

Midway Coordination: ATB and RNR vs. PG Constructions in English*

Myung-Kwan Park
(Dongguk University)

Park, Myung-Kwan. (2006). Midway Coordination: ATB and RNR vs. PG Constructions in English. *Language Research* 42.2, 299-321.

This paper investigates three constructions in English which apparently contain two gaps: (i) the across-the-board (ATB) construction; (ii) the parasitic gap (PG) construction; (iii) the right node raising (RNR) construction. Examining a new set of data involving interwoven dependency, identity, and a functional construal of the two gaps in these three constructions, I argue in favor of an approach which unifies the ATB and RNR constructions. I argue that the ATB construction cannot be reduced to a PG construction, or the other way around, though there have been recent endeavors to do so (cf. Haik 1985; Williams 1989, 1990; Munn 1998, 2001; Hornstein and Nunes 2002). Specifically, I propose that the two elements which are ATB-moved and “RNRred” in the ATB and RNR constructions undergo conjunction under coordination in the course of derivation. In the PG construction, on the other hand, there is no movement out of the adjunct clause, obviating the conjunction under coordination which is found in the other two constructions.

Keywords: across-the-board (ATB) movement, parasitic gap (PG) construction, right node raising (RNR), interwoven dependency, referential identity, functional construal, reduction/unification approach, conjunction under coordination

1. Introduction

The following three constructions, the parasitic gap (PG) construction in (1), the across-the-board (ATB) construction in (2) and the right node raising (RNR) construction in (3) apparently share one property. They are formed by two clauses each of which contains a gap (that is indicated by the symbol ○ below):

* I first thank two anonymous reviewers of this journal for their insightful comments and suggestions. I was not able to incorporate all the responses to them in the paper owing to space limitations. Thanks also go to Sung-Ho Ahn, Sungeun Cho, Ik-Hee Ihm and Sun-Woong Kim for the valuable comments on the paper. An earlier version of the paper was presented at the 2nd National Conference of the Korean Generative Grammar Circle held on May 13, 2006 at KAIST.

- (1) The parasitic gap (PG) construction:
Who do you think the police will arrest \bigcirc after interrogating \bigcirc ?
- (2) The across-the-board (ATB) construction:
Who do you think the police will arrest \bigcirc and the prosecutor will indict \bigcirc for this crime?
- (3) The right node raising (RNR) construction:
John loves \bigcirc , and Mary hates \bigcirc , oysters.

These seemingly similar constructions have received various analyses which reduce one construction to another.¹ First, Haik (1985) and then Williams (1989, 1990) takes an ATB approach to the PG construction. In their analyses, the example in (1) has undergone the following derivation:

- (4) Who₁ do you think the police will arrest t₁ after interrogating t₁?
 ↑ _____ ATB Movement _____ | _____ |

The thrust of Haik's and Williams' analysis is that movement takes place in an ATB format out of both the main and adjunct clauses of the PG construction, just as in the canonical ATB construction.

In an approach which is the exact opposite of Haik's and Williams', however, Munn (1998, 2001) takes a PG analysis of the ATB construction, arguing that there is no ATB movement whatsoever, and that the ATB construction is in fact derived by movement of an empty operator in the second conjunct clause, as in (5):

- (5) Who₁ do you think the police will arrest t₁ [**Op**₁ and the prosecutor will indict t_(PG)₁ for this crime]?

The upshot of Munn's analysis is that no movement takes place out of the second conjunct clause of the ATB construction nor out of the PG construction.

Hornstein and Nunes (2002) takes the same track as Munn, applying the concept of *sideward movement* to reduce the ATB construction to the PG one. In their analysis, the element moving either from the adjunct clause of the PG construction or the second conjunct clause of the ATB construction is merged into the main or first conjunct clause. From this position the element proceeds to form the whole extended chain of wh-movement, as in (6):

¹ However, Postal (1993) objects to the unification/reduction approach to the ATB and PG constructions.

- (6) a. Who₁ do you think the police will arrest t'₁ [t'₁ after interrogating t₁]?
 b. Who₁ do you think the police will arrest t'₁ [t'₁ and the prosecutor will indict t_(PG) for this crime]?

It is to be noted that the third RNR construction at issue has also received an ATB movement analysis. In fact, Postal (1974, 1998) argues that the right edge elements in the two conjunct clauses of the RNR construction undergo ATB movement of "right node raising," as in (7):

- (7) John loves t₁, and Mary hates t₁, oysters₁.
 | _____ | _____ ↑ ATB Right Node Raising

In Postal's analysis, movement takes place out of the first conjunct clause as well as out of the second conjunct clause.

Given the backdrop of a reduction/unification approach to the three ATB, PG, and RNR constructions, this paper will bring up more empirical data to examine the validity of this approach. In particular, it will investigate three phenomena: [i] what Postal (1998) calls "interwoven dependency," [ii] (referential) identity between two apparent gaps, and [iii] functional interpretation of the two gaps in the three constructions in question. It will be shown that the reduction/unification approach to the three constructions is not a correct one in understanding their structural properties. Rather, it will be argued that the PG construction is distinctly different from the other two constructions. The ATB and RNR constructions, in contrast to the PG construction, behave in a parallel fashion with respect to the aforementioned three phenomena.

2. New (Empirical) Challenges regarding Two Gaps

2.1. Interwoven Dependency between Two Gaps

The ATB-format movement, which was originally proposed by Williams (1978, 1979), makes it possible to target identical constituents, one inside each conjunct.² But the output yields a single instance of the constituent in a position outside the conjuncts. As noted above, this movement is attested in leftward *wh*-movement of (8a) or (8b):

- (8) Canonical ATB constructions:
 a. [Which woman]₁ did Fred date e₁ and Bob marry e₁?

² For more recent discussions on ATB movement, see Bošković and Frank (2000), Zhang (2004) and S Cho (2005).

- b. [Which pilot and which sailor]₁ will Joan invite e₁ and Greta entertain e₁?

Williams does not elaborate on exactly how a single instance of one constituent is derived from two identical ones. To my understanding he assumes that two identical constituents are base-generated in each conjunct clause and unified into one in the course of movement. Recently, however, Citko (2005) proposes that the unification proceeds through the notion of multi-dominance in the course of structure-building. The important point in Citko's proposal is that only one (shared) constituent undergoes two occurrences of Merge with its different sisters in the underlying structure.

