

# Reconstruction and Linear Order in ATB Movement and Parasitic Gap Constructions\*

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## Abstract

It is a point of controversy whether across-the-board (ATB) movement in coordination should be analyzed in the same way as parasitic gap constructions. Both have been claimed to show asymmetries in reconstruction of various types, while they have also been claimed to differ in some types of reconstruction and in other respects. We re-examine these claims, and show that where there are asymmetries, they are due to linear order, and not to a difference in the nature of the gaps. We find clear instances of reconstruction into parasitic gap sites, contra much of the literature (e.g., Haik 1985, Nissenbaum 2000), and we also find symmetric reconstruction in ATB movement. We conclude that ATB movement and parasitic gap constructions always behave the same and evidence completely symmetric reconstruction when there is reconstruction. We spell out a unified analysis of ATB movement and parasitic gap constructions in a copy theory of movement. We construct this analysis within a left-to-right model of syntax, where copies of the filler are merged into gap positions. We show that a left-to-right model permits a maximally simple analysis, dispensing with many mechanisms that have been proposed just for parasitic gap and ATB movement constructions. Our analysis requires no mechanisms beyond those that are necessary for single-gap constructions. The lack of reconstruction for Binding Condition C follows from the operation of the copy mechanism itself, which only copies material that is necessary for convergence.

## 1 Introduction

This paper is concerned with the proper analysis of across-the-board (ATB) movement in coordination (Ross 1967), illustrated in (1), and parasitic gap constructions (Ross 1967, Engdahl 1983), illustrated in (2). Throughout the paper, we use “\_” to represent a non-parasitic gap, with no commitment to its analysis, and “*pg*” to represent a parasitic gap, again with no commitment to analysis. We refer to the moved element—*which film* in (1) and *which form* in (2)—as the *filler*.

- |   |                      |
|---|----------------------|
| (1) Which film did one critic love _ and another hate _?                | <i>ATB Movement</i>  |
| (2) Which form should one never sign _ without reading <i>pg</i> first? | <i>Parasitic Gap</i> |

Descriptively, ATB gaps are those that occur in coordinate structures, while parasitic gaps occur outside of coordination, in what are often viewed as syntactic islands. These include adjunct clauses and subjects, primarily. We will return to the distribution of both types of gaps in section 4.1.

Turning to issues of analysis, there is a debate in the literature on whether ATB movement and parasitic gaps should be analyzed in the same way, or differently. ATB movement has traditionally been analyzed as a single filler binding multiple gaps in a symmetric fashion (Ross 1967, Williams 1978), and one line of research treats parasitic gaps in the same way (e.g., Sag 1983, Williams 1990, Levine *et al.* 2001, Hornstein

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and Nunes 2002, Nunes 2004, Levine and Hukari 2006, Chaves 2012b). A prominent counterposition treats parasitic gaps as involving movement of a null operator from the position of the parasitic gap (Contreras 1984, Chomsky 1986, Nissenbaum 2000). In this account, the real gap is bound by the filler, but the parasitic gap is not, it is bound by the null operator, which is treated basically as a pronoun. Empirical differences between parasitic gap constructions and ATB movement constructions are taken to justify treating them differently (e.g., Postal 1993a, Nissenbaum 2000).

We enter this debate by undertaking a re-examination of the phenomenon of reconstruction, which has been argued both to distinguish ATB movement from parasitic gap constructions, and to reveal their underlying similarity. On the one hand, symmetric reconstruction for variable binding has been claimed to be possible in ATB movement but not in parasitic gap constructions (Nissenbaum 2000); in fact, it is often claimed that parasitic gaps exhibit no reconstruction whatsoever (Haik 1985, Nissenbaum 2000). On the other hand, many publications have claimed that there is also no reconstruction to non-initial gaps in ATB movement (e.g., Munn 1992, 2001; Salzmann 2012). As an example, according to Munn (1992) we only see reconstruction into the first gap for Binding Condition A in ATB movement:<sup>1</sup>

(3) Condition A (Munn 1992, 10, (19)):

- a. Which pictures of himself<sub>1</sub> did John<sub>1</sub> buy \_ and Mary paint \_?
- b. \* Which pictures of herself<sub>1</sub> did John buy \_ and Mary<sub>1</sub> paint \_?

