

Alternative Conceptions of Phrase Structure

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Scrambling as Semantically

Vacuous A'-Movement

MAMORU SAITO

As is well known, Japanese has scrambling, and word order is relatively free in this language. For example, (1a) and (1b) are both perfectly acceptable sentences of Japanese.¹

- (1) a. *Mary-ga sono hon-o yonda (koto)*
 Mary-NOM that book-ACC read fact
 b. *sono hon-o Mary-ga yonda (koto)*
 that book-ACC Mary-NOM read fact
 'Mary read that book.'

It has been argued that scrambling is S-structure movement to A'-position, and further, that it is an adjunction operation. (See, for example, Whitman 1982, Saito 1985, and Hoji 1985.) According to this hypothesis, the S-structure representation of (1b) is as in (2):

- (2) [_S *sono hon-o [_S *Mary-ga* [_{VP} *t_i yonda*]]] (*koto*)*

On the other hand, it has also been suggested that scrambling is "stylistic" in nature. (See, for example, Ross 1967, N. McCawley 1976, Chomsky & Lasnik 1977.) As far as I can tell, the intuition behind this suggestion is that scrambling differs from other types of A'-movement, such as English topicalization and *wh*-movement, in that it does not establish a semantic

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tically significant operator-variable relation.² Intuitive support for this suggestion can be found in the contrast between (3b) and (4b).³

- (3) a. [_S *who_j* [_S [_{VP} *said* [_S *that* [_S *that book_i* [_S *John* [_{VP} *bought t_i*]]]]]]]]]
 b. * [_S *who_j* [_S [_{VP} *said* [_S *that* [_S *which book_i* [_S *John* [_{VP} *bought t_i*]]]]]]]]]
 (4) a. [_S *sono hon-o_i* [_S *John-ga* [_{VP} *t_i katta*]]] (*koto*)
 that book-ACC John-NOM bought fact
 'John bought that book.'
 b. [_S *dono hon-o_i* [_S *John-ga* [_{VP} *t_i katta*]]] *no*
 which book-ACC John-NOM bought
 'Which book did John buy?'

It is argued in Baltin (1982) that English topicalization can involve adjunction to S, as shown in the embedded clause of (3a).⁴ Example (3b), on the other hand, indicates that a *wh*-phrase cannot be topicalized in English. The contrast between (3a) and (3b) suggests that the phrase adjoined to S by topicalization is in fact interpreted as a topic, and that the unacceptability of (3b) is due to the incompatibility arising from a *wh*-operator being a topic operator at the same time. Sentence (4b), in contrast, shows that a *wh*-phrase can be adjoined to S by scrambling. This fact suggests that a scrambled phrase is not interpreted as a topic, and further, that it may not be interpreted as any kind of semantic operator.

In this paper, I argue that the two hypotheses mentioned above concerning the nature of scrambling are both correct. That is, I argue that scrambling is S-structure A'-movement, and yet it does not, or at least need not, establish a semantically significant operator-variable relation. In §1 I briefly discuss Hoji's (1985) paradigm as evidence that scrambling is S-structure movement to A'-position. Then in §2 I argue that scrambling, an S-structure movement operation, can be freely undone in the LF component. If this conclusion is correct, then the LF representation of (2), for example, can be as in (5):

- (5) [_S *Mary-ga* [_{VP} *sono hon-o yonda*]] (*koto*)

This in effect amounts to saying that scrambling can be merely "stylistic" in the relevant sense. If scrambling can be undone in LF, then it need not have any significant semantic import. Finally, in §3 I speculate on why scrambling, as opposed to English topicalization and *wh*-movement, can be merely "stylistic," despite the fact that it is S-structure movement to A'-position.

1. Hoji's Paradigm

Hoji (1985) discusses the following paradigm as evidence that scrambling is a subcase of S-structure Move- α :⁵

- (6) a. (??) [_S *dare_i-ga* [_{VP} [_{NP} [_S *pro_j e_i hitome mita*] *hito_j]-o*]
 who -NOM once saw person-ACC
suki-ni nata] *no*
 fell-in-love-with

- b. ?* [_S [_{NP} [_S *pro_j e_i hitome mita*] *hito_j]-ga* [_{VP} *dare_i-o*]
 once saw person-NOM who-ACC
suki-ni nata] *no*
 fell-in-love-with

- c. 'the person who took a glance at e_i fell in love with who_j '
dare_i-o [_S [_{NP} [_S *pro_j e_i hitome mita*] *hito_j]-ga*
 who-ACC once saw person-NOM
 [_{VP} t_i *suki-ni nata*] *no*
 fell-in-love-with

- d. (??) [_{NP} [_S *pro_j e_i hitome mita*] *hito_j]-o* [_S *dare_i-ga*
 once saw person-ACC who-NOM
 [_{VP} t_i *suki-ni nata*] *no*
 fell-in-love-with

'the person who took a glance at e_i , who_j , fell in love with t_i '

Japanese lacks syntactic *wh*-movement, and the *wh*-phrase *dare* 'who' is in situ in (6a), (6b), and (6d). In (6c)–(6d) the matrix object is scrambled to the sentence-initial position. In (6c), the matrix object is the *wh*-phrase *dare*, and hence the *wh*-phrase appears sentence-initially.

As Hoji points out, this paradigm is expected if we assume that scrambling involves S-structure movement to A'-position. The configurational relations of the *wh*-phrase and the coindexed empty category in (6a)–(6d) are as in (7a)–(7d) respectively.

