INTERDISCIPLINARY APPROACHES TO LANGUAGE

Essays in Honor of S.-Y. Kuroda

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(24) d. ?They must have both of them been being followed.

e. ??They must have been both of them being followed.

One can imagine various ways in which the differences in bonding strength could have arisen, but why shouldn't all words have equal ranges within the auxiliary? What does English gain from allowing *all* a wider range than *ever*? Why shouldn't *ever* be able to appear anywhere in the auxiliary? Alternatively, why should *any* element be able to occur in more than one place? Why do these words need to be able to appear at various places in the auxiliary?

Even assuming that the basic claim I am advancing here can hold up, all teleological questions remain wide open.

And these can be not answered now.

NOTE

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And to Charlie Pyle, for being, though there, very here.

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EXTRAPOSITION AND PARASITIC GAPS*

1. INTRODUCTION

Since Taraldsen (1981), Engdahl (1983), and Chomsky (1982), the "parasitic gap construction" has been discussed extensively in the literature. A typical example of this "construction" is shown in (1).

(1) Which articles$_i$ [$_{IP}$ did you [$_{VP}$ file t_i] without reading [e]$_i$]?

In this example, t_i is the trace produced by the *wh*-movement of *which articles* and [e]$_i$ is the parasitic gap.

The following generalization concerning the distribution of parasitic gaps is found in the works cited above:[1]

(2) A parasitic gap is licensed by a variable that does not c-command it.

(2) states that a parasitic gap is allowed only when there is a *wh*-trace (variable) elsewhere in the sentence. Examples such as (3) are in fact ungrammatical.

(3) *[$_{IP}$ John [$_{VP}$ filed the articles$_i$] without reading [e]$_i$].

(2) states further that the licensing *wh*-trace cannot c-command the parasitic gap. This generalization, which is exemplified by (4), is called the 'anti-c-command requirement on parasitic gaps.'

(4) *Who$_i$ [$_{IP}$ t_i [$_{VP}$ expected Bill to send a picture of [e]$_i$]]?

It is pointed out in Engdahl (1984) that there are some examples that cast doubt on the anti-c-command requirement on parasitic gaps. (5), from Chomsky (1986), represents one group of such examples:[2]

(5) Which men$_i$ did the police warn t_i [$_{CP}$ that they were about to arrest [e]$_i$]?

In (5), the *wh*-trace in the matrix object position seems to c-command the parasitic gap within the complement CP. Yet, the example clearly does not have the ungrammatical status of (4). Examples such as the following, also discussed in Engdahl (1984), seem to indicate that the matrix object in fact c-commands the parasitic gap in (5).

(6) *Which man$_i$ did the police warn him$_i$ [$_{CP}$ that they were about to arrest t_i]?

If (6) is an instance of strong crossover, as is evidently the case, then apparently *him*$_i$ c-commands t_i in this example.[3] But then, it is only natural to suppose that t_i c-commands [e]$_i$ in (5). The following example leads us to the same conclusion:

(7) *The police warned him$_i$ [$_{CP}$ that they were about to arrest John$_i$].

If (7) is to be ruled out by Condition (C) of the Binding Theory, then the matrix object must c-command the embedded object in this example, and consequently, also in (5).[4]

On the other hand, it is suggested in Chomsky (1986, p. 62) that in examples such as (5), the complement CP is moved rightward, i.e., extraposed, to a position outside the c-command domain of the matrix object.[5] According to this hypothesis, the structure of (5) is as in (8).[6]

(8) Which men$_i$ did the police [$_{VP}$ warn t_i t_j] [$_{CP}$ that they were about to arrest [e]$_i$]$_j$?

If this hypothesis is correct, the grammaticality of (5) is clearly consistent with the anti-c-command requirement on parasitic gaps. Safir (1987) discusses the interaction of the anti-c-command requirement with *that*-deletion and VP-deletion, and argues for this CP extraposition hypothesis. Further, he suggests, on the basis of VP-deletion facts, that when a complement CP is extraposed as in (8), it is adjoined to the VP node.

The purpose of this paper, like that of Safir (1987), is to defend the anti-c-command requirement on parasitic gaps as a generalization. In the following section, I will present additional evidence for the CP extraposition analysis of (5). Since this analysis assumes that a complement CP can be extraposed out of the c-command domain of the matrix object, as in (8), it implies that the matrix object need not c-command the embedded object not only in (5) but also in (6) and (7). I will argue in Section 3 that even if the complement CP is extraposed in (6), we still expect the example to have the ungrammatical status of strong crossover. Then, in Section 4, I will suggest an account for (7) that is independent of Condition (C). There, I will also speculate on the implications of the contrast between (5) and (7) for the hypothesis, suggested in Chomsky (1986, p. 63), that the anti-c-command requirement is to be attributed to Condition (C) of the Binding Theory.

2. RIGHTWARD MOVEMENT OF VP COMPLEMENTS

As we saw above, according to the hypothesis suggested in Chomsky (1986, p. 62) and argued for in Safir (1987), (5) has the structure in (8), and thus, is consistent with the anti-c-command requirement on parasitic gaps. Under this hypothesis, CP extraposition has applied in (5), exactly as in (9), but only string-vacuously in the former case.

(9) I believe t_i sincerely [$_{CP}$ that John is honest]$_i$.

But clearly, CP extraposition cannot always save a parasitic gap from the anti-c-command requirement. Engdahl (1984) points out that sentences like (5) are ungrammatical if the *wh*-trace is in the matrix subject position, instead of the matrix object position. The following example from Chomsky (1986) contrasts sharply with (5):

(10) *Who$_i$ t_i warned the men [$_{CP}$ that they were about to arrest [e]$_i$]?

If CP extraposition is possible in (5), then there is no reason to suppose that it is not possible in (10). Thus, the structure of (10) can be as in (11).

(11) Who$_i$ t_i [$_{VP}$ warned the men t_j] [$_{CP}$ that they were about to arrest [e]$_i$]$_j$?