It is to be noted that the ATB-format movement also allows for targeting two different constituents, one inside each conjunct. The output yields the coordinate structure of the two constituents in a position outside the conjunct clauses, as follows:

- (9) ATB constructions with interwoven dependency:
- a. [[Which nurse]₂ and [which hostess]₃]₁ did Fred date e₂ and Bob marry e₃, respectively?
 - b. [[Which pilot]₂ and [which sailor]₃]₁ will (respectively) Joan invite e₂ and Greta entertain e₃, (respectively)?

This is what Postal (1998) calls "interwoven dependency," in which there are overlapping dependencies of the two *wh*-chains. The interwoven dependency is the sort of pattern found in English *respectively* constructions.

Note that these instances of ATB constructions in (9) pose an apparently insurmountable problem for Citko's (2005) base-generation of a shared constituent under the concept of multi-dominance. This is simply because there is no shared constituent available at the starting point of derivation. Rather, contrary to Citko's analysis I suppose that the two *wh*-phrases in sentence-initial position of (9) are generated separately inside each conjunct clause. It seems that given this supposition, there are two possible ways of deriving (9a-b). One is that for instance, the example in (9a) is derived from the representation of (10) involving coordination of the two full clauses:

- (10) [Which nurse]₂ did Fred date e₂ and [which hostess]₃ did Bob marry e₃, respectively?

In the full conjunct clauses of (10) the two *wh*-phrases are moved separately to left-edges positions. To derive (9) from the representation (10), we obviously have to develop an idea of joining together the left-edge elements under coordination.

The other possibility is to pursue a modified version of ATB-format movement. The idea is that the *wh*-phrases separately generated in the two conjunct clauses move out of them and undergo a union process before merging into a [Spec, CP] position. To be more concrete, following Uriagereka's (1999) proposal, I suppose that a Spec element is constructed (and also spelled-out) in a different workspace from the workshop in which a series of head and complement elements are built. More relevantly, the two elements moving into a [Spec, CP] position in the ATB construction undergo restructuring in a different workspace. Note that to give a unified analysis of the ATB construction, I have to say that when the two elements happen to be identical, they are unified into one single term as in (8). However, when the two elements are not identical, they are joined together by the use of a coordinating construction as in (9).

At this point it is hard to see which of the two possibilities is superior. Without an attempt to argue in favor of one or the other possibility, I will proceed to examine whether the phenomenon of interwoven dependency is also realized in the other two constructions at issue in this paper.

Note that, as reported by Postal (1998), the RNR construction behaves in a similar way to the ATB construction with respect to interwoven dependency, as in (11):

(11) RNR constructions:

- a. John loves e_2 and Mary hates e_3 [[oysters]₂ and [clams]₃]₁, respectively.
- b. Marsha argued for e_2 on Tuesday and Louise argued against e_3 [[communism]₂ and [fascism]₃]₁, respectively.

The right-edge elements, separately generated in the preceding two conjunct clauses, can undergo coordination under RNR.³

Unlike these two constructions, however, the PG construction does not allow for interwoven dependency, as in (12):

³ In this paper I do not attempt to elaborate on the definition of "RNR" as a syntactic operation. It was argued in previous works on the right node raising construction that, first, the right-edge element in the second conjunct clause is derived by the ATB-format rightward movement (cf. Ross 1967 and Postal 1974, 1998). Second, the right node raising construction is derived by deleting the right-edge element in the first conjunct clause (cf. Gleitman 1965, Wexler and Culicover 1980 and Wilder 1997). Third, the right-edge element in the second conjunct clause of the RNR construction is multiply dominated simultaneously by the two nodes in the first and second conjunct clauses (cf. Wilder 1999 and Phillips 2003). In my previous works (cf. M-K Park 2005a, 2006b) I argued in favor of endorsing a multi-dominance approach to the construction and demonstrated that the concept of multi-dominance makes it possible to derive the apparent "displacement" effects of the right-edge element in the first conjunct clause without actually applying a usual movement operation. In this paper I simply assume this line of analysis for the right node raising construction.

(12) PG constructions:

- a. *[[Which paper]₂ and [which book]₃]₁ did (respectively) John copy e₂ before Mary read e_{(PG)₃}, (respectively)?
- b. *[[Which food]₂ and [which drink]₃]₁ did (respectively) John eat e₂ on Thursday after Mary had e_{(PG)₃}, (respectively)?

The impossibility of interwoven dependency in the PG construction seems to be attributed to the previous finding that a real gap is interpreted as identical to a parasitic one in this construction. Since interwoven dependency obtains when the two gaps are interpreted with different references, this phenomenon is not allowed in the PG construction.

Why does this contrast hold between the ATB and RNR constructions and the PG construction? I attribute this contrast to the island-hood of the clauses involved. In the former two constructions, either leftward *wh*-movement or RNR followed by conjunction under coordination is possible. In the latter PG construction, however, extraction out of an island-forming adjunct clause is not allowed (not even by virtue of *sideward movement*) though *wh*-movement can proceed in a main clause. In short, interwoven dependency renders convincing evidence refuting an approach toward unifying the ATB and PG constructions. It does, on the other hand, provide supporting evidence in favor of unifying the ATB and RNR constructions.⁴

Before turning to the next sub-section, let us note that there is an apparent possibility of allowing each of the parasitic gaps to be associated with each of the coordinated conjuncts (underlined below) in the ATB and RNR constructions, as follows:

(13) ATB and PG constructions:

[[Which secretary]₂ and which programmer]₃]₁ did respectively Jerome fire e₂ after finding e_{(PG)₂} drunk and Bill hire e₃ after finding e_{(PG)₃} sober?

(14) RNR and PG constructions:

Jerome fired e₂ after finding e_{(PG)₂} drunk and Bill hired e₃ after finding e_{(PG)₃} sober [[this tall young woman]]₂ and [that tall young man]₃]₁.