- (7) a. [_S QNP_i [_{VP} . . . e_i . . .]]
 b. [_S [_{NP} . . . e_i . . .] [_{VP} . . . QNP_i. . .]]
 c. QNP_i [_S [_{NP} . . . e_i . . .] [_{VP} . . . t_i . . .]]
 d. [_{NP} . . . e_i . . .]_j [_S QNP_i [_{VP} . . . t_i . . .]]

Japanese has null pronouns, and nothing seems to prevent e_i in (7a) from being a *pro*. In fact, since QNP_i c-commands e_i in (7a), the latter can be a bound pronoun.⁶ Thus, the grammaticality of (6a) is expected, exactly as the English example in (8):

- (8) *Everyone_i loves his_i mother*

The marginality of (6b) is also expected if we assume that e_i in this example is *pro*. This is so since if e_i is a pronoun, then (7b) is a configuration of weak crossover. More specifically, (7b) then contains a QNP that does not c-command a coindexed pronoun. Thus, (6b) is ruled out in exactly the same way as the English (9):

- (9) ?**His_i mother loves everyone_i*

The empty category e_i in (7c), unlike those in (7a)–(7b), is A'-bound. Further, it neither c-commands nor is c-commanded by t_i . Thus, it need not be a null pronoun but can be a parasitic gap. That is, the grammaticality of (6c) can be accounted for in the same way as that of (10), which is from Kayne (1983):

- (10) ?*a person who_i close friends of e_i admire t_i*

In (7d), e_i is neither c-commanded by QNP_i nor A'-bound. However, QNP_i c-commands the trace of the NP that contains e_i . Thus, as Hoji points out, (7d) has the configuration of "chain binding" in the sense of Barss (1984).⁷ Hence, if e_i in (6d) is *pro*, we expect the example to be grammatical exactly like English examples such as the following, which are discussed in detail in Engdahl (1981):

- (11) [*Which of his_i poems_j would every poet_i like to read t_j*]

In (11) also, the QNP (*every poet_i*) c-commands the trace of the NP (*which of his poems_j*) that contains the pronoun (*his_i*).

Hoji's paradigm in (6) shows convincingly, I believe, that scrambling applies in the mapping from D-structure to S-structure, rather than in the PF component. The contrast between (6b) and (6c), for example, indicates that scrambling can save a sentence from a weak crossover violation. Given that PF does not have anything to do with weak crossover, we can conclude that scrambling must already be represented at S-structure.⁸ Furthermore, in Hoji's account of the paradigm in (6) outlined above, it is assumed crucially that scrambling is movement to A'-position. Thus, if Hoji's account is correct, then scrambling must be A'-movement and not A-movement.

2. LF Effects of Scrambling

We saw in the preceding section that Hoji's (1985) paradigm provides evidence that scrambling is S-structure A'-movement. In this section, I argue

that scrambling can be freely undone in the LF component. The argument is based crucially on the hypothesis that the Proper Binding Condition, which requires that traces be bound, is insensitive to "chain binding" in the sense of Barss (1984). I first provide evidence for this hypothesis in §2.1 and then come back to the discussion of scrambling in §2.2.

2.1. Proper Binding and Chain Binding

Let us first consider the widely discussed examples in (12).

- (12) a. [Which picture of himself]_i does John_i like *t_i* best
b. *Himself_i, John_i loves *t_i**

The lexical anaphor *himself* is not bound in (12), yet these examples are perfectly grammatical. Similar examples in Japanese that involve scrambling are discussed in Muraki (1974) and Kuno (1973). Example (13) is grammatical despite the fact that it contains a free lexical anaphor.

- (13) [_{NP} *zibun-no hahayōya*]_o [_{VP} *John-ga [_{VP} *aisiteiru*]]] (*koto*)
self -GEN mother-ACC John-NOM love fact
'John_i loves his_i mother'*

In this example, the object NP, which contains *zibun*, is adjoined to S by scrambling. Thus, the lexical anaphor *zibun* is not bound by its antecedent *John*.

I know of two hypotheses that have been proposed to account for examples such as those in (12)–(13). Langendoen and Battistella (1982) suggest that the moved phrases in these examples are lowered to the positions of their traces by a general reconstruction rule applying in the LF component. According to this hypothesis, the anaphors in (12)–(13) are bound at LF because of this general reconstruction rule and hence satisfy Binding Theory at that level.⁹ On the other hand, Barss (1984) argues, convincingly I believe, against the reconstruction approach and proposes that anaphors need not be bound as long as they are chain-bound. That is, according to Barss (1984), (14a) is too strong, and must be replaced by (14b):¹⁰

- (14) a. Anaphors must be bound (in domain X).
b. Anaphors must be chain-bound (in domain X).

For the purpose of the discussion here, I assume the following definition of chain binding:

- (15) X CHAIN-BINDS Y =_{df} X and Y are coindexed, and
a. X c-commands Y, or
b. X c-commands a trace of Z, where Z = Y or Z contains Y.

In (12a), for example, *John* chain-binds *himself*, since they are coindexed and *John* c-commands the trace of *which picture of himself*, which contains *himself*. Similarly, *John* chain-binds *himself* in (12b), since they are coindexed and the former c-commands the trace of the latter. Thus, if anaphors need not be bound as long as they are chain-bound, as Barss argues, then the grammaticality of (12)–(13) is expected.