If the moved CP can be outside the c-command domain of the subject *wh*-trace in (11), then (10) should be grammatical for the same reason that (5) is. Thus, given the CP extraposition analysis of (5), the ungrammaticality of (10) indicates that by extraposition, a complement CP can escape the c-command domain of the object NP, but not that of the subject NP. We obtain the desired result if, as suggested in Safir (1987), an extraposed complement CP is always adjoined to the VP node that immediately dominates it. Then, when CP extraposition applies, the structures of (5) and (10) are as in (12) and (13), respectively.

(12) Which men$_i$ [$_{IP}$ did the police [$_{VP}$ [$_{VP}$ warn t_i t_j] [$_{CP}$ that they were about to arrest [e]$_i$]$_j$]]?

(13) Who$_i$ [$_{IP}$ t_i [$_{VP}$ [$_{VP}$ warned the men t_j] [$_{CP}$ that they were about to arrest [e]$_i$]$_j$]]?

The *wh*-trace t_i c-commands the parasitic gap [e]$_i$ in (13) but not in (12).[7] Thus, the contrast between (5) and (10) is in complete accordance with the anti-c-command requirement on parasitic gaps.

We have seen above that the CP extraposition analysis of (5) implies the following:

(14) In the configuration, [$_{IP}$ NP [$_{VP}$ V NP CP]],
(a) the CP can be extraposed string-vacuously,[8] and
(b) by extraposition, the CP can escape the c-command domain of the object NP, but not that of the subject NP.

If we state this consequence in more general terms, we obtain (15).

(15) In the configuration, $[_{IP}$ NP $[_{VP}$ V NP XP]],
(a) the XP can be moved rightward string-vacuously, and
(b) by such rightward movement, the XP can escape the c-command domain of the object NP, but not that of the subject NP.

Further, it should be clear that if (15) holds, then it provides strong evidence for the extraposition analysis of examples such as (5), and consequently, for the anti-c-command requirement on parasitic gaps. If (15) is correct, then the contrast between (5) and (10) is exactly what we expect, given the anti-c-command requirement on parasitic gaps. Drawing on some facts of disjoint reference considered in Reinhart (1976, 1981), I will argue in this section that (15) in fact holds.

Let us first consider the following examples from Reinhart (1981, p. 632):[9]

(16) a. *In Ben's$_i$ box, he$_i$ put his cigars.

b. *In Ben's$_i$ most precious Chinese box, he$_i$ put his cigars.

(17) a. In some of Ben's$_i$ boxes, he$_i$ put cigars.

b. In which of Ben's$_i$ boxes did he$_i$ put cigars?

c. In the box that Ben$_i$ brought from China, he$_i$ put cigars.

Reinhart proposes a reformulation of Lasnik's (1976) noncoreference rule, and assumes that the revised rule is responsible for the ungrammaticality of the examples in (16). Her formulation of the noncoreference rule is basically maintained in Chomsky's (1981, p. 188) Condition (C) of the Binding Theory.[10]

(18) *Condition (C)*: An R-expression is A-free.

If the examples in (16) are directly ruled out by Condition (C) at S-structure, then the pronoun *he* binds, and hence, c-commands the R-expression *Ben* in the S-structure representations of those examples. Reinhart assumes this to be the case. But then, in the grammatical examples in (17) also, the pronoun *he* binds the R-expression *Ben*, and hence we predict falsely that these examples should also be ungrammatical. Facing this problem, Reinhart suggests that the grammaticality of the examples in (17) is to be attributed to the fact that in those examples, the R-expression, *Ben*, is "deeply embedded." That is, her suggestion is that R-expressions are exempted from Condition (C) when they are "deeply embedded."[11]

It seems clear that the "deep embedding" of *Ben* is somehow relevant for the grammaticality of (17a–c), as Reinhart suggests. On the other hand, as pointed out by Guéron (1984), among others, there is evidence that the pronoun *he* does not bind, and hence, does not c-command the

R-expression *Ben* in the S-structure representations of (16)–(17). For example, the following pair from Guéron (1984, p. 150) indicates that an R-expression cannot be A-bound no matter how "deeply" it is embedded in the sentence:[12]

(19) a. The rumour that John$_i$ stole the money, he$_i$ has always denied.

b. *He$_i$ has always denied the rumour that John$_i$ stole the money.

The examples in (20) point to the same conclusion:

(20) a. Mary knows [which man that John$_i$ saw]$_j$ he$_i$ likes t_j best.

b. *He$_i$ knows [which man that John$_i$ saw]$_j$ Mary likes t_j best.

In both (20a, b), the R-expression *John* is "deeply embedded" in the moved constituent. But in (20b) *he* clearly binds *John*, and the sentence is ungrammatical. Thus, this example indicates that "deep embedding" does not exempt R-expressions from Condition (C). But then, *Ben* cannot be bound by *he* in the grammatical examples in (17), for otherwise those sentences should be ungrammatical exactly like (20b). This conclusion, in turn, implies that in the ungrammatical examples in (16) also, *Ben* is not bound by *he*. It seems then that the examples in (16) cannot be ruled out by Condition (C) at S-structure.[13]

Then what generalization can we draw from the examples in (16)–(17)? First, it is clear that in all of those examples, *he* c-commands *Ben* at D-structure. The D-structure of (17a), for example, is roughly as in (21).

(21) $[_{IP}$ He $[_{VP}$ put cigars in some of Ben's boxes]]

Further, as we saw above, *he* does not bind, and hence does not c-command *Ben* in the S-structure representations of those examples. I assume, following Reinhart, that the preposed PP in (17a) is adjoined to IP at S-structure, as shown in (22).[14]

(22) $[_{IP}$ $[_{PP}$ In some of Ben's$_i$ boxes$]_j$ $[_{IP}$ he$_i$ $[_{VP}$ put cigars $t_j]]]$.

These facts lead us to the following generalization, which is widely assumed in the current literature:[15]

(23) The following S-structure configuration is ill-formed:
$[_{XP} \ldots$ R-expression$_i \ldots]_j$ $[_{YP} \ldots$ pronoun$_i \ldots t_j \ldots]$ (order irrelevant), where
(a) XP A′-binds the trace,
(b) the pronoun c-commands the trace, and
(c) the R-expression is not "deeply embedded" in XP.