However, this association is indeed possible because the coordinated conjuncts of (13) and (14) are constructed after leftward *wh*-movement or RNR in the main clause. In other words, a parasitic gap is actually not directly associated with one of the coordinated conjuncts. Rather, it is directly associated with a real gap in the main clause. In this sense the examples in (13) and (14) also

⁴ This does not have to do with the functional reading explored by Munn (1998, 2001). See the relevant discussion in the next sub-section.

underscore the fact that a parasitic gap is interpreted as identical to a real gap in the PG construction.

2.2. Referential Identity between Two Gaps

In the previous sub-section I have suggested that two ATB-moved or “RNRed” elements undergo restructuring before merging into a targeted position. When the two elements happen to be identical, they are unified into one single term. However, when the two elements are not identical, they are joined together by the use of a coordinating construction. In this sub-section I will investigate the identity between the two elements involved, and in like manner, the identity between their respective two gaps.

Gawron and Kehler (2004) report the following contrast between (15a) and (16a) of the ATB construction:⁵

(15) ATB constructions:

- a. **Which man/What man** did John kill ○ on Tuesday and Fred kill ○ on Wednesday?
- b. #John killed **Bruno** and Bill killed **Arno**.

- (16) a. **Which men/What men** did John kill ○ on Tuesday and Fred kill ○ on Wednesday?
- b. John killed **Bruno** and Bill killed **Arno**.

Here the contrast is that when the head noun of an ATB-moved *wh*-element is singular as in (15a), the gaps inside the following two conjunct clauses are required to be interpreted as identical in reference. However, when the former is plural as in (16a), the latter can be interpreted as different in reference.

This contrast can be described in another way by considering the derivation of (15a) and (16a). In the case of (15a), where the *wh*-expressions moved out of the two conjunct clauses count as identical in reference, they are unified into a singular one, i.e., *which man/what man*. In the case of (16a), however, where the *wh*-expressions moved out of the two conjunct clauses count as different in reference, they are unified not into a singular one, but into a plural one without coordination involved, i.e., *which men/what men*. The latter process is also attested more concretely in the following example of what Postal (1998: 136) calls “additive coordination”:

⁵ Gawron and Kehler (2004) differ from Munn (1998, 2001) with respect to the acceptability of (15a) when it is followed by (15b). However, see the next sub-section for the fact that, as argued by Munn, the two gaps in (15a) can be interpreted as different in reference when they have *functional* interpretation rather than have *individual* interpretation.

- (17) [How many frogs]₁₊₂ did Greg capture t₁ and Lucille train t₂?

This example can be interpreted as a question asking about the total number of frogs that is yielded by adding the number of frogs captured by Greg up and combining that total with the total number of frogs trained by Lucille. This example shows clearly that the two ATB-moved *wh*-elements are unified into a single *wh*-expression, with their respective numbers added up onto the latter.

It is not always the case, however, that an apparently singular *wh*-expression in the ATB construction allows only for identical reference interpretation of two gaps inside conjunct clauses. Though seemingly singular, ATB-moved *who* and other adverbial *wh*-expressions such as *where*, *when*, *how*, and *why* in fact permits disjoint reference construal of them. The following examples reported by Gawron and Kehler (2004) illustrate this case:

- (18) a. **Who** did Bill kill ○ on Tuesday and Fred kill ○ on Wednesday?
 b. Bill killed Bruno and Fred killed Arno.
- (19) a. **Where** did Mary vacation ○ and Bill decide to live ○?
 b. **When** did Mary leave ○ and Fred arrive ○?
 c. **How** tired did Bill look ○ and Mary seem ○?
 d. **Why** did Bill leave ○ and Fred arrive ○?
- (20) a. Mary vacationed **in Paris** and Bill decided to live **in Toronto**.
 b. Mary left **last week** and Fred arrived **yesterday**.
 c. Bill looked **exhausted** and Mary looked **OK**.
 d. Bill left **because Fred arrived** and Fred arrived **because he had a meeting**.

The question in (18a) can be felicitously followed by its corresponding answer in (18b), and the ones in (19a-d) can also be felicitously followed by their corresponding answers in (20a-d).

These seemingly singular *wh*-expressions are not real counter-examples to the generalization that an ATB-moved singular *wh*-expression permits identical reference interpretation of two gaps inside the following conjunct clauses. This is because they are interpreted ambiguously either as singular or plural, as argued by Chierchia (1993). Maintaining the generalization on the correspondence between singular/plural *wh*-expressions and identical/different reference interpretations of conjunct-internal gaps in the ATB construction, I suppose that the *wh*-expressions in (18a) and (19a-d) are in fact used as not singular but plural ones.

It seems that the RNR construction exhibits a parallel pattern to the ATB construction with respect to the association between singular/plural antece-

dents and identical/different reference interpretations of conjunct-internal gaps. Note the contrast between (21) and (22):

(21) RNR constructions

John met on Tuesday ○ and Fred met on Wednesday ○ – a businessman from Saudi Arabia.

(22) John sang ○, and Mary recorded ○ – two (quite different) songs (between them).

When the RNRed element is singular as in (21), the preceding two gaps associated with it are interpreted as identical in reference.⁶ However, when it is plural as in (22), they are interpreted as different in reference.

Note furthermore that, just like the ATB construction, the RNR construction also allows for additive coordination as in (23):

(23) Greg captured t_1 and Lucille trained t_2 – [312 frogs]₁₊₂ between them.

(23) shows clearly that two constituents each generated in the t_1 and t_2 positions – say, *200 frogs* in the t_1 position and *112 frogs* in the t_2 position – can be unified into a single one in the course of derivation, with their respective numbers added up onto it.

Unlike the ATB and RNR constructions, however, the PG construction requires the two gaps to be identical in reference, as in (24)–(26):

(24) PG constructions:

- a. **Which/What man** did Bill kill ○ before Fred killed ○?
- b. #Bill killed Bruno before Fred killed Arno.

(25) a. **Which men/What men** did Bill kill ○ before Fred killed ○?
b. #Bill killed Bruno before Fred killed Arno.

(26) a. **Who** did Bill kill ○ before Fred killed ○?
b. #Bill killed Bruno before Fred killed Arno.