Barss's (1984) arguments for the chain-binding account of (12)–(13) seem to be quite convincing. At the same time, there is evidence that traces, as opposed to lexical anaphors, cannot satisfy Binding Theory by virtue of chain binding, but must be bound. That is, the relevant facts indicate that the Proper Binding Condition must be stated as in (16) in terms of binding and not in terms of chain binding.

- (16) Traces must be bound. (Fiengo 1977, May 1977)

First, consider the following examples:

- (17) a. *??Who_i do you wonder [which picture of *t_i]* John likes *t_i*
b. **[Which picture of *t_i]* do you wonder who_i John likes *t_i***

Example (17a), which is due to Howard Lasnik (pers. comm.), is marginal, probably being a weak Subjacency violation.¹¹ Example (17b), on the other hand, is hopeless and contrasts sharply with (17a). This contrast indicates that (17b) is not a mere Subjacency violation, but violates the Proper Binding Condition as well because of the trace *t_i*. But note here that the offending trace *t_i* is chain-bound by *who_i* in this example. The latter c-commands the trace of the matrix *wh*-phrase, which contains *t_i*. On the other hand, the trace *t_i* is clearly not bound by *who_i* in this example. Hence, if (17b) violates the Proper Binding Condition, as seems to be the case, then this condition must be insensitive to chain binding, and must be stated in terms of binding.¹²

The same point can be made also on the basis of the examples in (18):

- (18) a. *Who_i *t_i* knows [which picture of whom]_j Bill bought *t_i*
b. *??[Which picture of whom]_j do you wonder who_i *t_i* bought *t_i***

It is pointed out in van Riemsdijk and Williams (1981) that (18a) is ambiguous; *whom* can take matrix or embedded scope. When *whom* has matrix scope, the LF representation of (18a) is as in (19):¹³

- (19) [_{S'} [_{whom_i who_j]_i [_S [_{whom_k who_l]_k [_S Bill bought *t_i*]]]]]}}

Example (18b), on the other hand, is clearly unambiguous. The sentence is a Subjacency violation and hence is marginal to begin with. But if we ignore its marginal status, it is clear that the sentence can have the interpreta-

tion in which *whom* takes matrix scope. The interpretation in which *whom* takes embedded scope, on the other hand, is simply impossible. This indicates that (18b) cannot have the LF representation in (20):

- (20) [_S [*which pictures of t_k*] [_S *do you wonder* [_S [*whom_k who_j*]
[_S *t_j bought t_i*]]]]]

The structure in (20) can be ruled out by the Proper Binding Condition only if the condition is stated in terms of binding, not chain binding. The trace *t_k* is chain-bound by *whom_k*, since the latter c-commands *t_i*, whose A'-binder contains the former. Thus, (18b) also provides evidence that the Proper Binding Condition is insensitive to chain binding.

The contrast in (21) leads us to the same conclusion:

- (21) a. ??*Who_i t_i said that [the man that bought what_j, John knows
whether Mary_i likes t_j
b. *Mary thinks that [the man that bought what_j, John knows
who_i t_i likes t_j*

Both examples in (21) are Subjacency violations, since the embedded topics are moved out of *wh*-islands. Example (21a) is only marginal, and hence does not seem to violate any other constraint. A possible interpretation, in fact the only possible interpretation, for this sentence is the one in which *what* takes matrix scope. This implies that (22) is a possible LF representation for (21a):

- (22) [_S [*what_k who_j*] [_S *t_i said* [_S [*the man that bought t_k*]_j], *John knows* [_S [*whether* [_S *Mary likes t_j*]]]]]]

Example (21b), on the other hand, is hopeless, and clearly is not a mere Subjacency violation. Since *what* has to move to a [+wh] Comp in LF, the LF representation of (21b) is as in (23):

- (23) [_S [*Mary thinks* [_S [*that* [_S [*the man that bought t_k*]_j], *John knows* [_S [*what_k who_j*] [_S *t_i likes t_j*]]]]]]

Here, if the Proper Binding Condition is insensitive to chain binding, as I argued above, then (23) is straightforwardly ruled out by this condition. In (23), *what_k* chain-binds *t_k*, since it c-commands *t_i*, whose A'-binder contains *t_k*. But it clearly does not bind *t_k*. Hence, the contrast in (21) provides us with additional evidence that the Proper Binding Condition should be stated in terms of binding, and not in terms of chain binding.

2.2. Scrambling and the Proper Binding Condition

We saw in the preceding section that while lexical anaphors can satisfy Binding theory by virtue of chain binding, traces cannot. This implies that while

Condition (A) of Binding theory should be stated in terms of chain binding, the Proper Binding Condition should be stated in terms of binding.¹⁴ Scrambling provides further evidence for the insensitivity of the Proper Binding Condition to chain binding. Before I introduce the crucial data, let me briefly go over some basic facts of scrambling. First, as shown in (24), multiple scrambling is possible, i.e., two constituents can be preposed by scrambling in a single sentence.