All of the examples in (16)–(17) satisfy (a) and (b) of (23). For example,

in (17a), whose S-structure is shown in (22), the preposed PP is the XP, and it A′-binds a trace. Furthermore, the pronoun *he* c-commands the trace. The examples in (16) satisfy (23c) in addition. In those examples, *Ben* is not "deeply embedded" in the proposed PP. Thus, their ungrammaticality is in accord with the generalization in (23). On the other hand, in the examples in (17), the R-expression *Ben* is "deeply embedded" in the preposed PP. Thus, those examples do not satisfy (23c), and their grammaticality is also consistent with (23).

Note that (23) is relevant only when a pronoun c-commands an R-expression at D-structure and this c-command relation no longer holds at S-structure due to movement. For example, (23) does not say anything about examples such as (24) below, or those such as (20b) above.

(24) John's$_i$ mother loves him$_i$.

In (24), the pronoun *him* c-commands the R-expression *John* neither at D-structure nor at S-structure. Hence, the example does not have the configuration in (23). In (20b), on the other hand, the pronoun *he* c-commands the R-expression *John* both at D-structure and at S-structure. Thus, this example also does not have the configuration in (23). The example is ungrammatical simply because its S-structure violates Condition (C) as formulated in (18).

With (23) in mind, let us now consider the following examples from Reinhart (1976, pp. 160—161):

(25) a. *After days of search, they finally found him$_i$ in Dr. Levin$_i$'s hotel room.

b. After days of search, they finally found him$_i$ in a sleazy hotel room that Dr. Levin$_i$ had rented under a false name.

It is Reinhart's insight that the contrast between (25a) and (25b) is quite similar to that between the examples in (16) and (17). In the grammatical (25b), but not in the ungrammatical (25a), the R-expression *Dr. Levin* is "deeply embedded" in the PP headed by *in*. Observing this similarity, Reinhart makes the assumption, which I follow here, that the contrast in (25) and that between (16) and (17) are instances of the same general phenomenon. In our terms, this means that the examples in (25) are to be subsumed under the generalization in (23). However, (23) is irrelevant for (25a—b), if the relevant parts of these examples have the structure shown in (26).

(26) $[_{IP}$ NP $[_{VP}$ V him$_i$ $[_{PP}$ . . . Dr. Levin$_i$ . . .]]]

Given (26), we predict, contrary to the fact, that (25a—b) are both ungrammatical. (25a) will be correctly ruled out by Condition (C), since the object NP *him* binds the R-expression *Dr. Levin* in (26). But (25b) should also be ungrammatical for the same reason. Reinhart assumes (26), and at the same time analyzes the contrast in (25) and that between (16) and (17) in the same way. That is, she attributes the grammaticality of (25b) to the fact that *Dr. Levin* is "deeply embedded" in this example. But we cannot adopt her analysis here, since we have concluded above on the basis of (19b) and (20b) that "deep embedding" cannot save R-expressions from a Condition (C) violation.

Here, (15), which is repeated below as (27), enables us to capture the parallelism between (25a—c) and (16)—(17), and subsume (25a—b) under the generalization in (23).

(27) In the configuration, $[_{IP}$ NP $[_{VP}$ V NP XP]],
(a) the XP can be moved rightward string-vacuously, and
(b) by such rightward movement, the XP can escape the c-command domain of the object NP, but not that of the subject NP.

(27) states that a VP complement can be moved rightward string-vacuously, and as a result, be outside the c-command domain of the object NP at S-structure. Thus, according to (27), the S-structure configurations of (25a—b) can be as in (28), while their D-structure configurations are as in (26).

(28) $[_{IP}$ NP $[_{VP}$ V him$_i$ t_j] $[_{PP}$ . . . Dr. Levin$_i$ . . .]$_j$]

Now, (23) becomes directly relevant, since the pronoun *him* c-commands the R-expression *Dr. Levin* in the D-structure representation in (26), but not in the S-structure representation in (28). More precisely, (28) satisfies (a) and (b) of (23). The trace t_j is A′-bound by the moved PP, and is c-commanded by the pronoun *him* in the object position. Thus, if (23c) is satisfied, that is, if *Dr. Levin* is not "deeply embedded" in the moved PP, we expect the configuration to be ill-formed. And in fact, in the ungrammatical (25a), the R-expression *Dr. Levin* is not "deeply embedded" in the moved PP, while in the grammatical (25b), it is "deeply embedded" in the PP. Thus, given (27), the examples in (25) are subsumed under the generalization in (23). This fact clearly provides support for (27).

(27) also enables us to make correct predictions for another set of examples discussed in Reinhart (1976, 1981). She points out that examples such as (25b) are ungrammatical no matter how "deeply" the R-expression is embedded when the pronoun is in the matrix subject position instead of the matrix object position. Consider the following example from Reinhart (1976, p. 163):

(29) *After days of search, he$_i$ was finally found in a sleazy hotel room that Dr. Levin$_i$ had rented under a false name.

Reinhart discusses (29) as a problematic example. According to her

analysis, which assumes that "deep embedding" exempts R-expressions from Condition (C), there should be no difference in grammatical status between (25b) and (29). The R-expression *Dr. Levin* is embedded as "deeply" in (29) as in (25b). However, given the assumptions in this paper, in particular (27), the ungrammaticality of (29) is exactly what we expect. There is no reason to suppose that the PP headed by *in* cannot be moved rightward string-vacuously in (29) exactly in as (25b). However, (27) states that by such movement, the PP cannot escape the c-command domain of the subject NP. Thus, even if such movement takes place in (29), the R-expression *Dr. Levin* is still bound by the pronoun *he* at S-structure. Consequently, the example is ruled out by Condition (C) at S-structure, and does not have anything to do with the generalization in (23). Thus, given (27), the contrast between (25b) and (29) is explained directly by Condition (C), exactly as the contrast between (20a) and (20b).

I have argued in this section that some facts of disjoint reference discussed in Reinhart (1976, 1981) provide support for (27). And as noted above, if (27) is correct, the examples (5) and (10), which are repeated below as (30a—b), provide strong evidence for the anti-c-command requirement on parasitic gaps.