Irrespective of whether a *wh*-moved expression is singular or plural or unspecified in terms of a number feature, the two gaps of the PG construction are never interpreted as disjoint in reference. Nor does the PG construction allow

⁶ As noted in footnote 5 for the ATB construction, however, the gaps in (21) of the RNR construction can also be construed as different in reference when interpreted functionally. See subsection 2.3 below.

for additive coordination as found in the ATB and RNR constructions:

(27) ***[How many frogs]₁₊₂** did Greg capture t_1 before Lucille trained t_2 ?

To summarize, the identity of the two gaps in the PG construction is obligatory. However, the identity of the two gaps in the ATB and RNR constructions is not. Specifically, when an ATB-moved *wh*-expression or 'RNRed' expression is singular, the two conjunct-internal gaps are interpreted as identical in reference.⁷ On the other hand, when it is plural, they are construed as different in reference.

2.3. Functional Reading of Two Gaps

It is often noted that quantified NPs in questions lead to three distinct interpretations, which can be identified by their characteristic answers. The **narrow-scope** (of a quantifier) reading of (28) requires answers like (29a), the **functional** reading, answers like (29b), and the **pair-list** reading, answers like (29c):

(28) Which dish did every boy make?

- (29) a. (Every boy made) pasta.
 b. (Every boy made) his favorite dish.
 c. Al (made) the pasta, Bill the salad, and Carl the pudding.

There are reasons for distinguishing these three readings that relate to grammatical properties of the question itself, and not to their answers. First, in certain syntactic configurations pair-list readings are absent.

(30) Which boy made every dish?

⁷ This is the case for ATB A-movement, as noted by Schein (1998). The example in (i) has to be interpreted not as "all the Transylvanians in the Cabinet are both Hungarian(s) and Romanian(s)," but as "(some of) the Transylvanians in the Cabinet are Hungarians, and (the rest of) the Transylvanians in the Cabinet are Romanian(s)."

(i) **The Transylvanians in the Cabinet** are Hungarian(s) and Romanian(s).

Reading: (Some of) the Transylvanians in the Cabinet are Hungarians, and (the rest of) the Transylvanians in the Cabinet are Romanian(s). (cf. Schein 1998)

I suppose that the subject NP generated inside vP/VP has undergone additive coordination in the course of derivation.

- (31) a. Bill (made every dish).
 b. #The boy that likes it best (made every dish).
 c. #The past (was made) by Al, the salad, by Bill, and the pudding, by Carl.

Second, many quantifiers such as *most*, *several*, *a few* and *no* do not allow for pair-list readings:

- (32) Which dish did most/several/a few/no boys make?
 (33) a. (Most/Several/A few/No boys boy made) pasta.
 b. (Most/Several/A few/No boys made) their favorite dish.
 c. #Al (made) the pasta, and Bill the salad.

The properties of questions with quantifiers have generated a great deal of discussion. I will follow Chierchia (1991, 1993) among others in assuming that a pair-list interpretation is a form of functional answer. The functional reading of (28) exemplified by the answer in (29b) asks something like *what is the function f mapping boys to dishes such that every boy y made $f(y)$* ? In other words, the function in a functional reading is a means of pairing individuals. The pair-list answer can be viewed as specifying the function by listing the pairs (its extension).⁸

What LF phrase structure corresponds to the functional reading? Chierchia proposes a structure that involves a bound expression/pronoun at LF, as follows:

- (34) Which dish₁ did every boy₂ t₂ make [pro t₁]₁? (Chierchia 1993)

The index 1 is the f(unction)-index while the index 2 is the a(rgument) index. The idea is that the a-index can act as a bound pronoun while the f-index is bound by the *wh*-expression in Comp. What we have in the a-index is a bound pronoun analogous to the one that arises in the overt functional answer as in (29b). A way of interpreting this LF in recent syntactic terms is that the copy trace left by moving the *wh*-expression to a [Spec, CP] position can be interpreted as having the structure with an implicit bound pronoun.⁹

⁸ There are still cases in which a functional answer is possible but a pair-list answer is not as in (32). Therefore there must be something distinguishing the two readings. Chierchia (1993) proposes that the pair-list reading relies on the quantifier to provide a “minimal witness set” to set the domain for the list. While quantifiers like *everyone* prove this (the smallest set that can “witness” *everyone* is the set of all the relevant people), quantifiers like *nobody* do not (the smallest set that can “witness” *nobody* has no members.)

⁹ This kind of trace holding two indices are called a doubly indexed trace or layered trace.

With an understanding of the functional reading of a *wh*-expression, let us now examine whether this reading is available to the three constructions at issue in this paper. First, as reported by Munn (1998, 2001), the ATB-moved *wh*-expression as in (35a) can have a functional reading that allows for an answer like (35b):

(35) ATB constructions:

- a. Q: Which paper₁ did Bill₂ review t₁ on Tuesday and Fred₃ review t₁ on Wednesday?
 b. A: The paper he_{2/3} received from the editor.

In this reading, the two gaps are apparently interpreted as identical, i.e., having an individual reading. However, they actually can be construed as different in reference.

Given the discussion above on the functional reading of a *wh*-expression, it follows that (35a) can have the corresponding LF structure in (36):

(36) Which paper₁ did Bill₂ review [pro₂ t₁]₁ on Tuesday and Fred₃ review [pro₃ t₁]₁ on Wednesday?

This representation explains the availability of an answer like (35b) corresponding to the question (35a).

Recall that, to get a functional reading of a *wh*-moved expression, the implicit pronoun inside its copy trace has to be bound. It is then predicted that the absence of a binder c-commanding the pronoun leads to the absence of a functional reading of a *wh*-moved expression. This prediction is achieved, as reported by Gawron and Kehler (2004):

(37) Which paper did John review on Monday and criticize on Tuesday?¹⁰

¹⁰ Unlike that of (37), the *wh*-expression of the following example in (ia) is interpreted as referring to two different entities when associated with the objects of the two verbs, as shown by the fact that (ib) is a felicitous answer to (ia):

- (i) a. Q: What did Bill eat and drink?
 b. A: He ate a hamburger and drank a coke.

I attribute the two-referent interpretation of the *wh*-expression in (ia) to the fact that *what* in (ia) has a plural meaning.

