of the three readings seems to have disappeared. In particular, according to my intuitions, the narrow scope interpretation for disjunction (represented by (2a)) is absent with (5b). The NP object of *look for* may be read *de dicto* or (with difficulty) *de re*, but if it is read *de dicto*, then it seems to me that only reading (2c) – wide scope disjunction – is available.

Although the judgments are somewhat subtle, I believe similar results obtain with (5c, d):

(5)c. Mary is either looking for a maid or a cook.
    d. Mary either is looking for a maid or a cook.

In each of these sentences *either* occurs dislocated from the disjunction *or*, and it appears that in both cases (2c) is at the very least strongly favored over (2a) as a possible *de dicto* reading. In fact it seems doubtful that (5c, d) have the *de dicto* reading with narrow scope *or* at all.

Consider now some more complicated examples. In (6a, b) I give sentences in which a disjunction appears in an infinitival complement, in the scope of two intensional verbs. In the former, no instance of *either*
appears and in the latter either occurs adjacent to the disjoined object NP:\(^1\)

(6a). Sherlock pretended [to be looking for a burglar or a thief]
   (6b). Sherlock pretended.
       [to be looking for either a burglar or a thief]

In my judgment, (6a, b) are synonymous, having three readings distinguished by the scope of or. These are represented informally in (7a–c):

(7a). S. pretend to look for ((a burglar) or (a thief)).
   (7b). S. pretend [S. look for (a burglar) or S. look for (a thief)]
   (7c). S. pretend to look for (a burglar) or
         S. pretend to look for (a thief).

In (7a), or is understood within the scope of pretend and look for. Thus Sherlock is pretending to be hunting for any individual \(x\) satisfying the description “\(x\) is a burglar or \(x\) is a thief”. In (7b), or is read inside pretend but outside look for. On this interpretation one may imagine Sherlock to be pretending to have narrowed down his search to one of two categories of criminals: burglars or thieves. (Perhaps his pretense is to divert attention from the real object of his investigation: safe-crackers.) Finally, (7c) is the reading in which or is interpreted outside the scope of both intensional verbs – the “but I don’t know which” reading.

Compare (6a, b) with (6c, d) below in which either occurs displaced at various distances from its associated or:

(6c). Sherlock pretended
     [to either be looking for a burglar or a thief]
(6d). Sherlock either pretended
     [to be looking for a burglar or a thief]

Examples (6c) and (6d) contrast with (6a, b) in that neither has the narrowest scope reading for or, (7a). In each case either is positioned outside the scope of look for. Furthermore notice that (6c) and (6d) also contrast with each other: (6d) has only the widest scope reading for disjunction, (7c), while (6c) has only the middle scope reading (7b).

These observations regarding (5a–d) and (6a–d) suggest an interesting generalization concerning the position of displaced either and the scope of or: when either appears dislocated from or (i.e., in the configuration either \([XP XP or XP]\)) then or must take clausal scope – more precisely, or must take as its scope the clause within which either appears.

\(^1\) I am indebted to Ewan Klein for bringing these examples to my attention.
at surface form. Thus when *either* occurs in S-initial position as in (5b), or in the S-internal positions in (5c, d), disjunction must be understood as having scope over S and hence wider than the verb *look for*. This rules out the narrow scope *de dicto* reading in (2a). Similarly when *either* appears in the medial position in (6d), then *or* must be understood as taking scope over the embedded S, outside the scope of *look for* but inside the scope of *pretend*. And so on.

The sentences in (5) and (6) containing a non-displaced *either* show no changes in *or* scope resulting from the presence of this element. As we noted, (5a) is synonymous with (1), in which no instance of *either* appears. Similarly (6a) is synonymous with (6b). However consider a variant of our earlier example (3) (reproduced below) containing an undisplaced *either*:

(3) John believes that Bill said that Mary was
drinking or playing video games.

(8a) John believes that Bill said that Mary was either
drinking or playing video games.

We observed that (3) is three ways ambiguous according to how the scope of *or* is read vis-a-vis the intensional verbs *believe* and *say*: inside both, inside the former and outside the latter, or outside both. Given our results with (5) and (6) we might therefore expect (8a) to show identical ambiguities. In fact, however, the two sentences are not analogously ambiguous: two of the three readings have disappeared in the example with *either*. Specifically, it does not seem possible to get either the intermediate or the wide-scope readings of disjunction. According to my intuitions, *or* must be read as taking scope inside both of the intensional verbs *believe* and *say*.

That somewhat surprising result correlates with an interesting syntactic fact about the behavior of *either* in finite as opposed to nonfinite clauses, namely: *either* does not appear happily in surface form outside the minimal tensed sentence which contains its associated *or*. Consider the additional variants of (3) shown in (8b–e) below:

(8b) John believes that Bill said that
[either Mary was drinking or playing video games]

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2 This generalization is anticipated in Quine (1967), where it is noted: "...the pair of particles *either*-*or* is not just a redundant elaboration of the simple *or*, [rather]... the *either* does the useful work of a left-hand parenthesis marking the beginning of the compound whose connective is *or* (pp. 44–45)". I am grateful to Peter Ludlow for pointing out this reference to me.
c. ??John believes that Bill said either that
   [Mary was drinking or playing video games]

d. ??John believes that either Bill said that
   [Mary was drinking or playing video games]

e. *Either John believes that Bill said that
   [Mary was drinking or playing video games]

In (8b), either occurs within the tensed S containing or, and the sentence is acceptable. Contrastingly, in (8c–e) either occurs outside, and at various distances from, the bracketed tensed S. To my ear, each of these examples is marginal at best, ranging from awkward to outright impossible.

These facts taken together with those in (6) indicate that when either occurs overtly and adjacent to or in surface form (i.e., in the configuration \([\text{XP} \text{ either} \text{ XP} \text{ or} \text{ XP}]\)), disjunction scope is indeed affected. Examples (8a–e) suggest that in such situations the scope of or is confined, not to the clause in which its associated either does appear, but rather to the clauses in which it could appear were it in fact displaced. Thus as (8c–e) show, tensed clauses limit the potential surface positions of either: either cannot occur separated from or by a tensed S boundary. Accordingly, when either-or appear together in a tensed S, as in (8a), disjunction scope can be no wider than S. On the other hand, (6c) shows that nonfinite clauses do not confine the surface position of either; either can be separated from or by an infinitival S boundary. Correlatively, when either-or occur together in a nonfinite S, as in (6b), the scope of disjunction is not limited to S, but can be wider.

Finally, let us examine some facts concerning the interaction of or-scope and negation. Consider example (9):³

(9) Mary isn’t looking for a maid or a cook.

In sentences such as this it is quite difficult, if not impossible, to understand disjunction as taking scope wider than the negative auxiliary isn’t. Thus there is no readily accessible reading for (9) according to which Mary isn’t looking for a maid or Mary isn’t looking for a cook, where the object NPs are de dicto. This again correlates with an interesting fact about the syntax of disjunction: when either occurs with or, and the latter is in the scope of a negation, then either may not appear in surface form to the left of the negation. That is, negation may not intervene between either and its associated or. Compare (9) with (10a–d) below:

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³ I am indebted to Ewan Klein for bringing these examples to my attention.
(10)a. Mary isn’t looking for either a maid or a cook.
b. (?)Mary isn’t either looking for a maid or a cook.
c. ??Mary either isn’t looking for a maid or a cook.
d. ??Either Mary isn’t looking for a maid or a cook.

In (10a), *either* appears adjacent to its disjunction in the scope of the negative progressive auxiliary, and in (10b) it is displaced from *or*, but the negated auxiliary does not intervene between the two. Both sentences appear relatively acceptable. On the other hand in (10c, d), *either* appears to the left of negation, and the examples are quite marginal. Notice that in the acceptable (10b), disjunction is understood as having scope wider than *look for* (in line with the surface position of *either*), but narrower than negation. That is, (10b) is interpreted as the negation of the sentence *Either Mary is looking for a maid or a cook* (consider (10b) uttered to contradict the latter).4 The generalization emerging from these facts thus seems to be that when disjunction scope is confined to a certain domain, then an associated *either* is syntactically confined to that domain as well. In (10a–d) we observe that disjunction can take scope (wide or narrow) only within the scope of a negation to its left, and correspondingly displacement of *either* from its associated *or* is bounded on the left by negation.

Taking our observations concerning (5–10) together, then, we see that the presence and position of *either* interacts with the scopal interpretation of disjunction in important ways. When *either* occurs displaced from its associated *or*, then its overt surface syntactic position explicitly marks the scope of disjunction. On the other hand, when it occurs undisplaced and adjacent to its disjunction in surface form, then its potential surface

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4 As evidence that *or* is read wide scope but within the scope of negation in (10b), consider the contrast in (i) vs. (ii):

(i) a. Mary isn’t looking for either a maid or a cook.
b. she’s looking for a maid.
(ii)a. ??Mary isn’t either looking for a maid or a cook.
b. she’s looking for a maid.

In (ia), the narrow position of *either* allows the narrow scope reading of *or*. Hence (ia) can be understood as denying that Mary would be satisfied by finding a cook. Under this reading the continuation in (ib) is reasonable. However in (iia), the position of *either* outside the scope of *look for* forces the disjunction to be read as wide scope. Hence assuming negation to have widest scope, this sentence must be taken as denying that Mary is looking for a maid or looking for a cook — i.e., as affirming that she is not looking for a maid and that she is not looking for a cook. Accordingly the continuation in (iib) is quite unnatural (in fact it constitutes a contradiction).
positions delimit the potential scopes for or. Finally, when the scope of disjunction is limited to some domain even in the absence of either, then an overt either is syntactically confined to that domain as well.

2.2. Whether

Interaction between the scopal interpretation of or and a syntactic element is not limited in English to cases involving either. Similar phenomena can be observed in examples involving the interrogative element whether, which appears in verbal indirect question complement structures like (11a):

(11)a. I know [s whether John reads fiction]

and in noun phrase complement constructions like (11b):

(11)b. the decision [s whether John should read fiction]

The semantics of whether shows this item to bear a close relation to disjunction. Historically, whether developed, in effect, as the ‘Wh-counterpart’ of either, with an original meaning of ‘which of either A or B’. Thus Jespersen (1909–49) cites examples such as the following:

(12)a. Whether of them twaine did the will of his father?