(30) a. Which men$_i$ did the police warn t_i [$_{CP}$ that they were about to arrest [e]$_i$]?

b. *Who$_i$ t_i warned the men [$_{CP}$ that they were about to arrest [e]$_i$]?

According to (27), the complement CP in (30) can extrapose, and thereby escape the c-command domain of the matrix object, but not that of the matrix subject. Thus, given the anti-c-command requirement on parasitic gaps, the contrast between (30a) and (30b) is exactly what we expect.

The argument in this section is of course weak to the extent that it is based on the generalization in (23), and not on a principled account for it. Yet, the parallelism between the contrasts in (30a)—(30b) and (25b)—(29) is certainly striking. And if, as I argued above, the latter contrast is to be accounted for by Condition (C), which involves the structural relation 'c-command,' then what is crucial in the contrast in (30) seems to be the c-command relation between the *wh*-trace and the parasitic gap.

3. THE SCOPE OF THE STRONG CROSSOVER PHENOMENON

Once we assume that examples such as (30a) are consistent with the anti-c-command requirement on parasitic gaps, a problem arises, as Engdahl (1984) points out, as to the analysis of examples such as (6), which is repeated below as (31).

(31) *Which man$_i$ did the police warn him$_i$ [$_{CP}$ that they were about to arrest t_i]?

(31) seems to have the ungrammatical status of strong crossover. And as noted in note 3, the strong crossover effect arises typically when a pronoun c-commands a coindexed *wh*-trace, as in (32).

(32) *Which man$_i$ does he$_i$ think that Mary loves t_i?

However, if (30a) satisfies the anti-c-command requirement, then it is not clear why the pronoun in (31) should c-command the *wh*-trace. In particular, given the CP extraposition analysis of (30a), there seems to be no reason that (31) cannot have the structure in (33).

(33) Which man$_i$ did the police [$_{VP}$ warn him$_i$ t_j] [$_{CP}$ that they were about to arrest t_i]$_j$?

In (33), *him* does not c-command the *wh*-trace. It appears then that (31) cannot be accounted for as an instance of strong crossover.

Here, the following example, which is discussed by Chomsky (1981), among others, provides a clue to the solution to the problem posed by (31):

(34) *[Whose$_i$ brother]$_j$ did he$_i$ see t_j?

In (34), the pronoun *he* does not c-command a coindexed trace. What it c-commands is the trace of *whose brother*, not that of *whose*. Yet, the example has the status of strong crossover. It seems, then, that strong crossover is not limited to cases where a pronoun c-commands a coindexed *wh*-trace. And if this is in fact the case, the ungrammatical status of (31) need not be a problem. That is, we may be able to assume that the pronoun in (31) need not c-command the *wh*-trace, and at the same time, treat this example as an instance of strong crossover. But before we turn to the exact implications of (34), let us first briefly discuss the analysis of this example suggested in Chomsky (1981) and a problem associated with it.

Chomsky (1981) proposes to explain the typical examples of strong crossover, such as (32), as Condition (C) violations. If we make the reasonable assumption that *wh*-traces are R-expressions, then (32), for example, is straightforwardly ruled out by Condition (C). In this example, the *wh*-trace is A-bound by the pronoun in the matrix subject position.[16] Chomsky (1981, pp. 89—90) suggests further that this analysis may be extended to examples like (34), if we assume an LF operation called 'reconstruction,' which gives (34) an LF representation corresponding in form to (35).

(35) for which x, x a person, he(x) saw x's brother

Given this reconstruction operation, the LF of (34) is as in (36).

(36) Who$_i$ [he$_i$ saw t_i's brother]

This representation violates Condition (C) if the condition applies at LF. Thus, given LF reconstruction, (34) can be ruled out as a Condition (C) violation exactly as (32). Chomsky (1981) notes that this analysis of (34) is consistent with the grammaticality of examples such as (37).

(37) [Which book that John$_i$ likes]$_j$ did he$_i$ read t_j?

If the LF of (37) has a form corresponding to (38), as seems reasonable, then the LF reconstruction operation does not apply to this example.

(38) for which x, x a book that John likes, he read x

Thus, (37) does not violate Condition (C) at S-structure or at LF.

If Chomsky's (1981) analysis of (34) is correct, then a pronoun c-commands a coindexed trace in the LF representation of this example. Thus, we can maintain the generalization that the strong crossover effect arises when and only when a pronoun c-commands a coindexed *wh*-trace. But, then, it of course remains unclear why (31), which can have the structure in (33), has the ungrammatical status of strong crossover.

However, Chomsky (1981) merely suggests the LF reconstruction analysis of (34), noting that it faces a number of problems. One of the problems, which was first pointed out in Higginbotham (1980), has to do with pairs such as the following:[17]

(39) a. [Which book that criticizes John$_i$]$_j$ is he$_i$ pissed off at t_j?

b. *[Which book that criticizes who$_i$]$_j$ is he$_i$ pissed off at t_j?

(39b) has the ungrammatical status of strong crossover, while (39a) is perfectly grammatical. The grammaticality of (39a) is not problematic. It clearly does not violate Condition (C) at S-structure. Further, its LF should correspond in form to (40), and hence, no reconstruction takes place in LF.

(40) for which x, x a book that criticizes John, he is pissed off at x

Thus, (39a) does not violate Condition (C) at S-structure or at LF. On the other hand, as Higginbotham (1980) points out, examples like (39b) cast doubt on the LF reconstruction analysis of (34). (39b), like (39a), does not violate Condition (C) at S-structure. Furthermore, if (39a) is not subject to LF reconstruction, it is reasonable to suppose that (39b) is not, either. The LF of (39b) should correspond in form to (41).

(41) for which x and for which y, x a person and y a book that criticizes x, he(x) is pissed off at y

Thus, (39b), like (39a), does not violate Condition (C) at S-structure or at LF. The LF reconstruction analysis of (34) does not seem to extend to examples like (39b).[18]

Given the problem of the LF reconstruction analysis noted above, it seems that an alternative account must be sought for both (34) and (39b). And more importantly for the purpose here, (39b) shows that the strong crossover phenomenon is not limited to cases where a pronoun c-commands a coindexed *wh*-trace at some level. As we saw above, the pronoun *he* in (39b) c-commands a coindexed *wh*-trace neither at S-structure nor at LF. (34) and (39b) indicate that the strong crossover effect arises, instead, in the context stated in (42).