Similarly, reconstruction for Binding Condition C has been claimed to take place only in the first conjunct (Citko 2005), and Munn (2001) also claims that weak crossover effects are only found in the initial conjunct and not in subsequent conjuncts.

On the basis of such asymmetries, Munn (1992, 2001), Zhang (2010), and Salzmann (2012) have proposed that only the initial gap in ATB movement is the trace of the filler. For Munn, non-initial gaps are actually parasitic gaps (see also Franks 1992). Parasitic gaps are claimed to show the same asymmetries, and not permit reconstruction to the parasitic gap site at all (Haik 1985, Nissenbaum 2000). In Munn's and Nissenbaum's analyses, parasitic gaps are not traces of the overt filler. Rather, they are traces of null operators (Contreras 1984, Chomsky 1986). As such, we should see no reconstruction of lexical material of the overt filler into the position of the parasitic gap. For Zhang (2010), gaps beyond the first in ATB movement are actually null pronouns plus a morpheme meaning 'same' (intended to capture the identity reading that most cases of ATB movement have). Salzmann (2012) proposes that non-initial gaps are constituents elided under identity with the filler; vehicle change under ellipsis (Fiengo and May 1994) accounts for the reconstruction asymmetries.

Null pronoun and null operator accounts struggle with the above-noted possibility of symmetric reconstruction for variable binding in ATB movement (illustrated in section 3.1). Another apparently contradictory fact is that secondary strong crossover effects show up with non-initial gaps in both ATB movement and parasitic gaps (Williams 1990; illustrated in section 2.4). We also note the following cases of reconstruction into non-initial ATB gaps and parasitic gaps:

(4) *ATB Movement*

- a. It's each other that we can rely on \_ and depend on \_.
- b. It's only themselves that people should blame \_ and then try to improve \_.

(5) *Parasitic Gaps*

- a. It's herself that [her thinking critically about *pg*] will lead her to understand \_ better.
- b. It's herself that she should take a hard look at \_ [before she shamelessly promotes *pg* ].

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<sup>1</sup>Many works cite an unpublished 1983 manuscript by Kevin Kearney as the origin of this observation. We have been unable to locate this manuscript.

- c. It was himself<sub>1</sub> that John<sub>1</sub> nominated \_ [before he<sub>1</sub> voted for *pg*]. (Barss 1986, 377, (236a))

If these examples did not have complete reconstruction of an anaphor into every gap, they would violate Binding Condition B. Parasitic gaps can normally be pronounced as a pronoun, but pronouncing a pronoun in these parasitic gap cases is ungrammatical:

- (6) a. \* It's herself that [her<sub>1</sub> thinking critically about her<sub>1</sub>] will lead her to understand \_ better.  
b. \* It's herself that she should take a hard look at \_ [before she<sub>1</sub> shamelessly promotes her<sub>1</sub>].  
c. \* It was himself<sub>1</sub> that John<sub>1</sub> nominated \_ [before he<sub>1</sub> voted for him<sub>1</sub>].

In the null operator analysis, null operators are basically equivalent to pronouns (Browning 1987, Munn 2001, e.g.). On the face of it, then, symmetric reconstruction in (4) and (5) is incompatible with the null operator theory of both ATB movement and parasitic gap constructions.

A similar example was provided by Levine *et al.* (2001, 211, (56)):

- (7) \* Himself<sub>1</sub>, John<sub>1</sub> admires \_ without Mary liking *pg* in the least.

In this example, if the filler were not reconstructed fully to the parasitic gap site, there would be no Binding Condition A violation. In particular, if the parasitic gap were the equivalent of a pronoun, the sentence would be grammatical, since pronouncing a pronoun is:

- (8) Himself<sub>1</sub>, John<sub>1</sub> admires \_ without Mary liking him<sub>1</sub> in the least.