                      (Matthew 21.31)

b. Whether is greater, the gold or the temple?

                      (Matthew 21.17)

                      (Jespersen 1909–49; II. p. 200)

In both instances whether is interpreted as asking for some member of a disjunctively specified set whose contents are either understood from context, as in (12a), or stipulated explicitly, as in (12b).

The modern use of whether has also been analyzed semantically as involving a disjunctively specified set. To take one widely-known account within the framework of Montague Grammar, Karttunen (1977) analyzes indirect question complements of the form [whether α] as denoting the set of propositions \( \{ p : p \text{ is true } \& [p = q \lor p = \neg q] \} \), where \( q \) is the proposition expressed by \( \alpha \). So, for example, the interrogative complement whether John resigned appearing in a sentence such as I know whether John resigned will denote the set:

(13) \( \{ p : p \text{ is true } \& [p = \text{John resigned } \lor p = \neg \text{John resigned}] \} \)

If John resigned, then (13) will be just the unit set containing the proposition that John resigned. And if John did not resign, whether John
resigned will denote the unit set (~John resigned), and so on. The intuitive idea behind this approach is that to know whether John resigned is simply to know the contents of the set denoted by the whether complement, i.e., to know that John resigned or that he didn’t resign, whichever happens to be true.

This semantics for whether, which involves the disjunction of a proposition and its negation, is reflected to some extent in the syntax of English. Examples (11a, b) have fully synonymous variants in which whether is replaced by the disjunctive phrase whether or not which contains an overt negation:

(14)a. I know [s whether or not John reads fiction]
       b. the decision [s whether or not John should read fiction]

With these observations in mind, consider now the indirect question complements in (15a, b), which contain whether together with an instance of or in an embedded clause:

(15)a. I know [s {whether
                   {whether or not}
       b. [s Bill should ask [John to resign or retire]]]

Given the semantics for whether sketched above, we expect interpretations for S involving the disjunction of S and its negation, i.e.:

(16)a. {p; p is true &
       [[p = Bill should ask John to resign or retire] ∨
       [p = ~Bill should ask John to resign or retire]]

(16a) represents a reading of (15a, b) where what is known by me is either that Bill should ask John to resign or retire, or else that Bill should not ask John to resign or retire.

Now notice that while the Ss in (15a, b) certainly do have the reading in (16a), there is an ‘extra’ reading of the whether complement in (15a) which is not available for (15b). On this additional reading, I know whether Bill should ask John to resign or retire if I know that Bill should ask John to resign, or else I know that Bill should ask John to retire. More formally, on this extra reading S interprets as:

(16)b. {p; p is true &
       [[p = Bill should ask John to resign] ∨
       [p = Bill should ask John to retire]]

This second interpretation is not predicted under the Karttunen semantics (as Karttunen himself points out), for note that although the whether
complement denotes a disjunctively specified set of propositions, the
disjunction is not of the expected form. That is, it is not of the form \( \{p: p\text{ is true }\land (p = q \lor p = \neg q)\} \) as in (13) or (16a), but rather of the form \( \{p: p\text{ is true }\land (p = q \lor p = r)\} \). Furthermore, and more importantly, notice that the two propositions \( q \) and \( r \) can be derived logically by distributing or over the highest clause in exactly the same way that disjunction can be distributed over the highest clause in example (17a) to derive the reading in (17b):

(17a)  Bill should ask John to resign or retire.
       b.  [Bill should ask John to resign] \lor [Bill should ask John to retire]

That is, just as the reading (17b) can be derived by interpreting or in (17a) as having wide scope, so the reading in (16b) can be derived by interpreting the disjunction appearing in the embedded clause of (15a) as having wide scope, and by using this or to form the disjunctively specified set of propositions semantically associated with whether.

What these data suggest, then, is that in examples like (15a), (but, interestingly, not (15b)) whether is able to function like either in explicitly marking the scope of a disjunction – in this case the or which conjoins VPs in the most deeply embedded clause. This scope-marking ability is in fact somewhat broader than that exhibited by either. Notice that (18), which shows ambiguities parallel to that observed in (15a), has a tensed S boundary intervening between whether and its semantically associated disjunction:

(18)  I don’t know whether Bill claimed that John resigned or went on leave.

Nonetheless, the basic phenomenon – scope-indication by a syntactic element – appears to be the same.

3. THE SYNTAX OF DISJUNCTION SCOPE INDICATORS

The facts noted above concerning the scope of or can be given an interesting analysis within the Government-Binding theory of Chomsky (1981, 1982). The basic proposal that I will explore contains two central assumptions. First of all, I will assume that disjunctions in English (perhaps universally) have an underlying (D-structure) representation similar to one adopted in Lakoff and Peters (1966), Keyser and Postal
(1976), Stockwell, Schachter, and Partee (1973) and Pesetsky (1981), viz., the representation shown in (19):^5

(19)

\[
\begin{array}{c}
\text{CONJ} \\
\text{\{either, whether\}} \\
o \\
\alpha^* \\
\ldots \alpha \ldots \\
S
\end{array}
\]

Here CONJ is the category of conjunctions generally (including, e.g., and and but), \( \alpha \) is any category, and \( \alpha^* \) is the Kleene star. The idea here is that the syntax of conjunctions involves a finite sequence of categories, \( \alpha^* \), together with a conjunctive element CONJ. In the case of disjunctions, CONJ itself consists of two subparts: the item or and one of the ‘scopal indicator’ elements (SIs) either, whether or O (the null indicator).

The second major assumption I will make is that or-scope has an explicit syntactic reflex: that it is indicated in syntactic representation by the position of one of the disjunction-initial indicator elements. In particular, I assume that the scope of or is assigned through the rule Move alpha applied either at S-structure or LF to the \([-WH]\) indicator either, the \([+WH]\) indicator whether, or a phonologically null indicator O. Following standard views within the Government-Binding theory this movement is assumed to leave a trace – i.e., an empty category \([e]\) coindexed with the moved element. Furthermore, adopting the views of May (1977) and Higginbotham (1980), I assume that syntactic scope assignment always involves movement to a non-argument position (\( \wedge \)).

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^5 As it is not my aim here to give an account of how well-formed coordinate structures are provided to D-structure, I will simply set aside the issue of what rules or principles insure, e.g., that conjunctions have two or more conjuncts in the general case, that or is realized in the appropriate positions in \( \alpha^* \) (i.e., either between each instance of \( \alpha \) or before the final instance), that the conjuncts are typically of like category, etc. For suggestions and arguments as to what such rules and principles might be, see the authors cited in the text. For discussion of such issues within the framework of Generalized Phrase Structure Grammar see Gazdar (1981), and Sag et al. (1985).
position). Taking these points together, then, the general picture is as in (20):

(20)

where SI moves to an $\tilde{A}$ site.

3.1. Either

Let us see how these assumptions bear on the data adduced above concerning scope of disjunction, beginning with disjunctions involving *either*. For reasons that are perhaps intuitively apparent, but which will in any event be made more explicit in section 4, I assume that when disjunction is assigned scope wider than the surface position in which it appears, that scope is clausal. Hence as a scope indicator for *or*, I assume that if *either* moves, it must move (in the syntax or in LF) to positions associated with sentence scope. For non-Wh elements like *either* there appear to be essentially two such positions: adjoined to the head of S – i.e., to INFL – as in (21a), or adjoined to S itself as in (21b):6

(21a)

* In examples like *Mary either is looking for a maid or a cook* I assume that *either* is attached under S between NP and INFL. This is also a position occupied by sentence adverbs in examples like *Max probably will scream.*
The former is presumably the position of sentential adverbs such as necessarily, possibly, probably, &c. in examples like John can't possibly go to the party now or Max won't necessarily leave. The latter is the position occupied by such adverbs when they appear sentence-initially, and also the position assumed at LF by quantified NPs such as every man or some spinach.

Recall now the basic observations that we wish to account for regarding either: (i) when displaced from its or the actual surface position of either marks the actual scope of disjunction, (ii) when undisplaced, the possible surface positions of either delimit the potential scopes for disjunction, and (iii) when the possible scope of disjunction is confined to some domain D, even in the absence of either, then the possible surface positions of either are confined to that domain as well. As is not hard to see, these observations follow almost directly from the assumption that either is a scope indicator for or which may move between D- and S-structure, or between S-structure and LF. To illustrate, let us consider an example; (22) gives what we may take to be the D-structure underlying the sentences in (6):

(22) Sherlock pretended [PRO to be looking for [\text{NP either or [a burglar\text{[a thief]]]}}]

Suppose that or is moved between D- and S-structure. Then either is adjoined in either the embedded or the matrix sentence, and hence (22) is mapped to S-structures such as (23a, b):

(23a) Sherlock pretended [PRO to either, to be looking for [\text{NP e, or [a burglar\text{[a thief]]]}}]

b. Sherlock either, pretended [PRO to be looking for [\text{NP e, or [a burglar\text{[a thief]]]}}]

Since S-structure is the input to both PF and LF, (23a, b) will correspond to surface forms like (6c, d) (respectively).
THE SYNTAX OF DISJUNCTION SCOPE

Now let us assume, following a proposal by Aoun, Hornstein and Sportiche (1981), that (in English at any rate) if an element $a$ is moved to an $\overline{A}$ position at S-structure, then it is not subject to further movements at LF. Such a restriction appears to hold of Wh-elements. Thus in (24a) ((9), from Lasnik and Saito (1984)), the object NP what which is unmoved at S-structure may (and in fact must) undergo LF movement to the matrix COMP:

(24a) Who, [t$_i$ knows [that [John bought what]]]

However the Wh-phrase in (24b) ((8) from Lasnik and Saito (1984)), having been moved to the embedded COMP at S-structure, cannot be moved to the matrix COMP (and hence assigned matrix scope) at LF:

(24b) Who, [t$_i$ knows [what, [John bought t$_j$]]]

Assuming such a principle, then, it follows straightforwardly that when either is displaced from or by Move alpha in surface form – i.e., at S-structure – its overt position marks the scope of disjunction. Thus we account for observation (i).

Suppose that either remains in situ at S-structure, and so appears adjacent to its disjunction at PF. Then if or is to be assigned wide scope it must move (as in (23a, b)) at LF. Granting the reasonable supposition that the possible landing sites for either do not differ at S-structure and Logical Form, it follows directly that the possible surface positions for either will correspond to the potential scopes for or. Thus we account for observation (ii).