(42) A sentence exhibits the strong crossover effect if it has the following property: A quantified NP is A-bound if all A′-movements are undone.

In (34), if the *wh*-movement is undone, then the quantified NP *whose* will be bound by the pronoun *he* in the subject position. Similarly, if the *wh*-movement in (39b) is undone, then the quantified NP *who* will be A-bound. (32) also falls under the generalization in (42), although redundantly if we maintain Chomsky's (1981) Condition (C) account for it, which does not depend on LF reconstruction but only on the plausible assumption that *wh*-traces are R-expressions. It seems then that a proper account of strong crossover must explain the generalization in (42).

Here, I do not have a proposal to offer as an explanation for (42).[19] However, it should be clear at this point that the ungrammatical status of (31), repeated below as (43), is not problematic for the CP extraposition hypothesis discussed in Section 2.

(43) *Which man$_i$ did the police warn him$_i$ [$_{CP}$ that they were about to arrest t_i]?

As noted above, if a complement CP can be extraposed freely, and escape the c-command domain of the object NP, as argued in Section 2, then nothing seems to prevent (43) from having the structure in (44).

(44) Which man$_i$ did the police [$_{VP}$ warn him$_i$ t_j] [$_{CP}$ that they were about to arrest t_i]$_j$?

In (44), *him* does not c-command the coindexed *wh*-trace. Hence, it seemed mysterious that (43) should have the ungrammatical status of strong crossover. However, (43) was problematic because we entertained the assumption that the strong crossover effect obtains when and only when a pronoun c-commands a coindexed *wh*-trace. And (39b) shows convincingly, I believe, that the assumption is not well-founded. Furthermore, if (42) is a correct generalization, then we expect (43) to exhibit the strong crossover effect regardless of whether the complement CP is extra-

posed as in (44). If we undo the A′-movements in (44), i.e., *wh*-movement and CP extraposition, then the quantified NP *which man* will be A-bound by the pronoun *him*. Thus, the ungrammatical status of (43) seems quite consistent with the CP extraposition analysis of the parasitic gap example (30a), repeated below in (45).

(45) Which man$_i$ did the police warn t_i [$_{CP}$ that they were about to arrest [e]$_i$]?

It seems that if (43) is problematic, it is not because it casts doubt on the CP extraposition analysis of (45), but because it confirms the generalization in (42), and hence, provides further evidence that the account for the strong crossover phenomenon must be refined.

4. THE ANTI-C-COMMAND REQUIREMENT AND CONDITION (C)

So far, I argued for the CP extraposition analysis of (45), and showed that this analysis is consistent with the fact that (43) has the ungrammatical status of strong crossover. In this section, I will turn to (7), repeated below as (46).

(46) *The police warned him$_i$ [$_{CP}$ that they were about to arrest John$_i$].

Given the CP extraposition analysis of (45), we expect (47) to be a possible structure for (46).

(47) The police [$_{VP}$ warned him$_i$ t_j] [$_{CP}$ that they were about to arrest John$_i$]$_j$.

But if (46) can have the structure in (47), then the example cannot be ruled out by Condition (C), since in (47) the pronoun *him* does not c-command the name *John*. Thus, (46) apparently poses a problem for the CP extraposition analysis of (45).

Here, I would like to suggest that (46) in fact can have the structure in (47), and when it does, it is not a Condition (C) violation, but instead, it falls under the generalization in (23), which is repeated below as (48).

(48) The following S-structure configuration is ill-formed:
[$_{XP}$ . . . R-expression$_i$ . . .]$_j$ [$_{YP}$ . . . pronoun$_i$ . . . t_j . . .] (order irrelevant), where
(a) XP A′-binds the trace,
(b) the pronoun c-commands the trace, and
(c) the R-expression is not "deeply embedded" in XP.

In (47), the pronoun *him* c-commands the trace t_j of the extraposed CP, and the name *John*, we may say, is not "deeply embedded" within the extraposed CP.[20] According to this hypothesis, (46) is ungrammatical for

exactly the same reason as (25a). (25a—b), from Reinhart (1976), are repeated below in (49a—b).

(49) a. *After days of search, they finally found him$_i$ in Dr. Levin$_i$'s hotel room.

b. After days of search, they finally found him$_i$ in a sleazy hotel room that Dr. Levin$_i$ had rented under a false name.

If this analysis is correct, then examples like (46) should improve when the name *John* is embedded more deeply in the complement CP. This prediction seems to be borne out by the following example, due to H. Lasnik (personal communication):

(50) ??The police warned him$_i$ [$_{CP}$ that they were about to arrest everyone that John$_i$ knew].

The contrast between (46) and (50) may not be as clear as the one in (49). However, (50) seems substantially better than (46).

The account for (46) outlined above implies that there is a crucial difference between the pronoun/name relation as in (51a), and the *wh*-trace/parasitic gap relation as in (51b).

(51) a. *The police [$_{VP}$ warned him$_i$ t_j] [$_{CP}$ that they were about to arrest John$_i$]$_j$.

b. Which man$_i$ did the police [$_{VP}$ warn t_i t_j] [$_{CP}$ that they were about to arrest [e]$_i$]$_j$?

(51a) falls under the generalization in (48), i.e., whether or not the name *John* is deeply embedded within the extraposed CP matters. On the other hand, in examples like (51b), the depth of embedding of the parasitic gap does not seem to matter. The parasitic gap in (51b) is embedded within the extraposed CP only as deeply as the name *John* in (51a). Yet, (51b) is fine. In fact, examples like (51b) are allowed, it seems, as long as the parasitic gap is not c-commanded by the *wh*-trace, i.e., as long as they conform to the anti-c-command requirement.