- (24) a. [_S *Mary-ga John-ni sono hon-o watasia*] (*koto*)
Mary-NOM John-to that book-ACC handed fact
'Mary handed that book to John.'
b. [_S *sono hon-o_i John-ni_j Mary-ga t_i watasia*]]] (*koto*)
c. [_S *John-ni_j sono hon-o_i Mary-ga t_j watasia*]]] (*koto*)

Second, as pointed out by Haig (1976) and S.-I. Harada (1977), among others, scrambling is not clause-bound. For example, (25b) is perfectly grammatical:

- (25) a. [_S *John-ga Mary-ga sono hon-o yonda to*] *itai*] (*koto*)
John-NOM Mary-NOM that book-ACC read COMP said fact
'John said that Mary read that book.'
b. [_S *sono hon-o_i John-ga_j Mary-ga t_i yonda to*] *itai*]]] (*koto*)

In fact, multiple "long-distance" scrambling is possible, as shown in (26):¹⁵

- (26) a. [_S *Mary-ga John-ga Bill-ni sono hon-o watasia to*] [_S [*Mary-NOM John-NOM Bill-to that book-ACC handed COMP omoiteru*]]] (*koto*)
fact think fact
'Mary thinks that John handed that book to Bill.'
b. [_S *sono hon-o_i Bill-ni_j Mary-ga_k John-ga_l t_i watasia to*] [_S [*omoteru*]]] (*koto*)
c. [_S *Bill-ni_j sono hon-o_i Mary-ga_k John-ga_l t_i watasia to*] [_S [*omoteru*]]] (*koto*)

Finally, not only NPs and PPs but also S's are subject to scrambling. This is shown by the examples in (27):

- (27) a. [_S *John-ga Mary-ga sono hon-o yonda to*] *itai*] (*koto*)
John-NOM Mary-NOM that book-ACC read COMP said fact
(= 25a)
'John said that Mary read that book.'

- b. [_S [*Mary-ga sono hon-o yonda to*]_j] [_S *John-ga t_j itai*]]] (*koto*)

Despite the properties of scrambling discussed above, examples such as those in (28)–(29) are ungrammatical.

- (28) * [_S [_S *Mary-ga* *t_i yonda to*]_J [_S *sono hon-o*]_J [_S *John-ga t_i ita*]]]
 Mary-NOM read COMP that book-ACC John-NOM said
 (*koto*)
 fact

'John said that Mary read that book.'

- (29) * [_S [_S *Bill-ga t_i sundeiru to*]_J [_S *sono mura-ni*]_J [_S *John-ga t_i*
 Bill-NOM reside COMP that village-in John-NOM
omotteiru]]] (*koto*)
 think fact
 'John thinks that Bill lives in that village.'

Example (28), for example, is derived from (25a), by first scrambling the embedded NP object to the sentence-initial position as in (25b), and then, by adjoining the embedded S' to the matrix S. Since multiple scrambling, "long-distance" scrambling, and scrambling of S' are all possible, there is nothing wrong with the movement operations involved in the derivation of (28). Hence, it is reasonable to assume that (28) is ruled out by the Proper Binding Condition, *t_i* being the offending trace. But *t_i* in (28) is chain-bound by *sono hon-o*. The latter c-commands *t_i*, and *t_i*'s antecedent contains *t_i*. On the other hand, *t_i* is not bound by *sono hon-o*. Thus, the ungrammaticality of (28)–(29) also indicates that the Proper Binding Condition is insensitive to chain binding.

2.3. LF "Reconstruction" of Scrambled Constituents

We have seen in §2.2 that traces created by scrambling are constrained by the Proper Binding Condition exactly as expected, provided that the condition is insensitive to chain binding. That is, we have seen that traces created by scrambling and those created by *wh*-movement in English behave in exactly the same way with respect to the Proper Binding Condition. In this section, I discuss the traces created by LF *wh*-movement in Japanese and examine how they are constrained by the Proper Binding Condition.

First, it is shown convincingly in K. I. Harada (1972) that the traces created by LF *wh*-movement in Japanese are subject to the Proper Binding Condition.¹⁶ For example, (30a) and (31a) contrast sharply with (30b) and (31b):

- (30) a. [_S *John-ga Mary-ni* [_S [_S *dare-ga kuru*] *ka*] *osieta*] *koto*
 John-NOM Mary-to who-NOM come Q taught fact
 'the fact that John told Mary Q who is coming'
 b. * [_S *John-ga dare-ni* [_S [_S *Mary-ga kuru*] *ka*] *osieta*] *koto*
 John-NOM who-to Mary-NOM come Q taught fact
 'the fact that John told who Q Mary is coming'

- (31) a. [_S *John-ga* [_S [_S *dare-ga sono hon-o katta*] *ka*]
 John-NOM who-NOM that book-ACC bought Q
siriagatteiru] *koto*
 want-to-know fact

'the fact that John wants to know Q who bought that book'

- b. * [_S *dare-ga* [_S [_S *John-ga sono hon-o katta*] *ka*]
 who-NOM John-NOM that book-ACC bought Q
siriagatteiru] *koto*
 want-to-know fact
 'the fact that who wants to know Q John bought that book'

In Japanese, an embedded Comp is [+*wh*] if and only if it contains the Q-morpheme *ka*. Hence the *wh*-phrases in (30)–(31) must move to the most deeply embedded Comp in LF. Consequently, the LF representations of (31a)–(31b), for example, are as in (32a)–(32b):

- (32) a. [_S *John-ga* [_S [_S *sono hon-o katta*] *dare-ga*]_J *siriagatteiru*]
koto
 b. [_S *t_i* [_S [_S *John-ga sono hon-o katta*] *dare-ga*]_J *siriagatteiru*]
koto

Here, *t_i* is bound by *dare-ga* in Comp in (32a), but not in (32b). Hence, (32b) is ruled out by the Proper Binding Condition at LF. The contrast in (30) is accounted for similarly. That is, (30b), but not (30a), violates the Proper Binding Condition at LF. According to this analysis, the contrast in (30)–(31) is treated in exactly the same way as that between the English (33a) and (33b).