Finally consider observation (iii). Under the present proposals, disjunction scope where no overt indicator appears is understood to be determined by movement of the null indicator O. Since we assume (see 3.3 below) that O has distributional properties which allow it to occur in at least all of the positions where either may appear, it follows that if the former is confined to some domain D (e.g., scope of a negation), then the latter will be as well.

It is natural to inquire about the principles which actually determine the surface positions for either, e.g., what accounts for the fact that movement of either is confined by negation and by finite but not nonfinite clause boundaries. I will take up the former issue in section 4.2 where interaction between disjunction and negation is discussed. Regarding the latter issue, one plausible approach might be to appeal to the Empty Category Principle (ECP) of Chomsky (1981). The ECP is stated in (25) below:
ECP: traces, [e], must be properly governed.

Following discussion in recent literature (Chomsky (1981, 1982), Stowell (1981), Lasnik and Saito (1984)) let us assume that proper government of \( \alpha \) by \( \beta \) embraces two notions: (i) *lexical government*, i.e., government of \( \alpha \) by some lexical category \( \beta \) which assigns \( \alpha \) a thematic role (which "selects \( \alpha \) in its theta-grid", to use the terms of Stowell (1981)); and (ii) *antecedent government* which is defined as in (26) following Lasnik and Saito (1984):\(^7\)

\[ \beta \text{ antecedent governs } \alpha \text{ if } \]

(i) \( \beta \) c-commands \( \alpha \)
(ii) \( \beta \) and \( \alpha \) are coindexed
(iii) there is no \( \gamma \) (\( \gamma = \text{NP}, \bar{S} \)) such that \( \beta \) c-commands \( \gamma \) and \( \gamma \) dominates \( \alpha \), unless \( \alpha \) is the head of \( \gamma \).

To illustrate these notions, in (27)

\[ [s \ \text{who} , [s \ e, \text{was seen e},]] \]

the NP-trace in object position is lexically governed by the verb *see*, which assigns it a \( \theta \)-role; furthermore the trace in subject position is antecedent governed by the coindexed, c-commanding operator *who*. The structure is thus well-formed under the ECP.

With these principles in mind consider the structures in (21). In view of the ECP, the trace of *either* must be properly governed - i.e., lexically governed or antecedent governed. It is evident that *or* is not a member of a lexical category - it is not an \( X^0 \), where \( X = \text{N}, \text{V}, \text{P} \) or \( \text{A} \), hence *or* cannot lexically govern the trace of *either*. Furthermore given our strict interpretation of lexical government as involving thematic selection, it seems clear that no other element internal or external to the disjoined phrase will lexically govern \([e,] \) since no other element can be reasonably analyzed as assigning it a thematic role. It follows, then, that in the

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\[ \text{For concreteness I will adopt the simple definition of c-command proposed in Reinhart (1979), viz.:} \]

\[ \text{(ii) C-command: A category } \alpha \text{ c-commands a category } \beta \text{ iff } \alpha \text{ does not dominate } \beta, \beta \text{ does not dominate } \alpha, \text{ and the first branching node dominating } \alpha \text{ also dominates } \beta. \]
configurations in (21) \([e]\) can be properly governed if and only if it is antecedent governed - iff it is governed by and coindexed with some \(\beta\) in its local NP or \(S\) domain.

Given that its trace must be antecedent governed it is not hard to see that any single-stage movement of either beyond the minimal \(S\) containing \(or\) - e.g., the one in (28) - will result in an ECP violation:\(^8\)

\[
(28) \quad \text{either}, \ldots [S \ldots [XP [e], XP or XP]].
\]

This is so simply because an intervening \(S\) will block antecedent government as defined in (26).

Furthermore, movement of either through successive S-adjunctions will also be ruled out under the ECP. As discussed by Lasnik and Saito (1984), structures like that in (29), where either has 'escaped' its minimal \(S\) through iterated adjunctive movements, will not be well-formed since the intermediate trace \(t\) will fail to be properly governed (cf. Lasnik and Saito (1984) for discussion):

\[
(29) \quad \text{either}, \ldots [S, t, \ldots [XP [e], XP or XP]].
\]

These two possibilities exhaust the ways in which either could move outside of its \(S\) of origin. Thus it follows that movement of either should in the general case be confined to the minimal \(S\) containing its coindexed trace, and hence to the minimal \(S\) in which its associated disjunction appears. This prediction is evidently too strong in view of the results in (6), and to accommodate them I will amend clause (iii) in the definition of antecedent government such that \(\gamma\) includes only tensed \(\bar{S}\)s. This will correctly allow single stage movements like those in (28) in the case where \(S\) is an infinitival clause boundary.

\[^8\] I assume that structure introduced by the disjunction itself is irrelevant from the standpoint of these principles. Thus if either is moved out of a conjoined NP, resulting in a structure:

\(i\) \quad \text{either}, \ldots [S \ldots [NP [e], NP or NP]]

then the NP node introduced by the disjunction 'does not count' for antecedent government. Such an assumption is familiar in dealing with other principles. For example, in Across-the-Board extractions from conjoined Ss:

\(ii\) \quad \text{the man [who, [S [S, John saw e], and [S, Mary knew e]]]}

the S node introduced by the conjunction does not count from the standpoint of Subjacency, etc.
An interesting set of examples appears, at first blush, to raise difficulties for the account developed here. Consider (30a–c) below:  \(^9\)

(30)a. Either Mary is driving to the airport or she is taking a cab.

    b. Mary either is driving to the airport or she is taking a cab.

    c. Mary is either driving to the airport or she is taking a cab.

In view of the full sentence *she is taking a cab* after the disjunction, (30a–c) appear to be examples of S conjunction. However notice that if this is correct, then the position of *either* in (30b, c) seemingly compels us to analyze these examples as in (31):

(31) \[\left[\text{s either or } \left[\text{s, Mary is driving to the airport } \ldots \right] \right[\text{s, } \ldots ]\right]\]

where the scope-marker moves rightward into S. Such an analysis is problematic for a number of reasons. For one thing rightward movement of *either* is not available in general. Thus in a structure with conjoined subject NPs, it is not possible to adjoin *either* to INFL:

(32) \[\left[\text{NP e, John or Bill} \text{ are either, leaving.} \right]\]

Nor to adjoin *either* to the right of S:

(33) \[\left[s \left[\text{NP e, John or Bill} \text{ are leaving} \right] \text{ either}, \right]\]

Presumably this restriction follows from whatever is responsible for the general impossibility of rightward movement of scopal elements in English.

Second, assuming a derivation as in (31) it is quite unclear that *either* would c-command and hence antecedent govern its trace. Under the proposals made above, this would involve an ECP violation.

Finally, note that if (30b, c) are derived as in (31), then some principles will be necessary to insure that *either* does not move ‘too far’ into the initial S, deriving examples like (34a):

(34)a. *Mary is driving either to the airport or she is taking a cab.

And that it doesn’t move into a position in the second or succeeding clauses, deriving examples like (34b):

(34)b. Mary is driving to the airport or she (*either) is (*either) taking a cab.

\(^9\) I am grateful to Ewan Klein for pointing out these examples to me.
In the face of these problems, the analysis of (30b, c) in (31) does not look promising. Accordingly I would like to suggest a very different account. What I propose is that, contrary to appearances, (30b, c) are not instances of simple S disjunction with rightward movement of either; rather they are asymmetric disjunctions of VP and S, with leftward movement in the former and no movement in the latter. Under this proposal, (30b, c) both derive from the underlying structure in (35):

(35)

```
  S₀
 /   \
/     \INFL
Mary INFL
    \   / CONJ
     either or driving to the airport she is taking a cab
```

in which VP and S₁ appear under a neutralized category XP. In (30b) either adjoins to the left of INFL, and in (30c), either remains in situ.¹⁰

Although implausible at first glance there is evidence which supports the asymmetric conjunction picture. First of all, notice that disjunctions like those in (30b, c), are subject to an interesting semantic constraint. Examples like these are well-formed if and only if the disjoined clause, S₁, contains an instance of NP coreferential with the main clause subject noun phrase. Thus we get examples like (36a, b):¹¹

(36)a. Mary either is driving to the airport or
      she/Mary/the poor girl is taking a cab.

  b. Mary is either taking a cab to the airport or
      John is driving her/Mary/the poor girl.

where the second disjunct contains a pronoun, proper name, or definite description in the subject or object positions (respectively), coreferential with Mary. However if the second clause fails to contain any such

---

¹⁰ Sag et al. (1985) discuss other instances where unlike categories are apparently conjoined and propose a more precise analysis of neutralized categories.

¹¹ Examples like (36a, b) seem to be most acceptable when the coreferential element in the second clause is in subject position.
coreferral NP, as in (36c), or if it contains an NP coreferral with some noun phrase other than the subject of the main clause, as in (36d), then the result is uniformly bad:

(36c)  *Mary is either taking a cab to the airport or
      John is driving there.

d.  *Mary is either at John's house or his mother is there.

This restriction is quite peculiar under the view that (30b, c) are S-disjunctions, since analogous instances of S disjunction without 'rightward either-movement' are not similarly constrained. Compare (36c, d) to (37a, b):

(37a)  Either Mary is taking a cab to the airport or
      John is driving there.

b.  Either Mary is at John's house or his mother is there.

On the other hand, a coreferral NP restriction makes sense for (35) under plausible assumptions about the semantics of the XP constituent. Suppose that the interpretation of such structures involves conjoined predicates: VP in the case of the first conjunct, and a 'derived VP' in the case of the second. This derived VP would be obtained by treating $S_1$ as an open sentence, i.e., by treating one of the NPs in $S_1$ (call it NP$_1$) as a variable, $x$. Where VP' and $S_1'$ are the interpretations of VP and $S_1$ (respectively) the interpretation of the predicate phrase $[x_1 \text{VP or } S_1]$ would thus be: $\lambda x[\text{VP}(x) \lor S_1]$. In calculating the semantic value for the matrix S, the latter is predicated of the matrix subject NP (NP$_0$), with the result that NP$_1$ is ultimately bound to NP$_0$, so that there is coreference between the two. If no suitable NP is available in $S_1$, then no derived VP interpretation will be possible, and hence no interpretation is assignable to XP, and hence (presumably) illformed results. Thus we account for the fact that $S_1$ must contain an NP$_1$ coreferral to NP$_0$ in a straightforward way.