This difference between the pronoun/name relation and the *wh*-trace/parasitic gap relation is curious, especially if we adopt the hypothesis that parasitic gaps are R-expressions. Chomsky (1986, p. 63) suggests that the anti-c-command requirement on parasitic gaps may be explained in terms of Condition (C) of the Binding Theory.[21] When a parasitic gap is c-commanded by the licensing *wh*-trace, it is A-bound. Hence, if parasitic gaps are R-expressions, then it seems possible to make the anti-c-command requirement follow from Condition (C). If we adopt this plausible explanation of the anti-c-command requirement, then the parasitic gap in (51b) must be an R-expression exactly as the name *John* is in (51a). Then, why

is "deep embedding" relevant in (51a), and not in (51b)? I will briefly consider this question in the remainder of this section.

Note first that in (51a), the pronoun takes the name as its "antecedent," in the intuitive sense of the term. This antecedent relation can be expressed as in (52).

(52) The police $[_{VP}$ warned him$_i$ $t_j]$ $[_{CP}$ that they were about to arrest John$_i]_j$.

The antecedent relation indicated in (52) clearly does not hold between the *wh*-trace and the parasitic gap in (51b). That is, the *wh*-trace in no sense takes the parasitic gap as its antecedent. Building on this difference between (51a) and (51b), we can hypothesize that in examples such as (51a—b), the R-expression's depth of embedding matters when and only when the R-expression serves as the antecedent of the coindexed argument NP. If this speculation is correct, the generalization in (48) should be restated accordingly as in (53).

(53) The following S-structure configuration is ill-formed:
$[_{XP} \ldots$ R-expression$_i \ldots]_j$ $[_{YP} \ldots Z_i \ldots t_j \ldots]$ (order irrelevant), where
(a) XP A′-binds the trace,
(b) Z c-commands the trace,
(c) the R-expression is the antecedent of Z, and
(d) the R-expression is not "deeply embedded" in XP.

According to (53), what is important is not that Z is a pronoun, but that it takes the R-expression as its antecedent.[22]

(53) receives independent support from examples containing anaphoric epithets, such as *the poor guy* and *the sissy*. Let us first consider (54).

(54) *The police $[_{VP}$ warned the poor guy$_i$ $t_j]$ $[_{CP}$ that they were about to arrest John$_i]_j$.

In this example, Z is not a pronoun, but is the anaphoric epithet *the poor guy*. Hence, the example does not fall under the generalization in (48). However, the anaphoric epithet in (54) takes the R-expression *John* as its antecedent. Thus, the ungrammaticality of (54) is consistent with (53).[23] Let us next consider (55).

(55) *The police warned $[_{VP}$ him$_i$ $t_j]$ $[_{CP}$ that they were about to arrest the poor guy$_i]_j$.

As shown in Lasnik (1976, 1989), anaphoric epithets are subject to Condition (C), and hence, are R-expressions. The following example from Lasnik (1976) is ruled out by Condition (C):

(56) *John$_i$ realizes that the sissy$_i$ is going to lose.

Hence, (55), like (46), falls under the generalization in (53). The pronoun *him* c-commands the trace t_j, and the R-expression *the poor guy* is not deeply embedded in the extraposed CP.

Now, suppose that in the structure shown in (53), the R-expression is an anaphoric epithet, as in (55), and Z is a name. Given (53), we predict that this configuration is allowed, since the R-expression is clearly not the antecedent of Z. This prediction is borne out by (57), which contrasts sharply with (54) and (55).

(57) The police $[_{VP}$ warned John$_i$ $t_j]$ $[_{CP}$ that they were about to arrest the poor guy$_i]_j$.

The name/anaphoric epithet relation, as in (57), seems to show the same pattern as the *wh*-trace/parasitic gap relation, as in (51b). And given (53), this is expected because in both relations, the former member does not take the latter one as its antecedent.[24]

According to the analysis proposed here, since (57) does not fall under the generalization in (53), CP extraposition truly saves this example from a Condition (C) violation. Now, if the name *John* in (57) appears in the matrix subject position, instead of the matrix object position, then the example is degraded considerably, as shown in (58).

(58) *John$_i$ $[_{VP}$ warned the men $t_j]$ $[_{CP}$ that they were about to arrest the poor guy$_i]_j$.

This fact is exactly what we expect, given the analysis of the parasitic gap example (30b) proposed in Section 2. (30b) is repeated below as (59).

(59) *Who$_i$ t_i warned the men $[_{CP}$ that they were about to arrest $[e]_i]$?.

It was hypothesized in Section 2 that when a VP complement is extraposed, it can escape the c-command domain of the object NP, but not that of the subject NP. Thus, even if the complement CP is extraposed in (59), the example still violates the anti-c-command requirement. Given this hypothesis on extraposition, (58) is straightforwardly ruled out by Condition (C). In this example, the R-expression *the poor guy* is A-bound by *John* even after the CP extraposition takes place. In fact, if the anti-c-command requirement is to be attributed to Condition (C), as suggested in Chomsky (1986), then (58) and (59) are both Condition (C) violations.[25]

As we saw above, the examples (54), (55) and (57) provide independent evidence for the generalization in (53). And given (53), the contrast between (45) and (46) is not at all surprising, even if a complement CP can extrapose freely, as argued in Section 2. Thus, the contrast between (45) and (46), in particular, the ungrammaticality of (46), does not seem problematic for the CP extraposition analysis of (45). The remaining problem, which is beyond the scope of this paper, is to provide a principled account for the generalization in (53).

5. CONCLUSION

In this paper, I discussed the following three examples in detail:

(60) Which man$_i$ did the police warn t_i [$_{CP}$ that they were about to arrest [e]$_i$]?

(61) *Which man$_i$ did the police warn him$_i$ [$_{CP}$ that they were about to arrest t_i]?

(62) *The police warned him$_i$ [$_{CP}$ that they were about to arrest John$_i$].

As pointed out by Engdahl (1984), examples such as (60) appear to be problematic for the anti-c-command requirement on parasitic gaps. In Section 2, I presented additional evidence for the CP extraposition analysis of this example, which is suggested in Chomsky (1986) and proposed in Safir (1987), and argued that (60), together with examples such as (63), also discussed in Engdahl (1984), constitute evidence for, and not against, the anti-c-command requirement on parasitic gaps.

(63) *Who$_i$ t_i warned the men [$_{CP}$ that they were about to arrest [e]$_i$]?