It seems that the same situation is also true in the case of a *wh*-expression derived from the subject position. When the *wh*-expression is singular like *which boy* or *which girl* below, it refers to one single person. However, when it is underspecified in number like *who* below, it can refer to the two different persons when associated with the subjects of the two conjuncts:

- (ii) {Who vs. Which boy} ate and drank in the school cafeteria?
 (iii) {Who vs. Which girl} sang and danced in the party?

(38) Which paper was reviewed by Bill and criticized by Fred?

As the implicit pronoun inside its copy trace cannot be bound appropriately, the *wh*-expression in (37) and (38) can only be construed as having an individual reading, not a functional one. For instance, as a congruent answer to (37), the paper that John reviewed on Monday is required to be identical to the one that he criticized on Tuesday.

We postulated (36) as the LF phrase marker of (35a) when it is construed as having a functional reading. However, suppose that, rather than appearing for the first time in the LF representation, each of the implicit bound pronouns *pro*₂ and *pro*₃ are actually inserted in the course of structure-building, say, in the underlying structure in the traditional T-model of grammar. A question arises whether [*pro*₂ *which paper*] and [*pro*₃ *which paper*] are joined together successfully to produce the output [*pro*_{2/3} *which paper*] in the [Spec,CP] position. The following examples in (39a-b) render convincing evidence showing that they indeed can be unified into one single constituent despite the presence of the overt pronouns holding apparently different indices:

- (39) a. That she_{1/2}/her_{1/2} mother is a genius, Michelle₁ may believe and Amanda₂ certainly does believe.
 b. It was her_{1/2} mother's being a genius that Michelle₁ doubted and Amanda₂ rejected.

The pronoun inside the ATB-moved constituent in the topicalization and cleft constructions of (39a) and (39b) can be interpreted as ambiguous. In the line of analysis pursued in the paper, I suppose that the ambiguous pronoun inside the ATB-moved constituent in (39a-b) is derived by joining together two pronouns holding different indices.

One caveat is in order. It is not always possible to combine together two pronouns holding different indices in an ATB-moved constituent, as shown by the following ungrammatical examples:

- (40) a. *That she_{1/3}/her_{1/3} mother is a genius, Michelle₁ may believe and Amanda₂ certainly does believe.
 b. *It was her_{1/3} mother's being a genius that Michelle₁ doubted and Amanda₂ rejected.

The problematic aspect of (40a-b) is that the pronoun inside the ATB-moved constituent, when staying in its trace positions, is bound within just one of the conjunct clauses. However, in the grammatical examples of (39a-b) it is bound within both of the conjunct clauses. The generalization emerging is that when the two overt or implicit pronouns are bound by appropriate binders in each

conjunct clause before undergoing ATB movement, they count as non-distinct when they are joined together into one single expression.

The fact that two pronouns count as non-distinct when they are bound by appropriate binders prior to ATB movement reminds us of the well-known sloppy interpretation of a pronoun found in VP-ellipsis constructions as in (41).

- (41) John₁ visits his₁ family, and Mary₂ did (visit his₂ family).

There have been many ingenious proposals on accounting for the apparent violation of the identity condition on ellipsis when the sloppy reading of a pronoun obtains (Sag 1976, Williams 1978, Fiengo and May 1994). The insight we learn from the previous works on this issue is that the two pronouns holding different indices as in (41) count as non-distinct “somehow.” I emphasize that the sloppy reading of a pronoun found in various types of standard ellipsis constructions is also attested in the ATB movement construction.¹¹

Now let us turn to the RNR construction, which has been seen to display the same pattern of behavior as the ATB construction. It seems that the former behaves in an identical way to the latter, as found in (42a) of Peterson (2001), in which two different cars may be involved in the two actions done by the different subject NP referents:

- (42) RNR constructions:
 a. John bought, but Bill only leased – a new Saab. (Peterson 2001)
 b. Bill reviewed on Tuesday and Fred reviewed on Wednesday – a paper submitted to LI.

Peterson discusses this example by contrasting (42a) with the following example (43a), in which only the same car is involved in both actions:

- (43) a. John road-tested and bought a new Saab.
 b. John reviewed on Monday and criticized on Tuesday a paper submitted to LI.

Peterson attributes this contrast to the distinction between coordination and RNR. Coordination in (43a) imposes referential identity, whereas RNR may allow for referential distinctness. He goes on to suggest that there are two referential indices on *a new Saab* in (42a). I take his suggestion to mean that (42a) is understood as (44):

¹¹ However, see M-K Park (2006a) for the discussion that ATB differs a great deal from ellipsis with respect to inflectional/morphological sloppiness.

(44) John bought a new Saab₁, but Bill only leased a new Saab₂.

I differ from Peterson in arguing that (42) in fact does not involve referential distinctness; rather, it involves a functional reading of the RNRed element. As argued in the previous sub-section, if the structure in (44) feeds RNR, that is to say, the two right-edge elements undergo RNR, the resulting sentence has to be (45):

(45) John bought, but Bill only leased – two (different) new Saabs, (respectively).

In other words, two right-edge elements with different referential indices undergo *additive coordination* in the course of RNR. On the one hand, when the two right-edge singular expressions are identical though having different indices, as in (44), they are joined together into one plural expression after undergoing RNR. On the other hand, when they are different, they are combined together by the use of a coordinating conjunction.

What structure yields the example in (42)? Under the supposition that (42) involves a functional reading of the RNRed element, I can say that (42) has the following structure before RNR applies to it. The structural feature of (46) is that, just like that of an ATB-moved element discussed in the previous sub-section, the functional reading of a RNRed element stems from the presence of an implicit bound pronoun inside it:

(46) John₂ bought [pro₂ a new Saab], but Bill₃ only leased [pro₃ a new Saab].

Note here again that the distinctness of the indices borne by the implicit bound pronouns is disregarded in the course of joining together the two right-edge elements through RNR. Therefore the RNRed element in (42) turns out to be a singular expression.¹²

¹² Sung-Ho Ahn (pers. comm.) asked whether the following example containing the RNRed element with the definite article is interpreted as ambiguous:

(i) John bought, but Bill only leased – **the** new Saab.

In fact, it is, as Jason Merchant (pers. comm.) noted. However, Jason Merchant pointed out that this reading obtains only when *the new Saab* in (i) is interpreted as having a generic interpretation, or a type reading rather than a token one. In the following additional example Jason Merchant noted, the RNRed element which has a type reading is also interpreted as ambiguous.