Additional evidence for the structure in (35), derives from examples analogous to those in (30b, c) but involving both ... and rather than either ... or. Both differs importantly from either in that it cannot occur displaced from its associated conjunction in surface form:

---

12 The idea that pronouns, definite NPs and proper names might all be treated uniformly as variables (at least in certain circumstances) can be justified semantically under recent proposals by Heim (1982), who makes exactly this suggestion.
(38)a.  Mary is both [going to school and holding down a job]
     b. *?Mary both is [going to school and holding down a job]
     c.  *Both Mary is [going to school and holding down a job]

and it does not appear in S-initial position with conjoined Ss:

(38)d.  *Both John laughs and Mary smiles.

Now consider (39a–c):

(39)a.  Mary is both going to the wedding and
       she is attending the reception afterwards.
     b. *?Mary both is going to the wedding and
       she is attending the reception afterwards.
     c.  *Both Mary is going to the wedding and
       she is attending the reception afterwards.

Example (39a) is parallel to (30c) with approximately the same level of acceptability in my judgment, while (39b) is marginal at best, and (39c) is simply out. An asymmetric conjunction analysis similar to that suggested above for disjunction allows these facts to be accounted for smoothly. Under such an analysis, (39a) is analogous to (30c) with both immediately adjacent to a conjoined VP and S. Examples (39b, c) are marginal and out respectively, for the same reasons (38b, c) are. On the other hand, a rightward movement analysis would involve considerable complexities. First, we would again have to explain the coreferential NP constraint, which holds for these conjunction structures as well. Second we would be forced to derive (39a) from (39c), despite the fact that both never otherwise occurs in S-conjunctions (recall (38d)). Last we would have to propose some extra principles insuring that both always moves ‘far enough’ to the right so that (39b) is not derived — principles which would make the parallel ill-formedness of (38b) and (39b) coincidental. These complexities speak in favor of an asymmetric conjunction and disjunction analysis of (30b, c) and (39a), which pose no threat to the analysis developed here.

3.2. Whether

Let us turn to or-scope assignment in connection with the Wh-element whether. Under the present proposal, whether is a [+WH] scope indicator
for disjunction, and I assume that like other Wh-items it undergoes movement to COMP.\textsuperscript{13}

(40)

\[ S \]

\[ \text{COMP} \]

\[ S \]

\[ \text{whether}_i \]

\[ \ldots \alpha \ldots \]

\[ \text{CONJ} \]

\[ \text{or} \]

\[ \alpha^* \]

\[ \varepsilon_i \]

where again whether is coindexed with a trace contained in the disjoined phrase.

The assumption that whether moves to COMP rather than being adjoined to S like either correctly predicts an important difference in their properties which was noted earlier, viz.; that whether is able to designate or-scope in broader domains than either. This follows from the fact that the principle which confines either to its minimal clause of origin – the ECP – applies differently to structures involving iterated movement to COMP vs. iterated adjunction. Consider once again (15a) (reproduced below as (41a)):

\begin{itemize}
  \item (41a). I know whether Bill should ask John to resign or retire.
\end{itemize}

Under its wide-scope or interpretation (i.e., (16b)), example (41a) will have the S-structure shown in (41b):

\begin{itemize}
  \item (41b). I know \([S [\text{COMP whether}_i][S \text{ Bill should ask} [S t_i [S \text{ John to } [[\varepsilon], \text{ resign or retire}]]]]\]
\end{itemize}

where whether has moved successive cyclically through COMP from the

\textsuperscript{13} The proposal that whether be analyzed as moving to COMP is advanced and considered briefly in Grimshaw (1977). Huang (1982) discusses data regarding alternative questions in Chinese (so-called “A-not-A questions”) similar to those observed here in relation to whether; however a discussion of Huang’s syntactic and semantic analysis of these constructions, which departs from the account proposed here in important ways, is beyond the scope of this paper. Therefore I will simply refer the reader to Huang (1982) for the relevant details.
embedded S. The trace left in the disjunction \( [\nu P \{ e \} \text{ resign or retire}] \) will be properly governed since it will be antecedent governed by the trace \( t \), in COMP. Furthermore, the intermediate trace of \( \text{whether} \) will also be properly governed under the definition of antecedent government adopted earlier since this trace occupies a position in the head of \( S \). Thus long-distance scope indication will be possible with \( \text{whether} \), but not with \( \text{either} \).

The proposal that \( \text{whether} \) undergoes syntactic movement like other Wh-phrases makes a number of predictions beyond the one just noted. Observe that under this view we would expect \( \text{or} \) scope with \( \text{whether} \) to show Subjacency effects, given Subjacency as a condition on the rule Move alpha. This expectation appears to be justified. Compare the noun phrase complement constructions in (42a, b):

(42)a. The decision whether to believe that Bill resigned or retired
b. The decision whether to believe the claim that Bill resigned or retired
(is completely up to you, &c.).

In my judgment, (42a) can have either of the readings given in informal logical notation below:

(43)a. \( \lambda x \{ \text{decision}(x) \land \) \\
    \( [x = \text{PRO believe that Bill resigned or retired}] \lor \) \\
    \( [x = \neg \text{PRO believe that Bill resigned or retired}] \} \)

b. \( \lambda x \{ \text{decision}(x) \land [x = \text{PRO believe that Bill resigned}] \lor \) \\
    \( [x = \text{PRO believe that Bill retired}] \} \)

Thus, (42a) can be understood such that the decision is between believing that Bill resigned or retired or not believing that Bill resigned or retired – reading (43a). Alternatively, (42a) can be understood such that the decision is between believing that Bill resigned or believing that Bill retired – reading (43b). On the other hand (42b) has only one such reading, viz., the one in (43a). According to my intuitions (42b) simply cannot get a reading where \( \text{whether} \) is interpreted as marking the scope of the disjunction within the NP the claim that Bill resigned or retired. Thus \( \text{or} \) scope designation with \( \text{whether} \) appears to show Subjacency effects in examples involving complex noun phrases.

In a similar vein, consider \( \text{whether} \) complements involving Wh-islands such as the one in (44):

(44) \( I \) know whether Bill wonders who resigned or retired.
In the absence of Subjacency effects we might expect the $\bar{S}$ complement in this sentence to have the two readings given in (45a, b):

(45)a. \( \{ p: p \text{ is true} \ & \& \ [(p = \text{Bill wonders who resigned or retired}) \vee \neg (p = \text{Bill wonders who retired})] \} \)

b. \( \{ p: p \text{ is true} \ & \& \ [(p = \text{Bill wonders who resigned}) \vee (p = \text{Bill wonders who retired})] \} \)

On the interpretation in (45b), \textit{whether} would be understood as the scope indicator for the disjunction appearing inside the embedded indirect question \textit{who resigned or retired}. On the interpretation in (45a) it would not. In my judgment, (45b) represents an at best marginal reading of (44), with (45a) strongly preferred. This result is thus once again in conformity with what we would expect under a movement analysis of \textit{whether}, given the general status of Wh-clauses as (weak) Subjacency islands.

The analysis proposed is compatible with phenomena normally held to support a view of \textit{whether} as a simple interrogative morpheme, base-generated in its clause-initial position as the realization of a \textit{[+WH]} COMP (or, equivalently, as the 'spell out' of an abstract Q-morpheme). (See, e.g., Baker (1970), Bresnan (1972), Stockwell, Schachter, and Partee (1973), Emonds (1976), Chomsky (1981, 1982).) Consider, for example, the observation that \textit{whether} never occupies a sentence-internal position. Even in multiple Wh-constructions, where Wh-items typically may remain in situ, \textit{whether} is forbidden from appearing in its hypothesized D-structure position:

(46) *I don't know \( [s \text{ who should } [v_p \text{ whether resign or retire}]] \).

Lack of such non-moved instances of \textit{whether} has been taken to argue for a non-movement analysis of this element.

In fact the inability of \textit{whether} to appear in situ, even in multiple Wh-questions, can be accommodated in the present analysis by appealing to the ECP, and by invoking considerations similar to those adduced by Huang (1982) in explaining why the Wh-phrase \textit{why} never occurs in situ. Consider (46) once again. Following proposals by Aoun, Hornstein and Sportiche (1981), assume that at S-structure COMP inherits the index of any Wh-phrase which it dominates. Furthermore, in line with the position that \textit{whether} behaves as other Wh-elements do, assume that if \textit{whether} has not been moved to COMP at S-structure, then it must be so moved at LF. In view of these points, (46) will get the LF representation in (47):

(47) I don't know \( [s \text{ [COMP who, whether}_i] \)

\( [s, [e], \text{ should } [v_p [e] \text{ resign or retire}]] \)
THE SYNTAX OF DISJUNCTION SCOPE

Under the ECP, the traces of both who and whether must be properly governed, and the former is in fact antecedent governed by the c-commanding coindexed COMP. However, the trace of whether is not properly governed in (47). For reasons discussed earlier, e/i is not lexically governed; furthermore, it is not antecedent governed since the coindexed whether in COMP fails to c-command e/i. It follows under the ECP, then, that whether will never appear in a sentence-internal position at S-structure.14

As a final point concerning the movement analysis of whether advanced here, we should take note of a last, rather obvious objection, one based on the observation that whether readily appears in examples like (11a, b) (reproduced below as (48a, b)) containing no instance of or:

(48)a. I know whether John should read fiction
     b. the decision

Since whether has no source disjunction in such cases, it cannot be uniformly analyzed as a [+WH] scopal indicator for or, so the objection might go.

The position that I will take regarding examples such as (48a, b) is that despite surface appearances they are in fact instances of the general structure for disjunction given earlier; specifically, that they have the underlying configuration in (49):

14 It is also the case that whether does not appear in COMP in multiple Wh-questions; consider (ia) below:

(i)a. I don't know whether John said what.