In Section 3, drawing on the insights of Higginbotham (1980), I showed that the strong crossover effect is not limited to cases where a pronoun c-commands a coindexed *wh*-trace. Based on this conclusion, I argued that the CP extraposition analysis of (60) is consistent with the fact that (61) has the ungrammatical status of strong crossover. Finally, in Section 4, I suggested that the ungrammaticality of (62) is also consistent with the CP extraposition analysis of (60). There, I made some speculative remarks about the exact nature of the contrast between (60) and (62).

It was shown in this paper that the examples in (60)—(62) are not problematic for the anti-c-command requirement on parasitic gaps, but instead, they pose more general problems. (60) and (63), together with the examples from Reinhart (1976), indicate that when a VP complement is extraposed, it must be adjoined to the VP node immediately dominating it. This fact clearly demands an explanation. The problem here is to explain the severely bounded nature of rightward movement in general, and thus, is the one initially raised by Ross's (1967) right roof constraint. (61), together with examples such as (39b), repeated below as (64), indicates that the account of the strong crossover phenomenon suggested in Chomsky (1981) must be refined.

(64) *[Which book that criticizes who$_i$]$_j$ is he$_i$ pissed off at t_j?

Finally, if the speculation in Section 4 is correct, then the contrast between (60) and (62) is part of a more general phenomenon, which I stated in the form of a generalization in (53). Hence, a principled explanation for (53) seems to be in order if we are to provide a complete account for examples such as (62).

NOTES

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[1] I will assume the following definition of *c-command* throughout this paper:

(i) *X c-commands Y* $=_{df}$ neither of *X*, *Y* dominates the other, and the first branching node dominating *X* dominates *Y*.
(See Reinhart 1976, 1981.)

[2] Engdahl (1984) also discusses another group of examples, which have small clause complements. The following example represents this group:

(i) Which famous linguist$_i$ did you consider [t_i smarter than most friends of [e]$_i$]?

(i) may be somewhat worse than (5), but is certainly not as bad as (4). I will assume, without further discussion, that the analysis of (5) argued for in this paper can be extended to cover examples like (i) as well. See also Contreras (1984) for a different kind of potential empirical problem with the anti-c-command requirement on parasitic gaps.

[3] The strong crossover phenomenon is found typically when a pronoun c-commands a coindexed *wh*-trace, as in (i).

(i) *Which man$_i$ does he$_i$ think that Mary loves t_i

Engdahl (1984) considers, in addition, the possibility that examples such as (6) are instances of, not strong crossover, but weak crossover. I will not discuss this possibility in this paper, since (6) seems to have the ungrammatical status of strong crossover. In particular, it seems worse than (iia—b), which are clear examples of weak crossover.

(ii) a. ?*Which man$_i$ did the police warn his$_i$ mother [$_{CP}$ that they were about to arrest t_i?

b. ?*Which man$_i$ does his$_i$ mother think that Mary loves t_i?

The difference in judgement between strong crossover and weak crossover examples is often not clear. However, the contrast between (6) and (iia) can be used as prima facie evidence that the former is an instance of strong crossover.

[4] See (18) in Section 2 for a precise formulation of Condition (C).

[5] Chomsky (1986) attributes this suggestion to Luigi Rizzi.

[6] As noted immediately below, Safir (1987) suggests that the extraposed CP in (8) is adjoined to the VP node. In Section 2, I will present supporting evidence for this hypothesis. But for the moment, I will simply assume that it is somewhere outside the c-command domain of the matrix object.

[7] In an adjoined structure shown below, I assume that the upper XP and the lower XP are to be treated as independent nodes, and hence, that the latter blocks the c-command of YP by ZP. (Cf. the assumptions in Chomsky 1986, pp. 8—9).)

(i) . . . [$_{XP}$ [$_{XP}$ . . . ZP . . .] YP] . . . (order irrelevant)

[8] If CP extraposition is possible, as shown in (9), then it is of course the null hypothesis that it can apply string-vacuously.

[9] See also Reinhart (1976, p. 160).

[10] The following definitions are assumed:

(a) *X binds Y* $=_{df}$ *X* c-commands *Y* and *X* is coindexed with *Y*.

(b) *X A-binds Y* $=_{df}$ *X* binds *Y* and *X* is in A-position.

(c) *Y* is *A-free* $=_{df}$ there is no *X* such that *X* A-binds *Y*.

A positions are roughly those positions in which argument NPs can appear at D-structure. For example, the subject and the object positions are A-positions. R-expressions are roughly non-anaphoric, non-pronominal expressions. Names, such as *Mary, John*, are typical R-expressions.

[11] See also Lakoff (1968). In order to define the relevant notion of "deeply embedded" precisely, Reinhart suggests, tentatively, that the application of the noncoreference rule is constrained by subjacency. Thus, according to her, the generalization is that an R-expression cannot be A-bound by a subjacent NP. However, as reported in later works, there is much idiolectal variation as to how deeply an R-expression must be embedded in examples like those in (17), and the relevant data are far from clear. (See, for example, van Riemsdijk and Williams (1981) and the references cited there.) In what follows, I will use expressions such as "embedded deeply enough" without attempting to define them precisely. See Guéron (1984) for a review of the relevant literature.

[12] Reinhart (1976, 1981) in fact discusses examples similar to (19b) and (20b), and notes explicitly that they are problematic for her account. I will discuss one of her examples, i.e., (29), later in this section.

[13] Hornstein (1984, pp. 161—163) discusses the following examples from Taraldsen (1981), and proposes that they are both Condition (C) violations, but (ib) is saved by an independent discourse principle:

(i) a. *Which picture of John$_i$ did he$_i$ buy?

b. Which picture that John$_i$ liked did he$_i$ buy?

According to his analysis, the examples in (i) violate Condition (C), not because of the direct c-command of *John* by *he*, but because of a reconstruction principle. If this approach is correct, then the examples in (16), as well as those in (17), can be ruled out by Condition (C), contrary to the conclusion in the text. Although this approach has a number of attractive features, I will not adopt it here, since it is not at all clear how it can accommodate the examples discussed below in this section, e.g., (25). See van Riemsdijk and Williams (1981) for an analysis similar to Hornstein's (1984), and also Guéron (1984) for an attempt to make Condition (C) rule out the examples in (16), but not those in (17), at LF.