- (33) a. *I urged Bill to find out* [_S *who*]_J [_S *Mary saw t_i*]
 b. * *I urged t_i to find out* [_S *who*]_J [_S *Mary saw John*]]

The trace *t_i* is free in (33b), and hence is in violation of the Proper Binding Condition.

Let us now turn to slightly more complicated cases. As we saw in (4) above, a *wh*-phrase can be scrambled to the sentence-initial position in Japanese. Interestingly enough, it can be scrambled, although somewhat marginally, even to a position outside the c-command domain of the Comp where it takes scope at LF. Example (34b) is somewhat marginal, but is far better than (30b)–(31b).

- (34) a. [_S *Mary-ga* [_S [_S *John-ga dono hon-o tosyokan-kara*
 Mary-NOM John-NOM which book-ACC library-from
karidasita] *ka*] *siriagatteiru*] *koto*
 checked-out Q want-to-know fact

'the fact that Mary wants to know Q John checked out which book from the library'

- b. ?₁ [_S *dono hon-o₁ [_S *Mary-ga* [_S [_S *John-ga t_i tosyokan-kara karidasita*] *ka*] *siriagatteiru*] *koto**

Dono hon-o 'which book-ACC' in (34) moves into the most deeply embedded Comp marked by *ka* in LF, and takes scope there. In (34b), the *wh*-phrase is clearly scrambled out of the c-command domain of this Comp.¹⁷ A still more interesting example for our purpose is (35b):

- (35) a. [_S *Mary-ga* [_S [_S *mina-ga* [_S [_S *John-ga dono hon-o* *Mary-NOM all-NOM John-NOM which book-ACC tosyokan-kara karidasita*] *to*] *omotteiru*] *ka*] *library-from checked-out COMP think Q siriagatteiru*] *koto*
 want-to-know fact
 'the fact that Mary wants to know Q everyone thinks that John checked out which book from the library'
 b. ?₁ [_S [_S *John-ga dono hon-o tosyokan-kara karidasita*] *to*]₁
 [_S *Mary-ga* [_S [_S *mina-ga t_i omotteiru*] *ka*] *siriagatteiru*] *koto*

Example (35b) is derived from (35a) by scrambling the most deeply embedded S' to the initial position. The scrambled S' contains a *wh*-phrase, *dono hon* 'which book,' and is scrambled out of the c-command domain of the Comp where this *wh*-phrase takes scope at LF. Example (35b) is also marginal, and is somewhat worse than (34b). But it is still far better than (30b) and (31b), which indicates that it is not a Proper Binding Condition violation.

Let us examine (35b) more closely. The structure of the relevant part of the example is shown in (36):

- (36) [_S [_S . . . *wh* . . .]₁ [_S . . . [_S [_S . . . *t_i* . . .] Q] . . .]]

Although the S' containing the *wh* is scrambled to the sentence-initial position, the *wh* must still take scope at the position of the Q-morpheme. Hence, the *wh* must move to the position of Q in LF. If we directly apply this LF *wh*-movement to (36), we obtain the structure in (37):

- (37) [_S [_S . . . *t_i* . . .]₁ [_S . . . [_S [_S . . . *t_i* . . .] *wh₁*] . . .]]

But we know that the LF representation of (35b) cannot have the structure in (37). In (37), the trace *t_i* is not bound, and hence is in violation of the Proper Binding Condition. The trace is chain-bound since it is contained in

S'₁ and the *wh* c-commands *t_i*. But this is irrelevant, since, as we saw above, the Proper Binding Condition is insensitive to chain binding. Note that the structure in (37) is in relevant respects identical to that of (23), the LF representation of the ungrammatical English example (21b).

What, then, is the structure of the LF representation of (35b)? We know that the *wh* has to move to the position of Q. Furthermore, since the example is not a Proper Binding Condition violation, the trace of the *wh* must be within the c-command domain of the *wh* at LF. It then must be the case that the scrambled S' in (35b) is moved back to a position within the c-command domain of Q in LF. That is, it must be the case that in LF, not only does the *wh* move to the position of Q, but also the scrambled S' moves to a position within the c-command domain of the moved *wh*. Then, the structure of the LF representation of (35b) will be as in (38), and not (37):

- (38) [_S . . . [_S [_S . . . *t_i* . . .] . . .] *wh₁*] . . .]

In (38), the trace *t_i* is bound, and hence satisfies the Proper Binding Condition. Since the LF in (38) can be obtained only by lowering the scrambled S', we are led to the conclusion that scrambling can be freely undone in the LF component.

The conclusion drawn here implies that the reconstruction hypothesis of Langendoen and Battistella (1982) holds in essence for scrambling, although not for *wh*-movement and topicalization in English. Let us consider again (12a), repeated as (39):

- (39) [Which picture of himself]₁ does John₁ like *t_i* best

As mentioned in §2.1 Langendoen and Battistella (1982) suggests that *which picture of himself*₁ in (39) is lowered to the position of *t_i* in LF by a general reconstruction rule, so that *himself*₁ is bound by *John*₁ at LF. The example in (18b), repeated as (40), provides evidence against this approach and hence for Barss's (1984) chain-binding analysis of (39), which I have been assuming in this paper.