Note that the LF for this example (ib) involves no ECP violation:

(i)b. I don't know [e [COMP what, whether, j, [c]],
     (or not) [s, John said [c]],]

The trace of whether is antecedent governed by COMP, which inherits the index j; moreover, the trace of what is lexically governed by say. Following a number of authors (Aoun, Hornstein and Sportiche, 1981; Lasnik and Saito, 1984), I will attribute the ill-formedness of (ib) to the rule of Quantifier Absorption proposed by Higginbotham and May (1981), which requires multiple Wh-elements in the same COMP to be merged into a single Wh-quantifier. I assume the status of whether as a [+WH] scope indicator, and not a quantifier, prohibits it from undergoing this process. Note that if this is correct then examples like (46) with in situ whether violate both ECP and Q-Absorption, while those like (ia) violate only the latter. We might appeal to the difference to explain why the unacceptability of (46) is appreciably greater than that of (ia).
(49)

\[
\begin{array}{c}
S \\
\downarrow \\
\text{COMP} \\
\downarrow \\
\text{whether} \\
\downarrow \\
\text{or not} \\
\downarrow \\
\cdots
\end{array}
\]

Here \textit{whether} moves to COMP from the CONJ node of a disjoined S, and, for reasons that I do not understand, the phrase \textit{or not} is optional.\textsuperscript{15} According to this view, then, the underlying representations for (48a, b) actually contain the 'hidden' disjunction which surfaces overtly in (50a, b):

\begin{enumerate}
\item[(50)a.] I know \{whether or not John should read fiction
\item[(50)b.] the decision\} whether John should read fiction or not
\end{enumerate}

This proposal brings (48a, b) into line with the analysis of \textit{whether} complements that we have been exploring, and it also makes an interesting prediction. Notice that if \textit{whether} is positioned by movement in such examples, then, in parallel with (41a, b), we would expect to observe 'long distance dependencies' in cases where no overt instance of \textit{or} appears, or when an \textit{or not} phrase shows up. This expectation seems to be justified. Consider example (51) below:

(51) I know whether John claimed that Bill left or not.

This sentence appears to have two distinct readings according to whether the \textit{or not} is read as a constituent of the higher or the lower clause. On the first reading, I know either that John claimed Bill left or else that John didn't claim that Bill left, hence the S' is interpreted as in (52a):

\begin{enumerate}
\item[(52)a.] \(p: p \text{ is true } \land [p = \text{John claim(leave(b))} \lor [p = \neg \text{John claim(leave(b))}]\]
\end{enumerate}

On the second reading, I know either that John claimed Bill left or I know that John claimed that Bill didn't leave, i.e.:

\textsuperscript{15} (49) is an instance of the general structure for disjunctions since the Kleene star allows any finite string of \(\alpha\) categories, including a string consisting of only a single \(\alpha\).
(52)b. \( p: p \) is true & \( [[p = \text{John claim}(\text{leave}(b))] \lor [p = \text{John claim}(\neg \text{leave}(b))]] \)

This ambiguity is predicted under our analysis, since the \( S \) in (51) can have either of the underlying structures in (53a, b) (respectively):

(53)a. \( [s \text{ [COMP whether}_1 e_i, [s \text{ John claimed [that Bill left]] or not}] \)

   b. \( [s \text{ [COMP whether}_1 s \text{ John claimed } [t_i, [e, \text{ Bill left or not}}]]] \)

Consider also example (54):

(54) I know whether John made the claim that Bill left or not.

In contrast with (51), this sentence has only a reading analogous to (52a). No reading corresponding to (52b) appears possible. Again, this result is predicted under the present account since the \( S \) in (54) will have the unique underlying structure in (55a):

(55)a. \( [s \text{ [COMP whether}_1 e_i, [s \text{ John made the claim that Bill left] or not}]] \)

in which the \textit{or not} phrase is a constituent of the higher \( S \). There will be no underlying representation for (54) wherein \textit{or not} is a constituent of the lower \( S \) since this would involve a derivation in which \textit{whether} is extracted from a complex NP, violating Subjacency:

(55)b. \( [s \text{ [COMP whether}_1 \text{ [} t_i, e_i, \text{ Bill left or not}}]]] \)

Hence the structure in (49) appears to have empirical support.

3.3. The Null Indicator \( O \)

Finally, let us consider disjunctions in which the phonologically null element \( O \) is the scope indicator. I assume that this item has the movement privileges of both the overt \([-WH] \text{ either} \) and the overt \([+WH] \text{ whether} \). Thus like the former it can adjoin to \( S \) (or INFL):\(^{16}\)

\(^{16}\) In a recent analysis of parasitic gap phenomena Chomsky (class lectures, fall 1983) has also proposed that empty operators can move through COMP and adjoin to \( S \). This view is advanced to account for parasitic gaps in gerunds, (ia), and clausal complements (ib):

(ia) Who did you visit \( t \) [before \( s \text{ [John’s seeing } e] \)].

   b. Who did you visit \( t \) [after \( s \text{ [John saw } e] \)].

For reasons dealing with the definition of Subjacency, it appears correct to analyze the empty operator binding \( e \) in (ia) as adjoined in QR-like fashion within NP, and the empty operator binding \( e \) in (ib) as occupying the COMP of \( S \).
(56)a.

```
S
  /\  \\
O_i S  \\
   \  \\
    \ / \\
     \ \  \\
      \ \ \\
     CONJ  \\
   /\  /\  \\
  e_i or \  \\
    \    \  \\
     \    \\
      \  \\
       \  \\
       \ \\
       α*
```

Alternatively, like the latter it can move into COMP:

(56)b.

```
S
 /\  \\
COMP S  \\
 /\  /\  \\
O_i \  \  \\
   \    \\
    \  \\
     CONJ  \\
 /\  /\  \\
 e_i or \  \\
   \    \\
    \  \\
     \  \\
      \  \\
       \  \\
       α*
```

These structures differ minimally from (21b) and (40) (respectively). Note that on the basis of (56b) in particular we are led to expect that disjunctions showing no overt indicator in surface form will behave like disjunctions involving *whether* with respect to *or* scope. This is so because, as we have argued, the potential scope for *or* is crucially determined by whether its associated indicator element moves to COMP or adjoins to S. Since O can move to COMP like *whether*, we expect the same range of possible scopes for *or*.

This expectation is borne out by the data. In the discussion of example (3), we noted that in disjunctions with no indicator element *or* can take scope wider than the minimal tensed S which contains it. This is analogous to disjunctions involving *whether* (but not those involving *either*).
THE SYNTAX OF DISJUNCTION SCOPE

Furthermore, disjunctions with no scope indicator show the same sensitivity to syntactic islands that we observed in connection with whether. Consider (57a, b) below:

(57a) John maintains that Bill should resign or retire.
   b. John maintains the claim that Bill should resign or retire.

Example (57a) has both of the readings in (58a, b):

(58a) John maintains [SHOULD(resign(b)) v SHOULD(retire(b))]
   b. John maintains [SHOULD(resign(b)) v
      John maintains [SHOULD(retire(b))]]

That is, (57a) can be understood such that John maintains that Bill should do either of two things – resign or retire. This is reading (58a). Alternatively, (57a) can be understood such that either John maintains that Bill should resign, or else he maintains that Bill should retire. This is the “... but I don’t know which” reading, (58b). On the other hand (38b) is not similarly ambiguous. According to my judgments, this sentence only has reading (58a), with or taking narrow scope.

   Similarly, consider example (59):

(59) John knows who should resign or retire.

Again in the absence of other considerations one might expect the two readings for the interrogative complement given in (60a, b):

(60a) John knows p
   where p is true & ∃x[p = SHOULD(resign(x)) v
   SHOULD(retire(x))]
   b. [John knows p] v [John knows q]
      where p is true & ∃x[p = SHOULD(resign(x))], and
      where q is true & ∃x[q = SHOULD(retire(x))]

On the reading in (60a) disjunction has narrow scope. Accordingly, John knows who should resign or retire if he knows all true propositions of the form ‘x should resign or retire’, where x is some individual. On the reading in (60b) disjunction has wide scope. John knows who should resign or retire if he knows all true propositions of the form ‘x should resign’, or else he knows all true propositions of the form ‘x should retire’, where again x is some person. By my intuitions, the reading in (60b), which would be brought out by the “... but I don’t know which” continuation, is at best quite marginal for (59). Thus, like whether disjunctions, O disjunctions appear to show scope confinements by complex noun phrases and Wh-islands.
3.3.1. *O in Interrogative Complements*

Beyond the similarities in scope possibilities, disjunctions with *whether* and *O* may be analyzed as having another interesting behavioral parallel, viz.: the ability to move into an interrogative COMP. Consider examples (61a, b) below, which contain interrogative complements in which *whether* and *if* appear together with an overt instance of *or*:

(61a).

b. Bill doesn't know [if *whether* John should resign or retire]

The first of these examples exhibits the by-now familiar ambiguity in its complement clause with respect to scope of disjunction. Thus (61a) can be true if what Bill doesn't know is either that John should resign or retire, or else that John should not resign or retire (narrow *or*). Alternatively, (61a) can be true if what Bill doesn't know is either that John should resign, or else that John should retire (wide *or*). Perhaps surprisingly, however, (61b) shows the identical ambiguity. According to my intuitions, the *if* complement can be also read with *or* taking wide or narrow scope.

This similarity in interpretational possibilities between *whether* and *if* seems to extend to other more complex examples as well. Note that in (61c), which is parallel to our earlier example (15a), the same possibility of a wide scope *or* reading arises:

(61c). I don't know if Bill should ask John to resign or retire.

Here again, the *or* which conjoins VPs in the most deeply embedded clause can be understood as the 'or' which appears in the disjunctively specified set of propositions semantically associated with the *if* complement.

The ambiguity in (61b, c) is quite unexpected at first blush. The element *if* does not seem plausibly analyzed as a scopal indicator on a par with *either* or *whether*. If has no morphological or historical connection with disjunction comparable to that of *whether*; there is no evidence that I am aware of that *if* had the meaning 'which of either A or B', &c. Hence apart from the semantic parallels with *whether* in examples like (61b, c), there is little motivation for an analysis in which *if* arises in the structure [VP *if* or VP VP].

What I propose regarding examples like (61b, c) is that the wide scope *or* reading is produced not by movement of *if*, but by the movement of *O* into an interrogative COMP, where *if* is a base-generated interrogative
complementizer.\textsuperscript{17} Thus on this analysis the wide scope or readings of (61a, b), for example, would have quite similar underlying syntactic representations for their $\hat{S}$ complements:

\begin{equation}
(62) \quad [s \text{[[COMP} O_i, \text{if}]]], \text{if} \exists s \text{John should [VP [e], resign or retire]]}
\end{equation}

The semantics for this structure is identical in the two cases, with if/[[+WH]] presumably encoding the interrogative status of the complement and O/whether marking the scope of disjunction in the associated set of propositions.