[14] As noted above, Reinhart (1976, 1981) assumes that *he* binds *Ben* in (22). She proposes a revision of the definition of 'c-command' in note 1 to make such binding possible.

[15] (i) *X A′-binds Y* $=_{df}$ *X* binds *Y* and *X* is not in A-position.

The generalization in (23), or a similar one, is assumed, for example, in van Riemsdijk and Williams (1981), Hornstein (1984), Guéron (1984). As noted in note 13, each of these works proposes an account for this generalization. But here I will simply assume the generalization, and will not discuss their accounts.

[16] It has been known that this account for the typical strong crossover examples needs to be refined so that it accommodates examples such as (i).

(i) Himself$_i$, John$_i$ likes t_i.

This example shows that not all *wh*-traces are R-expressions. If t_i in (i) is an R-expression, then the example should be a Condition (C) violation. One difference between (32) and (i) is that the A′-binder of the *wh*-trace is a quantified NP in the former example, while in the latter it is an anaphor. Thus the binding property of a *wh*-trace seems to depend in part on its A′-binder. See Kearney (1983), Barss (1984) for detailed discussion.

[17] I owe the examples in (39) to R. May (pers. comm.).

[18] Higginbotham's (1980) argument is based on the following example, which seems to have the configuration of weak crossover, rather than that of strong crossover.

(i) *Which driver of which millionaire's$_i$ car did his$_i$ father hire?

But his argument against the reconstruction analysis of (34) is exactly like the one presented in the text. He shows that the analysis does not extend to (i), since *which millionaire*, being a *wh*-phrase, is not reconstructed in LF.

[19] It is of course possible to state the generalization in (42) in the form of a condition. For example, if we adopt Barss's (1984) notion of chain binding, (42) can be restated as follows:

(i) A quantified NP cannot be chain bound.

[20] In the configuration in (48), it seems that the R-expression must be embedded more deeply when it is preceded by the pronoun. The R-expression's depth of embedding is the same in (i) and (46), but the former is far better than the latter.

(i) That John$_i$ passed the exam, he$_i$ (already) knows.

See Hornstein (1984) for examples and discussion that are relevant to this problem.

[21] Chomsky (1986) also suggests that the anti-c-command requirement may follow from a condition on chains. In addition, he entertains the possibility that the anti-c-command requirement is not valid as a generalization.

[22] The notion 'antecedent-of' must of course be defined explicitly. H. Lasnik (pers. comm.) points out that examples such as the following pose a problem to the "intuitive definition" assumed in the text.

(i) John$_i$ is on the run. *The police warned him$_i$ that they were about to arrest John$_i$.

In (i), nothing seems to prevent *him* from taking the first occurrence of *John* as its antecedent.

It also remains to be seen how the discussion in the text can be related to the theory of Higginbotham (1983), where 'antecedent-of' is defined as a formal syntactic relation.

[23] H. Lasnik (pers. comm.) points out that (54) is rather weak if it is used as direct evidence to distinguish between (53) and (48). As shown in (ii), backwards anaphora with an epithet seems to be always degraded.

(i) After he$_i$ walked in, John$_i$ fell down.

(ii) ?*After the clumsy oaf$_i$ walked in, John$_i$ fell down.

Thus, if we are to argue on the basis of (54) alone that (53) is preferred over (48), the argument must be based on the subtle distinction between (ii) and (54).

[24] The analysis presented here predicts that examples such as (16a), repeated below as (i), should improve when we substitute the name for the pronoun, as in (ii).

(i) *In Ben's$_i$ box, he$_i$ put his cigars.

(ii) ??In Ben's$_i$ box, Ben$_i$ put his cigars.

The contrast may not be as clear as it should be, but (ii) seems better than (i) as predicted. The marginality of (ii) may be partially due to the awkwardness arising from the repetition of the name.

[25] Since the *wh*-trace/parasitic gap relation, as in (51b) and (59), and the name/anaphoric epithet relation, as in (57) and (58), are not subject to the generalization in (53), they after all seem to provide the best diagnosis for the c-command relation of constituents.

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INFINITY IS IN THE EYE OF THE BEHOLDER*

OVERVIEW

There are clear senses in which natural languages are finite. It is generally assumed that human brains and hence linguistic processing ability is finite. If we assume that a sentence used by a human must fit in memory, this implies that there is some upper bound on the number of sentences that a human being can understand or produce. The number would be extremely large, but would be finite nonetheless. It is possible that a person might produce or understand a sentence by processing it in pieces without ever having the entire sentence in memory, but that would require either extensive use of external storage, such as pencil and paper, or else limit the complexity of natural languages to that of finite-state languages. Moreover, other processing constraints place very small upper bounds on the sizes of sentences that humans can process. For example, humans seem incapable of processing clauses nested to arbitrary depths. Without the aid of pencil and paper, humans lose track of certain types of nested structures once the depth of nesting exceeds about five [Miller (1956), Bach et al. (1986)]. Perhaps the most compelling of all senses in which language is finite is the simple fact that, at any point in time, an individual, or the entire community of human beings, will have experienced only a finite number of sentences. At no point in history will scientists be able to point to any actual pool explicitly containing an infinite number of sentences. Despite these apparently irrefutable facts, linguists quite typically treat natural languages as infinite sets, at least when studying syntax. One may believe that humans only use clause nesting to depths of five or ten, but one does not seem able to use this fact to simplify grammars. Language, viewed through the eyes of many linguists, is an infinite set of sentences. Their view of language goes beyond the finite data to a language they perceive as both infinite and obviously real. Standing before the finite data of actual human experience, Chomsky (1972) confidently and unhesitatingly states: "There is no human language in which it is possible, in fact or in principle, to specify a certain sentence as the longest sentence meaningful in this language."

This technique of treating finite sets as if they were infinite is not limited to linguistics. The same technique is widely used in computer science, among other fields. Computers are finite objects and all programs are in practice limited to finite sets of input data and output responses. Yet, algorithms for computer programs are typically written as if there