(ii) John has a subscription to, and Mary buys at the newsstand – the same newspaper.

Chris Wilder (pers. comm.) also noted that (i) is interpreted as ambiguous when the RNRed element is followed by the relative clause containing a pronoun apparently bound by each of the subject NPs in the preceding conjunct clauses (For the matter

The test case in learning that the two bound pronouns with different indices count as non-distinct when they are joined together in the process of RNR can be found in the RNR construction where an overt bound pronoun is contained within a RNRed element. The following examples in (47a) and (48a) make this point:

- (47) a. [[Everyone]₁ loves], but [[no one]₂ wants to marry] his_{1/2} mother.
 b. [[Everyone]₁ loves his₁ mother], but [[no one]₂ wants to marry his_{1/2} mother].
- (48) a. [[No man]₁ actually loves] although [Mary thinks that [every man]₂ ought to love] his_{1/2} mother. (Jacobson 1999).
 b. [[No man]₁ actually loves his₁ mother] although [[Mary thinks that [every man]₂ ought to love his₂ mother].

As Jacobson (1999) and Postal (2000) note, the pronoun inside a RNRed element as in (47a) and (48a) can be interpreted as ambiguous. I ascribe the ambiguity of the pronoun to the fact that it is licensed as a bound pronoun before undergoing RNR. I suppose that (47a) and (48a) are derived from (47b) and (48b), respectively.

Note that when both of the pronouns fail to be licensed as a bound pronoun before undergoing RNR, it results in producing the ungrammatical RNR examples as in (49):

- (49) *[Every boy₁ loves] but [no one₂ wants to marry] his_{1/3} mother.

bearing on (iii), see the discussion in subsection 2.3 below of the text):

- (iii) John bought, but Bill only leased – the new Saab I saw him_{1/2} driving yesterday.

A question arises whether it is possible to construe as ambiguous the RNRed element with the definite article when it is interpreted as having a token reading. We cannot test this question with the example (i). This is because given the real-world nature of the predicates (*buy* vs. *lease*) in (i), which exclude joint ownership of a car (unless the times are evaluated sequentially), there must be two cars in the model to make (i) true. However, the following example can make a test case:

- (iv) Bill reviewed on Tuesday and Fred reviewed on Wednesday – the lengthy paper.

(iv) describes a situation where there were two actions at different times. The situation may allow for the existence of two lengthy papers relating to the actions. However, *the lengthy paper* in (iv) is only construed as the same one that Bill reviewed on Tuesday and Fred reviewed on Wednesday.

The generalization emerging is that the RNRed singular expression with the definite article that has generic or type interpretation is read as referring to two different things in the two conjunct clauses because it allows for a functional interpretation. However, that of token interpretation is only construed as referring to the same thing in the two conjunct clauses because it does not allow a functional interpretation.

- (50) *Michelle₁ and Amanda₂ respectively assumed and proved that she_{1/2} was a genius.

The problem with (49) is that his₁ is a bound pronoun, whereas his₃ is a referential pronoun. They cannot be combined together successfully. Sentence (50) does not involve RNR; rather it involves coordination, just like (43). The doubly indexed pronoun in (50) has not had a chance to be licensed as a bound pronoun.¹³

Let us now turn to the PG construction. It was noted in the previous subsection that the first gap in the main clause is identical in reference to the parasitic gap in the adjunction of the PG construction. Furthermore, as the following question-answer pair of (51) shows, the construction does not allow for a functional reading, which is noted by Munn (2001):

- (51) PG constructions:
 a. Q: Which paper₁ did Bill₂ copy after Fred₃ read?
 b. A: The paper he_{e(e2/3)} received from the editor.

The question in (51a) cannot be followed by the functionally-interpreted answer in (51b) which contains a variable pronoun bound by the subjects of the main and adjunct clauses.

It was argued in the previous sub-sections that there is no movement out of the second adjunct clause of the PC construction. I rather assume that there is movement of a null operator within the clause, as argued in Chomsky (1982). If so, a question that arises is why it is not possible to allow a functional copy trace to occur in each of the main and adjunct clauses, as represented in (52):

- (52) Which paper₁ did Bill₂ copy [pro₂ t₁]₁ [OP₁ after Fred₃ read [pro₃ t₁]₁ ?

¹³ Whether a functional reading obtains for an ATB-moved expression in other topicalization (i), cleft (ii), and pseudo-cleft (iii) constructions below is an interesting question that deserves detailed discussion:

- (i) A paper submitted to *Language*, Bill₁ reviewed on Tuesday and Fred₂ reviewed on Wednesday.
 (ii) It was a paper submitted to *Language* that Bill₁ reviewed on Tuesday and Fred₂ reviewed on Wednesday.
 (iii) What Bill₁ reviewed on Tuesday and Fred₂ reviewed on Wednesday was a paper submitted to *Language*.

Jason Merchant (pers. comm.) notes that unlike the RNR construction, the topicalization construction in (i) has the ATB-moved topic expression interpreted as one and the same paper that Bill reviewed on Tuesday and Fred reviewed on Wednesday. I hadn't an opportunity to consult native speakers to ascertain whether the ATB-moved expression in the cleft and pseudo-cleft constructions is construed as having individual or functional interpretation.

Apparently, the functional copy trace in the main clause is not a problem, in that the same one is also found in the ATB construction. I will argue presently that the functional copy trace in the adjunct clause is not a legal one.

The problematic aspect of the functional copy trace in the adjunct clause of the PC construction in (52) is that it occurs in an island context. This is unexpected because apparently there is no island in the adjunct clause. However, Larson (1990) and Munn (2001), following Geis (1970), argue that there is another operator movement in the adjunct clause in addition to a null operator movement represented in (52). In particular, Larson argues that temporal adjuncts such as *before* and *after* involve movement of a null temporal operator similar to *when*, which accounts for the ambiguity of examples such as (53):

- (53) a. I saw Mary in New York *before* [_{IP1} she claimed that [_{IP2} she would arrive]].
 b. I saw Mary in New York *after* [_{IP1} she swore that [_{IP2} she had left]].
 c. I couldn't leave *until* [[_{IP1} John said [_{IP2} I could leave]].
 d. I haven't been there *since* [_{IP1} I told you [[_{IP2} I was there]].