- (40) ?[Which picture of whom]₁ do you wonder who₁ *t_i* bought *t_i*

As pointed out above, this sentence cannot have the interpretation in which *whom* takes scope at the embedded Comp. And this fact is straightforwardly accounted for by the Proper Binding Condition, since if *whom* is moved to the embedded Comp in LF, then its trace will not be bound at LF. But if there is a general reconstruction rule that lowers *which picture of whom*₁ in LF to the position of *t_i*, then it is not clear how to prevent *whom* from taking scope at the embedded Comp. Thus, (40) indicates that there is

no "general reconstruction rule" of the kind suggested in Langendoen and Battistella (1982). However, our conclusion that scrambling is freely undone in the LF component in effect amounts to saying that scrambled constituents, in particular, can be "reconstructed" in LF. Since nothing seems to prevent us from supposing that this LF lowering or "reconstruction" is achieved by application of Move- α in LF, I will assume that this is the case.¹⁸

I argued above that scrambling differs from *wh*-movement and topicalization in English in that it can be freely undone in the LF component. According to this hypothesis, the D-structure of (41) is as in (42), and its LF can be as in (41) or as in (42):

- (41) [_S sono hon-o; [_S John-ga [_{VP} t_i katta]]] (koto) (= (4a))
that book-Acc John-NOM bought fact

- (42) [_S John-ga [_{VP} sono hon-o katta]] (koto)
'John bought that book.'

Since LF is the level that feeds into semantic interpretation in the relevant sense, this conclusion implies that scrambling does not, or at least need not, establish a semantically significant operator-variable relation.¹⁹

3. Summary and Speculations

I have argued in this paper that scrambling is S-structure A'-movement and, further, that it can be freely undone in the LF component. The latter conclusion implies that scrambling need not establish a semantically significant operator-variable relation, as already suggested in Ross (1967), N. McCawley (1976), and Chomsky and Lasnik (1977), among others.

If the conclusions arrived at in this paper are correct, then a question naturally arises as to why scrambling, but not *wh*-movement and topicalization in English, can be freely undone in LF. Before I conclude this paper, I will briefly speculate on this difference between scrambling on the one hand and *wh*-movement and topicalization on the other.

First, it is well known that a *wh*-phrase that is already in Comp at S-structure must be in the same Comp at LF. Consider the following example:

- (43) [_S' Who_i [_S t_i wonders [_S' where_j [_S we bought what t_j]]]]]

As Baker (1970) points out, (43) is only two ways ambiguous. *What* can take scope either at the matrix Comp or at the embedded Comp. But *where* can only have the embedded sentence as its scope, i.e., it must be in the

embedded Comp at LF. Thus, descriptively, the scope of the *wh*-phrases that underwent syntactic *wh*-movement is determined at S-structure.²⁰ This description may be generalized to cases of topicalization. Let us consider again (21b), repeated as (44):

- (44) *Mary thinks that [_S the man that bought what_j], John knows who_i t_i likes t_j

If the scope of the topic, *the man that bought what*, is determined at S-structure, then it cannot lower in LF to the position of t_j or to any other position within the scope of the most deeply embedded Comp. Thus, when *what* moves to the most deeply embedded Comp in LF, its trace violates the Proper Binding Condition.

Now the question is why scrambled phrases need not stay at their S-structure positions in LF. If one assumes Baltin's (1982) analysis of English topicalization, as I do here, then both scrambling and English topicalization can involve adjunction to S. Thus, the peculiarity of scrambling in question cannot be attributed to some universal property of adjoined positions. It seems then that the difference between scrambling and English topicalization, i.e., the fact that only the former can be undone in LF, must be attributed to some independent difference between Japanese and English. For this I do not have a definite proposal to make at this point. In the remainder of this paper, however, I would like to suggest a possible first step toward the solution of this problem. More specifically, I will try to relate the peculiarity of scrambling in question, descriptively, to the fact that Japanese, but not English, has what is called the multiple subject construction.²¹

Some examples of the multiple subject construction, which are taken from Kuno (1973), are shown in (45):

- (45) a. [_S yama-ga [_S ki-ga kirai-desu]]
mountain-NOM tree-NOM pretty-be
'It is the mountains where trees are beautiful.'
b. [_S bunnai-koku-ga [_S dansei-ga [_S heikinzyumyo-ga
civilized country-NOM male-NOM average lifespan-NOM
mizikai]]]
is short
'It is in civilized countries that men are such that their average
lifespan is short.'

In (45a), for example, the embedded sentence functions as a "predicate" and licenses the additional subject *yama* 'mountain,' which appears in nomi-

native Case. It is argued in Shibatani and Cotton (1976–77), Hoji (1980), and Saito (1982), among others, that these “additional subjects” are base-generated in the position adjoined to S. If this analysis is correct, then in Japanese an NP can appear in the position adjoined to S at D-structure. However, if scrambling is A'-movement, as I have been assuming in this paper, then a phrase adjoined to S by scrambling is in A'-position. In order to ensure that the position adjoined to S is in general an A'-position, let us adopt the following definition of A/A'-positions:

- (46) An A-POSITION is a position in which an NP can appear at D-structure and to which a θ -role can be assigned provided that there is an appropriate θ -role assigner. An A'-POSITION is one that is not an A-position. (See Chomsky (1981:47).)

Let us assume here, as seems reasonable, that the “additional subjects” in (45) are not assigned a θ -role, but are licensed by some sort of aboutness relation. Then (46) implies that the position adjoined to S is an A'-position even in Japanese, since it is not a potential θ -position. The fact that an NP can be base-generated in that position does not suffice to make it an A-position. Thus, given (46), we can maintain both the analysis of the multiple subject construction, mentioned above, and the analysis of scrambling as A'-movement. The position adjoined to S is an A'-position in general, in both English and Japanese.