The view of if complements proposed above leads us to analyze examples like (63a), in which no overt instance of disjunction occurs, in parallel with the whether examples in (48):

(63a). I don’t know [$s$ if John left]

That is, we may take $\hat{S}$ to have an underlying structure containing a degenerate case of $S$ disjunction:

\begin{equation}
(63)b. \quad [s \text{[[COMP} O_i, \text{if}]]\exists s \text{John left]]]
\end{equation}

where the null indicator moves to a [+WH] COMP.

This analysis of (63a) in turn leads us to expect long distance dependencies similar to those observed in connection with (51) above. Thus consider (64):

(64) I don’t know [$s$ if John claimed that Bill left or not]

We predict, correctly it seems, that this example will be ambiguous between a reading where what I don’t know is either that John claimed that Bill left or else that John didn’t claim that Bill left (cf. (52a)), and a reading where what I don’t know is either that John claimed that Bill left or else that John claimed that Bill didn’t leave (cf. (52b)). These two readings correspond (respectively) to the two possible structures for the $\hat{S}$ in (64) shown in (65a, b):

\begin{equation}
(65) \quad \text{I don’t know } [s \text{ if John claimed that Bill left or not]}
\end{equation}

\begin{equation}
(66) \quad \text{I don’t know } [s \text{ if John didn’t claim that Bill left or not]}
\end{equation}

\textsuperscript{17} Bolinger (1978) examines a variety of data involving interrogatives in whether and if and concludes that the two elements should be analyzed differently – the former as a Wh-word and the latter as (essentially) a complementizer “... if appears to be the same kind of embedder of questions as that is with statements. In both types of sentence, if and that are opposed to the Wh-words, including whether, which are indifferent to the quotative-nonquotative contrast (p. 95).” This conclusion seems to be compatible with the analysis of whether and if presented here.
(65)a. \[ \{ \text{COMP} \, O, \text{if} \} \, e, \{ \text{S} \, \text{John claimed} \, [\text{that} \, \text{Bill left}] \, \text{or} \, \text{not} \} \]

b. \[ \{ \text{COMP} \, O, \text{if} \} \, \{ \text{S} \, \text{John claimed} \, [t_1, \{ e, \text{Bill left} \, \text{or} \, \text{not} \}] \} \]

Moreover, we correctly predict that examples like (66) will show no ambiguity comparable to that in (64):

(66) I don’t know \[ \{ \text{s} \, \text{if} \, \text{John made the claim} \, \text{that} \, \text{Bill left} \, \text{or} \, \text{not} \}. \]

Movement of \( O \) from the lowest \( S \) would involve a Subjacency violation (compare (55b)):

(67)a. \[ \{ \text{COMP} \, O, \text{if} \} \, \{ \text{S} \, \text{John made} \, \{ \text{NP} \, \text{the} \, \text{claim} \} \, \text{or} \, \text{not} \} \]

b. \[ \{ \text{S} \, t_1, \{ \text{e}, \text{Bill left} \, \text{or} \, \text{not} \} \} \]

Hence the \( \tilde{S} \) in (66) has only an underlying representation in which \( O \) moves from the higher \( S \):

(67)b. \[ \{ \text{COMP} \, O, \text{if} \} \, \{ \text{S} \, \text{John made} \, \{ \text{NP} \, \text{the} \, \text{claim} \} \, \text{or} \, \text{not} \} \]

In brief, then, \textit{whether} and \( O \) appear to share the property of being able to move into a \([+\text{WH}] \, \text{COMP} \) in interrogative complements.\(^{18}\)

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\(^{18}\) Movement of the null indicator seems to be involved in matrix as well as indirect alternative questions, although there are some complexities. Examples like (ia, b) below exhibit by-now familiar ambiguities with respect to the scope of the disjunction appearing in the matrix and embedded VPs respectively:

(iia). Did John resign or retire?

b. Did John want Bill to resign or retire?

Under the present analysis, the ambiguity of (ib), for example, would be captured by assigning it the two distinct underlying structures in (iia, b):

(iiia). \[ \{ \text{COMP} \, O, [+\text{WH}] \, e, \{ \text{or} \, \text{not} \} \} \, \{ \text{S} \, \text{John want} \, \{ \text{S} \, \text{Bill to} \, \{ \text{VP} \, O \, \text{or} \, \{ \text{resign} \, \text{[retire]]} \} \} \}

b. \[ \{ \text{COMP} \, O, [+\text{WH}] \, O \, \{ \text{or} \, \text{not} \} \} \, \{ \text{S} \, \text{John want} \, \{ \text{S} \, \text{Bill to} \, \{ \text{VP} \, e_1 \, \text{or} \, \{ \text{resign} \, \text{[retire]]} \} \}

However matrix alternative questions analogous to (51) and (64) – alternative questions involving disjoined \( S \)s – do not show comparable ambiguities. According to my judgments (iiiia) simply has no reading corresponding to the representation in (iiib) – a representation generated under the account proposed here:

(iiiia). Did John claim that Bill left or not?

b. \[ \{ \text{COMP} \, O, [+\text{WH}] \, \{ \text{S} \, \text{John claim} \, \{ t_1, \{ e_1, \text{Bill left or not} \} \} \}

I have no explanation for this apparent divergence between matrix and embedded alternative questions.
3.3.2.

As a final note concerning O disjunctions I might point out that under the analysis advanced above we are now able to understand why examples like (68a) are ambiguous between a wide and narrow scope reading for or while examples like (68b) are not:

(68)a. I know {whether
b. whether or not} Bill should resign or retire.

Given earlier remarks, the S complement in (68a) can be analyzed as having either of the underlying structures below:

(69)a. [S [COMP whether,] S Bill should [VP [e], resign or retire]]
   b. [S [COMP whether,] [e], (or not)
      [S O, S Bill should [VP [e], resign or retire]]]

That is, in (68a) the whether can be taken as arising in the disjunction which appears overtly (analysis (69a)). This will correspond to a wide scope reading for the disjunction. Alternatively, whether can be taken as arising in a hidden or not disjunction, where this latter phrase is simply not realized in surface form (analysis (69b)). In the latter case, the overt or will have its own O scope indicator – here adjoined in S, and hence the overt disjunction will not get wide scope. On the other hand, in (68b) the overt occurrence of or not compels the analysis in (69b). Under our proposals or not must be associated with a disjunction scope indicator in COMP, and since whether is the only possible candidate in (68b), (69b) is the only possible analysis of this sentence. Accordingly, or must get narrow scope in examples like (68b) where the phrase whether or not also occurs.

4. The semantics of wide-scope or

In examining or scope phenomena we have thus far confined ourselves to explanations involving syntactic principles and conditions (ECP, Subjacency, &c.); however in this section I will consider how our syntactic analysis may be connected with an explicit semantics and, in particular, with the model-theoretic semantics for disjunction proposed by Rooth
and Partee. In developing this connection I shall assume certain aspects of their framework for the analysis of scope and quantification. In particular, I will adopt a compositional semantics, with interpretation defined over LF structures in which the scope of quantified elements with respect to intensional verbs and operators is syntactically represented. Moreover, I will adopt a theory of generalized quantifiers along the lines of Montague (1974), in which quantified expressions may be interpreted in situ, and need not undergo obligatory raising in logical form. On this view, as in Higginbotham (1980) and May (1977), LF has the character of a scopally disambiguated language.

The specific proposal that I have in mind is most easily motivated by examining a certain puzzle which arises in connection with examples like (70) below (R & P's (22b)):

(70) If Mary is swimming or dancing, then Sue is.

This sentence has two distinct readings, which are informally represented in (71a,b):

(71a) [swim(m) v dance(m)] → [swim(s) v dance(s)].

b. [swim(m) → swim(s)] & [dance(m) → dance(s)].

On the interpretation in (71a), if Mary is engaged in either swimming or dancing, then Sue is too, but their respective activities needn't be the same. Mary could be swimming while Sue is dancing, etc. Contrastingly, on the interpretation in (71b) Mary and Sue must both be engaged in the same activity — again either swimming or dancing. Under this second interpretation the VP in the consequent clause is understood, essentially, as 'bound' by the disjunctive VP in the antecedent phrase.

Interestingly, the availability of the second, 'bound' reading in examples like (70) can be influenced by the presence of either. Compare (70) with (72a,b):

(72a) If Mary is either swimming or dancing, then Sue is.

b. ??If either Mary is swimming or dancing, then Sue is.

According to my intuitions, (72a) and (to the extent that it's acceptable) (72b) have the reading in (71a), where if Mary is engaged in one of two

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19 In what follows I will only be concerned with the semantics of wide-scope disjunction as explicated by Rooth and Partee (1981). The semantics of disjunction where or is not assigned sentence scope is presumably to be handled by the cross-categorial or operator introduced in R & P (1981). I will not be concerned with the latter here, and hence will include no discussion of how, for example, the reading of (1) represented in (2a) is to be treated formally. The reader is referred to R & P (1981) for details.
activities then so is Sue, although not necessarily the same one. However neither seems to have a reading equivalent to (71b). In my judgment, there simply is no ‘bound VP’ interpretation available for these examples – no reading which is incompatible with Mary’s and Sue’s activities being different.

The results in (72) are surprising and rather disturbing. As we recall, the chief difference between disjunctions with either vs. or is that in the former case or scope is confined to the minimal S in which the indicator originates. Hence the disappearance of the ‘bound VP’ reading in (72) would seem to imply that this reading arises from a disjunction with scope wider than the S of the antecedent clause. However, the logical representation for the bound VP reading in (71b) not only contains no wide scope or, it contains no instance of disjunction at all. Instead what we appear to get, in effect, is a ‘wide scope and’. This suggests that in order to bring (70) and (72) under our analysis we might be compelled to somehow convert the disjunction which appears in the conditional clause to a conjunction; an unpleasant prospect.

Fortunately there is an alternative to this move based on the semantic analysis of or scope presented in R & P (1982). This analysis derives from the theory of indefinites developed by Kamp (1981) and Heim (1982). In brief, and much simplified terms, the central proposal is that disjunctions be analyzed as introducing free variables whose values are constrained according to a condition determined by the or phrase. To illustrate what is intended here, consider the example in (73) below:

(73) John hopes Mary is swimming or dancing.