Each example in (53) is ambiguous with respect to the interpretation of the temporal preposition – the main clause in each sentence can be interpreted as relating either to the time of the clause marked **IP1** or to the clause marked **IP2**.

The fact that the ambiguity is sensitive to islands, as the examples in (54) show, supports this analysis. In neither case is the lower clause reading available:

- (54) a. I haven't been there since I made the claim that I was there.
 b. I haven't been there since you asked whether I was there.

Following Larson, I assume that the temporal preposition selects a CP which hosts the null temporal operator. I also assume that the null operator of the parasitic gap moves to the [Spec,PP] position. This yields the schematic structure in (55):

- (55) [_{PP} OP_{PG} before [_{CP} OP_{temp} [_{IP} . . . t_{PG} . . . t_{temp}]]]

The structure in (55) shows that the parasitic chain involves an island like a *wh*-island context: OP_{PG} crosses over OP_{temp} in the course of moving into the final landing site. It is instructive to note that a *wh*-trace inside an island does not allow for a functional interpretation. The relevant examples are in the following, drawn from Hornstein (1995):

- (56) a. What did you say that everyone **didn't** buy ○?
 b. What **didn't** you say that everyone bought ○?
 c. What did everyone make a **plan to** say ○?
 d. What did you make **the claim that** everyone said ○?
 e. Who did everyone go to Rome **without** visiting ○?

In these examples the gap marked ○ must have a structure like (57a), but not like (57b):

- (57) a. $WH_1 \dots$ [island ... $t_1 \dots$]
 b. $WH_1 \dots$ [island ... [$pro_2 t_1$]₁ ...]

In other words, the *wh*-trace in the examples of (56) must be construed as an individual variable (a variable raising over individuals); however, it cannot be functionally interpreted as having an implicit bound pronoun.

It is now clear why the parasitic gap lacks a functional interpretation. I attribute it to the fact that the parasitic gap occurs in an island context. In this regard, it has to be accounted for on a par with the examples in (56), which do not allow for a functional reading of the *wh*-trace. Before closing this subsection, I present a contrast between ATB and RNR, and PG constructions, which renders further supporting evidence that the adjunct clause of the PG construction involves an island structure within it, whereas the coordinate conjunct clauses of the ATB or RNR construction does not. The following examples show a case:

- (58) *How quickly did John solve the problem after proving the theorem?¹⁴
 (59) How quickly did John solve problem 1 on Monday and Mary solve problem 2 on Tuesday?
 (60) John solved problem 1 on Monday and Mary solved problem 2 on Tuesday - in a remarkably quick way.

¹⁴ Levine et al. (2001), however, claim that the following example is grammatical, in contrast to the example in (58):

- (i) How harshly do you think we can treat THEM ○ without in turn being treated ○ OURSELVES?

However, there is an important difference between (i) and (58) in the text. (i) contains right-edge elements of the main and adjunct clauses that bear contrastive focus. I suppose that the presence of contrastive focus on the right-edge elements indicates that (i) actually involves right node raising of *how harshly*, followed by its leftward *wh*-movement. In this supposition, the first step of right node raising by *how harshly* is not subject to island conditions, for right node raising in general is not subject to island conditions.

The common element that has been displaced from its usual position of each clause in the three constructions of (58-60) is the adjunct expression, either *how quickly* or *in a remarkably quick way*. The adjunct can be extracted or RNRed licitly in an ATB-format from both clauses of the ATB or RNR construction. However, the ungrammaticality of (58) means that since the adjunct *how quickly* can be moved legitimately in the main clause, the problem with this sentence has to be found in the parasitic clause. I then attribute the ungrammaticality of (58) to the inherent island-hood of the parasitic clause which prevents movement of the null operator corresponding to the adjunct expression *how quickly*, as represented in (61):

- (61) *[How quickly]₁ did John solve the problem [OP₁ after OP_{temp2} proving the theorem t₁ t₂?

The OP₁ cannot move across the temporal OP_{temp2}, which obviously follows the effects of Relativized Minimality (Rizzi 1990).

To summarize, the ATB and RNR constructions on the one hand allow for a functional interpretation; that is, the gaps in the two conjunct clauses can be construed functionally as containing an implicit bound pronoun. The PG construction on the other hand does not. I attribute the lack of a functional reading of the parasitic gap in the latter construction to the fact that the gap occurs in island structure induced by the movement of a null temporal operator in the parasitic clause.

3. Summary and Conclusion

This paper started with an investigation of ATB, PG, and RNR constructions against the background of a reduction/unification approach. In examining the validity of this approach, this paper investigated three kinds of phenomena: [i] interwoven dependency between two apparent gaps in the three constructions, [ii] (referential) identity between the gaps, and [iii] functional interpretation of them. It was shown that the reduction/unification approach to the three constructions is not sufficient to account for their structural properties. Rather, it was argued that the PG construction is distinctly different from the other ATB and RNR constructions, which behave in analogous fashion with respect to the aforementioned three phenomena.

Specifically, the ATB and RNR constructions differ from the PG construction with respect to interwoven dependency. I attribute this contrast to the island-hood of the clauses involved. In the former two constructions, either leftward wh-movement out of the second clause or RNR out of the first one is possible. In the latter PG construction, however, extraction out of the island-

forming adjunct clause is not. Interwoven dependency provides conclusive evidence discrediting an approach toward unifying the ATB and PG constructions but approving an approach toward unifying the ATB and RNR constructions.

Second, it was noted that the two gaps in the PG construction are required to be identical, whereas those in the ATB and RNR constructions are not. Specifically, when an ATB-moved *wh*-expression or RNRred expression is singular, the two conjunct-internal gaps are interpreted as having the same reference. On the other hand, when it is plural, they are read as having different references.

Third, the two gaps in the ATB and RNR constructions can be construed functionally as containing an implicit bound pronoun. However, those in the PG construction cannot be. I attribute the contrast to the fact that the parasitic gap of the latter construction actually occurs within an island structure induced by the movement of a null temporal operator in the parasitic clause; however, the gap in the second conjunct clause of the ATB construction and that in the first conjunct clause of the RNR construction do not occur within an island structure in grammatical sentences.