But at the same time it is clear that the nature of the position adjoined to S differs in English and Japanese. An NP can be base-generated in that position in Japanese as shown in (45), but not in English. In order to capture this difference, let us now define D/D'-positions as follows:

- (47) A D-POSITION is a position in which an NP can appear at D-structure and can be licensed as a nonoperator. A D'-POSITION is one that is not a D-position.

The “additional subjects” in (45) are nonoperators in the sense that they need not bind a variable (or anything else) at any level. Hence, the position adjoined to S is a D-position in Japanese. In English, since an NP cannot appear in this position at D-structure, it is a D'-position.

Given (47), the fact that *wh*-movement and topicalization cannot be undone in LF may be described as in (48)–(49).

- (48) At S-structure, a constituent in D'-position binding a trace must be licensed as an operator.
 (49) If X is licensed as an operator at position Y, then it must take scope at that position.

Statement (48) ensures that *wh*-phrases in Comp and topics adjoined to S are licensed as operators at S-structure. Statement (49), on the other hand, states that a constituent that is licensed as an operator at S-structure must take scope at its S-structure position, and in particular, cannot be lowered in LF. Statements (48)–(49) are irrelevant for scrambling, since scrambled constituents adjoined to S are in D-position. Thus, scrambling can be undone in LF without contradicting (48)–(49). Statements (48)–(49) are mere descriptive statements at this point, and if they are correct, they themselves must be explained in a principled way. However, as noted above, it seems that the fact that scrambling in Japanese, but not *wh*-movement and topicalization in English, can be undone in LF must be explained in terms of some independent difference between the two languages. Statements (48)–(49), I believe, suggest a possible direction to pursue in this research.

NOTES

1. *Koto* ‘the fact that’ is added to the end of some of the example sentences to avoid the unnaturalness resulting from the lack of topic in a matrix sentence. I ignore *koto* in the translations of those examples.
2. Chomsky and Lasnik (1977), for example, assumes that scrambling applies in the PF component and hence that its application has no effects on the LF representations. The nonconfigurational analysis of the Japanese “free word-order phenomenon” proposed by Hale (1980) and Farmer (1980) is also based on the assumption that scrambling, as a phenomenon, does not have any significant semantic import.
3. There is considerable variation among speakers’ judgments with respect to the acceptability of sentences involving embedded topicalization. In this paper, I assume the judgments of those who allow embedded topicalization relatively freely. To them, the contrast between (3a) and (3b) is quite clear.
4. See Lasnik and Saito (in preparation) for further evidence that English topicalization can involve adjunction to S.
5. The strongly preferred reading for (6a) and (6d) is the one in which *dare* is coindexed with the relative clause subject, and the relative head with the relative clause object. These examples are somewhat marginal under the intended interpretation. But I assume, following Hoji (1985), that the explanation of this marginality falls outside the domain of sentence grammar. See also Kornfilt, Kuno, and Sezer (1980) for relevant discussion. For an attempt to provide a syntactic account for the marginality of (6a) and (6d), see Hasegawa (1985).
6. We assume the following definition of “bind” throughout this paper:

X BINDS Y =_{df} (i) X and Y are coindexed, and (ii) X c-commands Y.

See Chomsky (1981) and the references cited there. “C-command” is defined as follows:

X C-COMMANDS $Y =_{df}$ the branching node most immediately dominating X also dominates Y.

See Reinhart (1981) and the references cited there.

7. "Chain binding" is defined in (15) below. This relation is discussed in detail in §2 of this paper.

8. Note that given the standard account of weak crossover, the contrast between (6b) and (6c) provides further evidence against the functional approach to empty categories (Chomsky 1982). Suppose that weak crossover rules out the following configuration at LF:

- (i) . . . QNP [\dots pronoun $t_i \dots t_j \dots$] . . . (order irrelevant),

where QNP binds the pronoun and the trace, and the trace does not bind the pronoun. The LF of (6b) has the configuration in (7c) after QR (Quantifier Raising) takes place. Thus the example is ruled out as a weak crossover violation only if e_i cannot become a parasitic gap and must remain a pronoun at that level. Hence, (6b) shows that an S-structure null pronoun must remain a pronoun at LF and cannot become a parasitic gap at that level. See Safir (1984) and Chomsky (1986) for additional arguments against the functional approach to empty categories.

9. See also Chomsky (1981:345) for relevant discussion. It is assumed in Langendoen and Battistella's approach that lexical anaphors are subject to Binding theory only at LF.

10. "Chain binding," as opposed to "binding," seems to be the relevant relation not only for lexical anaphors but also for bound pronouns, as we saw in (6d) and (11). Discussing examples such as those in (12), Barss (1984) proposes "chain binding" as a substitute for "binding" in general, and hence, as the only binding relation in Binding theory. Although this assumption is quite attractive conceptually, I do not adopt it here for reasons that will become clear immediately below.

11. See Chomsky (1986:26) for similar examples in Spanish, which he attributes to Esther Torrego.

12. Maggie Browning has independently come up with a pair similar to (17) which involves VP proposing. (1a) is clearly better than (1b), which is hopeless.

- (i) a. . . . *ready to marry John, I wonder whether Mary is*
b. . . . *ready to marry t_i , I wonder who $_j$ Mary is*

13. Since (19) is well formed, it must be the case that t_i satisfies the Proper Binding Condition. That is, *whom* must c-command t_i in this example. However, given the definition of c-command in note 6, it is not clear how this is possible. I assume here that such c-command, i.e., "c-command out of Comp," is possible for the purpose of Proper Binding, because of absorption in the sense of Higginbotham and May (1981).