In the Montague Grammar framework which R & P adopt, basic sentence constituents are rendered as expressions of a higher order intensional logic (IL), and are then assembled together to yield the translations of larger phrases. Under their proposal, the disjunctive VP of the embedded clause receives the IL translation in (74a):

(74a) $\lambda x[P_i(x) \& [P_i = '\text{swim'} \vee P_i = '\text{dance'}]]$

where $P_i$ is a free variable over properties of individuals. Thus swimming or dancing is translated as the set of individuals $x$ possessing the property $P_i$, where the value of $P_i$ is restricted to either the property of swimming or the property of dancing. This expression then combines with the subject noun phrase Mary to yield the interpretation of the embedded (74b):

(74b) $P_i(m) \& [P_i = '\text{swim'} \vee P_i = '\text{dance'}]$. 
That is, Mary has the property $P_1$, where the latter is the property of swimming or the property of dancing.

The free property variable contained in (74b) is now subject to binding in a number of ways and these yield the different scopal readings for or in (73). One way $P_1$ may be bound is through an existential quantification associated with the intensional verb like hope. In combining with the latter, an existential quantifier over $P_1$ is introduced giving the translation for the matrix VP hope Mary is swimming or dancing shown in (75a):

(75a). $\text{hope}'(\forall P_1[P_1(m) \& (P_1 = \text{'swim'} \lor P_1 = \text{'dance'})]).

This verb phrase then combines with the matrix subject John to yield the translation of (73) shown in (75b):

(75b). $\text{hope}'(j, \forall P_1[P_1(m) \& (P_1 = \text{'swim'} \lor P_1 = \text{'dance'})]).

This expression represents the narrow scope reading of disjunction. John hopes that Mary is engaged in either of two activities, swimming or dancing.

A second way of binding $P_1$ is through a discourse level principle of 'existential closure'. Under this option the variable is left free at the point where the embedded clause combines with hope. The matrix VP once again combines with John and the disjunctive condition, $[P_1 = \text{'swim'} \lor P_1 = \text{'dance'}]$, is attached at the matrix S level. This gives us (76a):

(76a). $\text{hope}'(j, \forall P_1(m)) \& (P_1 = \text{'swim'} \lor P_1 = \text{'dance'}).

At this point an existential quantifier over properties is simply introduced as an option of discourse, binding $P_1$ and yielding (76b):

(76b). $\exists P_1[\text{hope}'(j, \forall P_1(m)) \& (P_1 = \text{'swim'} \lor P_1 = \text{'dance'})]$.

This expression represents the wide scope reading of disjunction in (73). John hopes that Mary is engaged in swimming or else he hopes that she is dancing, the speaker may not know which.

A third way for $P_1$ to be bound is through an adverb of quantification. This is the option which R & P assume to underlie the 'bound VP' reading of (70). The sentence Mary is swimming or dancing in the conditional clause is given a translation identical to (74b):

(77a). $P_1(m) \& (P_1 = \text{'swim'} \lor P_1 = \text{'dance'})$.

The 'missing VP' in the consequent clause is also translated by $P_1$, hence the sentence Sue is receives the IL rendering in (77b):

(77b). $P_1(s)$.

Now adopting proposals by Heim (1982), R & P assume that conditionals like (70) contain a 'hidden' adverb of quantification – in effect, a hidden
instance of *always* in the matrix S. Following Lewis (1975), they analyze such adverbs as 'unselective quantifiers' which bind all free variables in the sentence in which they occur. In this case, the adverb universally binds the occurrences of $P_i$ in both the conditional and consequent clauses when the two are put together syntactically. As a result (70) receives the translation in (77c):

(77c) $\forall P_i[[P_i(m) \& [P_i = 'swim' \lor P_i = 'dance']]] \rightarrow P_i(s)]$.

This expression entails (71b), the 'bound VP' reading for this sentence which was discussed earlier.

4.1. Scope-marking and Variable Binding

As R & P show, this analysis employing free variables delimited by a disjunctive condition can be extended to handle or scope phenomena where any categories are conjoined. Hence the account achieves considerable generality. Notice that it also gives content to our earlier claim that the scope of wide scope *or* is clausal. As we observe in (75a), (76b) and (77c), under the R & P semantics assignment of scope to a wide scope disjunction involves binding a variable in an open sentence.

I would like to suggest that the semantics sketched above can be integrated with our syntactic results in a simple and intuitively satisfying way. The basic idea is that the scope indicators *either, whether* and *O* be be viewed as marking the point in syntactic structure where binding of the free variable introduced by a disjunction must occur. More concretely, the proposal is that in (78) below, the presence of SI is to be understood as requiring that the disjunction variable be bound at the point where the interpretation of S (or S if SI is in COMP) is semantically composed with that of $\alpha$ under $\gamma$:

(78)
In the case where $\alpha$ is an unselective quantifier $Q$ binding all free variables within its scope, the requirement posed by SI will be straightforwardly met. $Q$ will bind the disjunction variable. In the case where $\alpha$ is what Heim (1982) calls an “operator” – essentially, a quantifier over possible worlds such as a modal adverb or intensional verb, or else a negation – then I assume that an unselective existential quantifier may be optionally supplied as a binder at the point where the semantic values of $\alpha$ and $S$ are composed. That is, where $\alpha$ is an operator and $\alpha'$ and $S'$ are the interpretations of $\alpha$ and $S$ (respectively), then I take the interpretation of $\gamma$ to be (optionally) $\alpha'(\exists S')$. (This simply echoes what R & P propose in regard to (75a).) Finally, in the case where $S$ is the matrix clause, and hence no $\alpha$ or $\gamma$ is present, then I assume (again following Heim and R & P) that an unselective existential quantifier may be freely introduced.

The relevance of these proposals to our results concerning the interaction of scope indicators and disjunction is not hard to appreciate. Consider, for instance, examples (59a, b):

(79a) John hopes Mary is swimming or dancing.
(79b) John hopes Mary is either swimming or dancing.

Sentence (79a) has both narrow and wide scope or readings, while (79b) has only the former. Given our view of scope indicators this will follow immediately. The either which occurs within VP in (79b) may move at LF to an S-adjoined position in the lower clause, but no further, given the tensed S boundary. Because of this the free property variable introduced by *swimming or dancing* will necessarily get bound by an unselective existential quantifier within the scope of *hope*, an intensional operator. Hence (79b) will have only the reading in (75b). On the other hand, (79a) can have underlying structures in which the null scope indicator $O$ is either occupying the COMP of the embedded $S$, or is adjoined to the matrix $S$. Accordingly, it will have readings in which existential closure occurs both inside and outside the scope of *hope*. That is, (79a) will have both wide and narrow scope interpretations for disjunction. Thus our proposal is in accord with the difference in readings available to (79a, b).

The analysis put forward here also sheds light, I believe, on the problematic examples in (70) and (72) which motivated this discussion. Consider (72a), for instance. Either is the scope indicator here, and so, recalling earlier remarks, we know that the highest possible attachment for *either* in the LF for (72a) will be the S node of the conditional clause:
Under our proposals the position of *either* requires that the free property variable associated with *swimming or dancing* be bound at the point where the interpretation of the subordinate $\bar{S}$ is calculated. Suppose we assume that *if* is a member of the class of operators. Then an existential quantifier will be introduced when the interpretations of $S$ and COMP are composed. Since we know from our discussion of (77a–c) that the possibility of a bound VP reading depends precisely on the option of leaving the property variable free until the matrix $S$ it follows that no bound VP interpretation will be available for (72a). Suppose on the other hand that *if* is not an operator. Then the free property variable will simply fail to be bound at all in the domain required by its scope indicator. We may assume that in such cases the interpretation of (80) will block. Under either assumption about *if* it will thus correctly follow that (72a) has no bound VP reading.20

Consider now (81), in which a bound VP reading does occur. Here $O$ is the scope indicator for disjunction. Again recalling earlier discussion we know that this element can move at least as far as the COMP of the conditional clause (although presumably no further in view of Subjacency):

20 In fact it seems reasonable to suppose that *if* is not an operator. Under the semantics for conditionals adopted by Kamp (1981) and Heim (1982), it lacks semantic content altogether. Furthermore note that if we make this assumption we can account for the marginality of (72b), which has only the LF in (80).
(81)

\[
\begin{array}{c}
\text{S} \\
\text{COMP} \\
O_i \\
\text{if} \\
\text{S} \\
\text{Sue is } [\nu_F e] \\
\text{Mary is } [\nu_F [e], \text{swimming or dancing}] \\
\end{array}
\]

Again, under our proposal the position of O requires that the free property variable be bound at the point where the interpretation of the conditional clause is combined with that of the consequent. Since the interpretation of a hidden universal adverb of quantification is entered at exactly this point (recall (77c)), it correctly follows that in this structure a bound VP reading will be available.

Isabelle Haik has pointed out to me (p.c.) that this analysis predicts that a bound VP reading will be available in examples involving ‘VP Deletion’ in which the empty VP occurs within the scope of either. This prediction appears to be correct. Consider (82a) below:

(82)a. Mary either stole or dropped the apples that Sue did.

Here the ‘deleted’ VP associated with did occurs in a relative clause modifying the object NP. Let us assume that (82a) may be interpreted as containing a hidden quantificational adverb with roughly the meaning ‘in every case’, and let us assume that either adjoins to INFL at LF. The logical form for this sentence will be as in (82b):

(82)b.

\[
\begin{array}{c}
\text{S} \\
\text{NP} \\
\text{Mary} \\
\text{INFL} \\
\text{V} \\
\text{either,} \\
\text{CONJ} \\
\epsilon_i \\
\text{or} \\
\text{stole} \\
\text{V} \\
\text{dropped} \\
\text{V} \\
\text{NP} \\
\text{the apples} \\
\text{that Sue did,} \\
\end{array}
\]
A straightforward extension of our proposals to cases like these, where SI is attached to INFL, would assume that the free variable over transitive verb intensions associated with sole or dropped must be bound at the point where the interpretation of INFL is combined with that of the other elements of S. Since the interpretation of the universal adverb is entered at this point, and since this quantifier will also have scope over the proform did in the object noun phrase, we would predict that (82a) may have a reading in which Mary stole the apples that Sue stole, and Mary dropped the apples that Sue dropped. Such a reading does indeed seem to be available.