References

- Bošković, Željko and Steven Franks. (2000). Across-the-board movement and LF. *Syntax* 3, 107-128.
- Chierchia, Gennaro. (1991). Functional *wh* and weak crossover. *Proceedings of West Coast Conference on Formal Linguistics* 10, 75-90.
- Chierchia, Gennaro. (1993). Questions with quantifiers. *Natural Language Semantics* 1, 181-234.
- Cho, Sungeun. (2005). Reconstruction asymmetry between parasitic gap and across-the-board constructions. *Studies in Modern Grammar* 41, 73-88.
- Chomsky, Noam. (1982). *Some Concepts and Consequences of the Theory of Government and Binding*. MIT Press.
- Ciko, Barbara. (2005). On the nature of merge: External merge, internal merge, and parallel merge. *Linguistic Inquiry* 36, 475-497.
- Fiengo, Robert and Robert May. (1994). *Indices and Identity*. MIT Press.
- Haik, Isabelle. (1985). *The Syntax of Operators*. Doctoral dissertation, MIT.
- Hornstein, Norbert. (1995). *Logical Form: From GB to Minimalism*. Blackwell.
- Hornstein, Norbert and Jairo Nunes. (2002). On asymmetries between parasitic gap and across-the-board constructions. *Syntax* 5.1, 26-54.
- Gawron, Mark and Andrew Kehler. (2004). The semantics of respective readings, conjunction, and filler-gap dependencies. *Linguistics and Philosophy* 27.2, 169-207.
- Geis, Michael. (1970). *Adverbial Subordinate Clauses in English*. Doctorial dissertation,

MIT.

- Gleitman, Lila. (1965). Coordinating conjunctions in English. *Language* 41, 260-293.
- Jacobson, Pauline. (1999). Towards a variable free semantics. *Linguistics and Philosophy* 22, 117-184.
- Larson, Richard. (1990). Extraction and multiple selection in PP. *The Linguistic Review* 7, 169-182.
- Levine, Robert D., Thomas E. Hukari, and Michael Calcagno. (2001). In Peter Culicover and Paul Postal, eds., *Parasitic Gaps in English*, 369-392. MIT Press.
- Munn, Alan. (1992). A null operator analysis of ATB gaps. *The Linguistic Review* 9, 1-26.
- Munn, Alan. (1998). ATB movement without identity. *Proceedings of Eastern States Conference* 14, 150-160.
- Munn, Alan. (2001). Explaining parasitic gap restrictions. In Peter Culicover and Paul Postal, eds., *Parasitic Gaps in English*, 369-392. MIT Press.
- Park, Myung-Kwan. (2005a). When things are cumulated or distributed across coordinate conjuncts. *Studies in Generative Grammar* 15.4, 415-431.
- Park, Myung-Kwan. (2005b). Two types of pronouns and the identity/parallelism condition in the RNR construction of English. *Studies in Modern Grammar* 42, 29-50.
- Park, Myung-Kwan. (2006a). Morphological/inflectional strict vs. sloppy identity in RNR constructions: Towards a midway coordination analysis. *Studies in Generative Grammar* 16.1, 175-191.
- Park, Myung-Kwan. (2006b). Displacement effects by multi-dominance in right node raising constructions. *Linguistics* 14, 37-65.
- Peterson, Peter. (2001). The distribution of grammatical information across sets: Some consequences for coordination. *Proceedings of the 2001 Conference of the Australian Linguistics Society*. <http://au.geocities.com/austlingsoc/proceedings/als2001.html>.
- Phillips, Colin. (2003). Linear order and constituency. *Linguistic Inquiry* 34, 37-90.
- Postal, Paul M. (1974). *On Raising*. MIT Press.
- Postal, Paul M. (1993). Parasitic gaps and the across-the-board phenomenon. *Linguistic Inquiry* 24, 735-754.
- Postal, Paul M. (1998). *Three Investigations of Extraction*. MIT Press.
- Postal, Paul M. (2000). Strange pronouns. In Sandy Chung, Jim McCloskey, and Nathan Sanders, eds., *Jorge Hankamer WebFest*. <http://ling.ucsc.edu/Jorge/postal.html>.
- Rizzi, Luigi. (1990). *Relativized Minimality*. MIT Press.
- Ross, John Robert. (1967). *Constraints on Variables in Syntax*. Doctorial dissertation, MIT.
- Sag, Ivan. (1976). *Deletion and Logical Form*. Doctorial dissertation, MIT.
- Schein, Barry. (1998). Conjunction reduction redux. Ms., USC.
- Uriagereka, Juan. (1999). Multiple spell-out. In Samuel Epstein and Norbert Hornstein, eds., *Working Minimalism*, 251-282. MIT Press.
- Wexler, Ken and Peter Culicover. (1980). *Formal Principles of Language Acquisition*. MIT Press.
- Wilder, Chris. (1997). Some properties of ellipsis in coordination. In Artemis Alexiadou and T. Alan Hall, eds., *Studies on Universal Grammar and Typological Variation*.

- tion, 59-107. John Benjamins Publishing Company.
- Wilder, Chris. (1998). Right node raising and the LCA. *Proceedings of West Coast Conference on Formal Linguistics* 18, 586-598.
- Williams, Edwin S. (1977a). Across-the-board application of rules. *Linguistic Inquiry* 8, 419-423.
- Williams, Edwin S. (1977b). Discourse and logical form. *Linguistic Inquiry* 8, 101-139.
- Williams, Edwin S. (1978). Across-the-board rule application. *Linguistic Inquiry* 9, 31-43.
- Williams, Edwin S. (1989/1990). The ATB theory of parasitic gaps. *The Linguistic Review* 6, 265-297.
- Zhang, Niina Ning. (2004). Against across-the-board movement. *Concentric: Studies in Linguistics* 30.2, 123-156.

Myung-Kwan Park
Department of English
Dongguk University
3-ga 26, Pil-dong, Chung-gu
Seoul, 130-791
Korea
parkmk@dgu.edu

Received: September 4, 2006

Revised version received: December 22, 2006

Accepted: December 26, 2006