14. In the discussion of the Proper Binding Condition so far, I have considered only traces of *wh*-movement, and not those of NP-movement. There are well-known examples such as (i), which suggest that traces of NP-movement can satisfy Binding theory by virtue of chain binding.

- (i) [*How likely t_i to win*] $_j$ is *John* $_j$ t_j

In (i), the NP-trace t_i is not bound, but is chain-bound, by *John* $_j$. Given examples such as (i), I proposed in Saito (1986) that chain binding is relevant for A-binding, but not for A'-binding.

However, Anthony Kroch (pers. comm.) pointed out to me that there are similar but completely ungrammatical examples, due originally to Mark Baltin, such as those in (ii)-(iii), and these examples, as opposed to (i), clearly involve NP-movement.

- (ii) * [*How likely t_i to be a riot*] $_j$ is *there* $_j$ t_j
(iii) * [*How likely t_i to be taken t_j of John*] $_j$ is *advantage* $_j$ t_j

Examples (ii)-(iii) suggest that the Proper Binding Condition, which constrains traces of NP-movement as well as those of *wh*-movement, is insensitive to chain binding in general, as assumed in the text of this paper, and that examples such as (i) should be explained in some other way. See Lasnik and Saito (in preparation) for detailed discussion. Since traces of NP-movement are subject to both Condition (A) and the Proper Binding Condition, I assume here that (ii)-(iii) satisfy the former but violate the latter. A question, of course, remains as to why chain binding is relevant for Condition (A) but not for the Proper Binding Condition.

15. Examples (26b)-(26c) are awkward for some speakers. Scrambled phrases, especially those that are scrambled "long-distance," often receive some sort of focus interpretation. The awkwardness of (26b)-(26c) may be due to this effect. That is, these sentences may be interpreted as having two focused constituents, and this may be the reason for the awkwardness.

16. K. I. Harada (1972), of course, does not presuppose Trace theory, and hence does not explicitly make use of the Proper Binding Condition as such. But her analysis can be easily translated into one in terms of this condition, and her insight, I believe, is not affected by such translation.

17. The marginality of (34b) may be in part due to Subadjacency. The scrambled NP in this example is moved out of a *wh*-island. Further, it seems likely that there is a weak S-structure constraint requiring *wh* to be within the c-command domain of the Q-morpheme that it is "associated with."

18. I assume here, following Lasnik and Saito (1984), that a moved constituent need not leave a trace unless the trace is required by independent principles. The analysis proposed in the text implies that no principle requires the LF lowering of a scrambled constituent to produce a trace. Otherwise, the LF lowering will result in a Proper Binding Condition violation.

19. Given that scrambling can be freely undone in LF, the analysis of (28)-(29) proposed above implies that the Proper Binding Condition applies at S-structure as well as at LF. There will be no trace in (28)-(29) violating the Proper Binding Condition after scrambling is undone in LF.

20. Aoun, Hornstein, and Sportiche (1981) state that *wh*-raising (LF *wh*-movement) can take place only from A-position. Lasnik and Saito (1984) discuss the relevant cases in detail and propose an account for the phenomenon in question

in terms of Comp indexing. But this account does not cover the case of topicalization discussed immediately below.

21. See Kuroda (1965, 1984), Kuno (1973), Shibatani and Cotton (1976–77), Hoji (1980), and Saito (1982) for discussion of the multiple subject construction in Japanese. Interesting attempts to relate the possibility of scrambling to that of the multiple subject construction are found in Kuroda (1985) and Fukui (1986). They are concerned not with the peculiarity of scrambling discussed in this paper, but with the more general issue of why scrambling and multiple subject construction are allowed in Japanese. See also Kitagawa (1986) for relevant discussion.

9

Constituency and Coordination in a Combinatory Grammar

MARK STEEDMAN

The present paper modifies and extends an earlier proposal to explain the syntax and semantics of unbounded dependency and coordination in natural language using a generalization of the Categorical Grammars (CGs) of Ajdukiewicz (1935) and others (cf. Lyons 1968). The theory follows traditional CG in assigning lexical and phrasal grammatical categories a syntactic and semantic type defining them either as atomic ARGUMENTS or as (directional) FUNCTIONS from one type into another. However, whereas CG categories define legal syntactic structures (and the associated interpretations) solely via the operation of Functional Application, the present theory departs from “pure” CG in including certain further “combinatory” operations for combining grammatical entities. The combinatory rules notably include Functional Composition and Type-raising. The inclusion of these operations dramatically changes what is meant by the notion “surface constituent.” The present paper examines the consequences for the grammar of coordination.

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References

ABBREVIATIONS

- ACL *Proceedings of the Association of Computation Linguistics*
BLS *Proceedings of the Annual Meeting of the Berkeley Linguistics Society*
CLS *Papers from the Regional Meeting of the Chicago Linguistic Society*
COLING *Proceedings of the International Conference on Computational Linguistics*
ESCOL *Proceedings of the Eastern States Conference on Linguistics*
FL *Foundations of Language*
LA *Linguistic Analysis*
Lg. *Language*
LI *Linguistic Inquiry*
LP *Linguistics and Philosophy*
LR *Linguistic Review*
NELS *Proceedings of [formerly Papers from] the North Eastern [formerly New England] Linguistic Society*
NLLT *Natural Language and Linguistic Theory*
WCCFL *Proceedings of the West Coast Conference on Formal Linguistics*
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