In a similar vein consider (83):

(83) [Mary was \text{[VP either swimming or dancing] when Sue was}]]

This example contains a temporal adverbial clause, whose highest possible attachment I assume to be daughter of S, as shown. Again assume (83) to contain a hidden quantificational adverb with universal force. If either adjoins to INFL at LF, then the free property variable introduced by the disjunction may be bound by the universal adverb at the point where the interpretations of INFL, NP and the when-clause are put together. This universal quantifier may also bind the pro-VP contained within the when-clause, hence we predict – again correctly according to my intuitions – that (83) will have a reading in which Mary was swimming when Sue was swimming and Mary was dancing when Sue was dancing.

4.2. Negation

The semantics for disjunction adopted here suggests an approach to some facts noted earlier regarding the interaction of negation and or scope. Recall examples (9) and (10a) (reproduced below).

(9) (10a) Mary isn’t looking for  a maid or a cook.

We observed that it was quite difficult to construe disjunction as taking scope wider than the negation expressed by the auxiliary – i.e., to understand these sentences as meaning ‘Mary isn’t looking for a maid or she isn’t looking for a cook’. This limitation was correlated with the fact that either cannot appear to the left of a negation having scope over its associated or:

(10)b. ??Mary either isn’t looking for a maid or a cook.
   c. ??Either Mary isn’t looking for a maid or a cook.
Interestingly, indefinites seem to show analogous scope confinement in similar environments. Consider (84a, b):

(84)a. Mary isn’t looking for a maid.
b. John doesn’t need a car.

Here, as in (9) and (10), a reading with the indefinite taking scope over the negation seems highly marginal.

As I have indicated, the semantics for disjunction proposed by R & P closely follows the semantics for indefinites developed by Kamp (1981) and Heim (1982), in which indefinites are also interpreted via free variables whose values are restricted by a descriptive condition. In view of the parallels between (9), (10) and (84), then, it seems plausible to suppose that the factors which limit the scope of disjunction are semantic ones bearing on the binding of free variables.

The proposal that I will adopt again borrows heavily from Heim (1982). Assume that in certain contexts – e.g., those containing negation and an intensional operator – interpretation of negation involves obligatory introduction of an unselective existential quantifier. The result will be that in such contexts any free variable, hence all disjunctions and indefinites, will get bound within the scope of negation. To see what this involves for disjunction scope indicators, consider the schematic structures in (85a, b), where in each case SI occupies a position where it has scope over negation:

(85)a.}

\[
\begin{array}{c}
S \\
\quad S \\
\quad \quad NP \\
\quad \quad\quad INFL \\
\quad \quad\quad\quad INFL \\
\quad \quad\quad\quad\quad VP \\
\quad \quad\quad\quad\quad\quad NEG \\
\quad \quad\quad\quad\quad\quad\quad\quad\quad \ldots \beta \ldots \\
\quad \quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad e_i \text{ or } \beta^x
\end{array}
\]

21 That the position of SI in (85b) involves scope over NEG is well-known from examples with adverbs. Thus John often doesn’t run, in which often occupies the same site, cannot be read with negation taking scope over the adverb.
Without giving precise interpretation rules, it is clear that the position of SI outside the scope of NEG will insure that the free variable associated with the disjunction is bound (by an unselective existential quantifier) prior to the point at which SI is reached in the interpretation of S. It seems reasonable to assume that such situations might be ruled out under some version of the Principle of Full Interpretation discussed in Chomsky (1984). According to this principle, every element of syntactic structure must be 'licensed' in an appropriate way, and for scope indicators the relevant way is clearly that they in fact mark the scope of their associated construction. Since this is precisely what SI fails to do in (85), such structures are accordingly bad.

4.3. Conjunction

As a final point in favor of the proposal that either, whether and O are scope indicators with the semantics discussed above, I would like to suggest that this view illuminates a subtle difference between the syntax of disjunction and that of conjunction. Earlier we noted that the two items either and both have a superficially similar status as optional parts of 'discontinuous constituents' of disjunction and conjunction, respectively. However we also noted some important differences in their syntactic distribution. Recall that unlike either, both does not occur happily outside its associated conjoined constituent:

(86)a. John is [both laughing and crying]
    b. John is [either laughing or crying]

(87)a. ?*John both is [laughing and crying]
    b. John either is [laughing or crying]
(88)a. *Both John is laughing and crying.
   b. Either John is laughing or crying.

Furthermore, both can occur at the rightmost margin of a conjunction, while either cannot:

(89)a. [John and Bill both] are going.
   b. *[John or Bill either] is going.

(90)a. ?John [laughed and cried both]
   (Acceptable until recently and still so in some dialects.)
   b. *John [laughed or cried either]

Finally, both undergoes Q-float in parallel with quantifier phrases (QPs) such as each and all while either does not:

(91)a. i. \( \{ \text{Both} \} \) of the men can go.
     \( \{ \text{Each} \} \)
     \( \{ \text{All} \} \)
   ii. The men can \( \{ \text{both} \} \) go.
     \( \{ \text{each} \} \)
     \( \{ \text{all} \} \)

   b. i. Either of the men can go.
     \( \{ \text{each} \} \)
   ii. *The men can either go.

Thus despite initial impressions, both and either do not have a similar syntactic status. And indeed no element associated with conjunction exhibits behavior parallel to that of either. Since most syntactic analyses treat disjunction and conjunction in completely parallel fashion, this difference is a puzzling one, and we are led to ask why the parallelism fails on this point?

A plausible explanation for these facts lies in an important difference between disjunction and conjunction predicted under R & P's semantics. Consider example (92) (R & P's (21)):

(92) Bill hopes that someone will hire a maid and a cook.

R & P point out that if and were allowed to take wide scope like or, then we would expect a reading of (92) as in (93) according to which Bill hopes that some individual will hire a maid and Bill hopes that some individual (not necessarily the same one will hire a cook; informally:

(93) Bill hopes (\( \exists x [\text{hire}(x, \text{a maid})] \)) &
     Bill hopes (\( \exists y [\text{hire}(y, \text{a cook})] \))

However in fact, (92) simply does not seem to have such an inter-
pretation. Apparently, the only reading available with respect to conjunction is one in which and is read narrowly:

(94) Bill hopes \( (\exists x [\text{hire}(x, \text{a maid}) \land \text{hire}(x, \text{a cook})]) \)

According to (94), Bill hopes that some individual \( x \) will hire a maid and a cook.

R & P observe that this interpretive asymmetry makes sense given their semantic analysis of or scope, for the latter will not be extensible to conjunction in the general case. To see this, suppose we try to mimic the analysis of or by letting conjunctions translate with a free variable whose value is restricted by the and phrase. Let us attempt to treat (95) along such lines:

(95) John hopes that Mary is swimming and dancing.

In parallel with (74a), we would presumably give the conjunctive verb phrase swimming and dancing an IL translation as in (96):

(96) \( \lambda x [P_i(x) \land [P_i = \text{'swim'} \land P_i = \text{'dance'}]] \)

where, again, \( P_i \) is a free variable over properties of individuals, but where the value of \( P_i \) is now restricted to being the property of swimming and the property of dancing. However, (96) is simply a contradiction on any plausible interpretation of English, for under any such interpretation the property of swimming and the property of dancing will be nonidentical. Conjunctive specification of the free variable will in general result in contradictions of this kind; hence the treatment of or does not extend to and. R & P suggest that this, then, is the reason why conjunction does not take scope in English, i.e., because the only way for it to do so would be along lines parallel to or, but this is ruled out by the semantics.\(^{22}\)

Now if R & P's conclusions are correct regarding the difference between disjunction and conjunction with respect to scope, they will have immediate consequences under the view of scope indicators suggested above. For if either and whether are scope indicators and if indeed conjunction does not take scope, then clearly there should be no element associated with conjunction which exhibits behavior parallel to that observed with either or whether, since this behavior derives precisely from their scope indicator status. As we have seen, this expectation appears to be correct.

\(^{22}\) It is to be emphasized that contradiction is a general, but not universal result. As R & P note, conjunctive conditions involving co-intensive items will not yield a contradiction (e.g., in a conjunction of the proper names Cicero and Tully).
5. Conclusion

The account of disjunction proposed above is an interesting one, I believe, not simply because a principled account has been given of a certain collection of data, but also because the relation between the syntactic and semantic analyses is an intuitively satisfying one. Under the account argued for here the syntactic properties of elements such as either and whether are almost entirely predictable given three components of information: (i) the meaning of disjunction as explicated by Rooth and Partee (1982); (ii) a number of general principles and conditions, and (iii) certain very simple lexical facts such as the fact that either is [-WH], while whether is [+WH]. In view of the first component we know that disjunction takes scope through binding of a free variable. The second component presumably gives us that scope is syntactically represented, that scope assignment involves movement to an A position, that the trace of this movement is subject to ECP, that the domain of this movement is bounded by Subjacency, &c. Finally, given either and whether as scope indicators, the third component entails that the former adjoins to S, and so marks scope within the minimal sentence containing its associated disjunction, while the latter moves to COMP, and so may mark scope in broader domains.

From the standpoint of language acquisition these represent promising results, particularly when considered with reference to recent thinking in the philosophy of mind. Suppose we assume, following Fodor (1983), that certain meanings or concepts — perhaps a large number of them — are given to the language learner as a part of universal biological endowment, and that the task of acquiring these meanings is essentially one of ‘identification’, i.e., of matching concepts with morphemes from the spoken environment. The meanings of basic logical connectives such as and, or, if are plausible candidates for membership in this universally available class. Then adopting the semantics of disjunction discussed above, the language learner will know that or takes scope, and that he or she may tacitly expect scope markers. The task then reduces essentially to identifying such markers in the stock of morphemes encountered, of picking out either and whether as the relevant items, or of postulating their null counterparts in languages where phonetically realized markers are lacking. Once this identification is made, the syntactic properties of either and whether then follow immediately, as we have seen. Correlatively, given our results concerning conjunction, the language learner will also know that and does not take scope, and hence that no such markers are to be expected or hypothesized. Thus he or she would tacitly
know that both is not and could not be a scope indicator, and hence must
be assigned some other syntactic status, say, quantifier phrase. If this
general picture is correct, therefore, we appear to move toward a
genuinely explanatory account of disjunction.

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