Hence, we seem to have conflicting evidence regarding reconstruction in both ATB movement and parasitic gap constructions: sometimes there appears to be no reconstruction into non-initial gaps, but in other cases there must be full reconstruction into non-initial gaps.

Given this apparently contradictory evidence, we undertake to re-examine the asymmetries that have been observed in the literature regarding reconstruction. We show first that some of the putative asymmetries are not real, like the one involving Condition A in (3), and the one involving Condition C, from Citko (2005). Second, where there are asymmetries, they are due to linear order and not to the nature of the gaps. This is shown by looking at parasitic gap constructions where the parasitic gap *precedes* the real gap, not previously considered in the literature on reconstruction in parasitic gaps (except briefly by Levine and Hukari 2006, and also by Nissenbaum 2000 and Munn 1994, who report conflicting judgments; see section 2.2). The data indicate that ATB movement and parasitic gap constructions both involve a copy of the filler in every gap. Hence, we conclude that ATB movement and parasitic gap constructions should be analyzed in the same way, with all gaps being bound by and containing a copy of the filler. However, only the head of the filler is copied faithfully; non-head material is left out, accounting for the lack of reconstruction for Condition C.

We propose an analysis of filler-gap constructions within a left-to-right derivational model of syntax, where null copies of the filler are merged into gap sites. We show that looking at multiple-gap constructions in a left-to-right model permits an analysis of them that adds nothing beyond what is necessary for single-gap constructions. All we need is the ability to merge multiple copies of the filler, but this is something that we need anyway for successive-cyclic movement. We can do without sideward movement (Hornstein and Nunes 2002, Nunes 2004), multidominance (Goodall 1987, Moltmann 1992, Citko 2005), or some way of fusing multiple moving constituents into one (Williams 1978). We also propose that the copy mechanism does not have to copy all material in the filler, but only needs to copy the head of the filler. This provides a more satisfying account of reconstruction generally, without the need for countercyclic late merger (Lebeaux 1988, Chomsky 1993, and much other work).

We begin in section 2 by investigating claims that ATB movement and parasitic gap constructions behave similarly, and in particular that they both evidence asymmetries. We report on several experiments run using Amazon Mechanical Turk which call these asymmetries into question. In particular, we see full

reconstruction to all gap sites, including parasitic gap sites. Section 3 then looks at claims that ATB movement and parasitic gap constructions behave differently, and need to be distinguished. We show that all of the data that have been thought to distinguish them are incorrect, and ATB movement and parasitic gap constructions behave the same in every respect. In section 4, we propose our left-to-right analysis of multiple gap constructions that accounts for all of the data. Section 5 is the conclusion.

## 2 A Critical Look at Claims of Asymmetries

In this section we re-examine evidence that has been presented to argue that ATB movement and parasitic gap constructions behave the same. In particular, we examine claims that in both constructions, one gap behaves differently from the other(s). In the next section we will examine claims that ATB movement and parasitic gap constructions behave differently. This section looks at reconstruction for Condition C and Condition A of the Binding Theory, and weak crossover. All of these have been claimed to behave asymmetrically in multiple-gap constructions. We show that both parasitic gap constructions and ATB movement are actually symmetric, and where there are asymmetries they are due to linear order (and are probably not part of the grammar). We also present evidence from secondary strong crossover from the literature that further reinforces this conclusion.

### 2.1 Condition C

We begin with reconstruction for Condition C of the Binding Theory. As stated in the introduction, some previous work has claimed that there is an asymmetry in ATB movement, with reconstruction only into the initial conjunct. Specifically, Citko (2005) reports the following judgment:

- (9) (Citko 2005, 494, (45))
- a. \* Which picture of John<sub>1</sub> did he<sub>1</sub> like \_ and Mary dislike \_ ?
  - b. Which picture of John<sub>1</sub> did Mary like \_ and he<sub>1</sub> dislike \_ ?

We are very suspicious of this judgment. First, in informal polls, few speakers of English that we have spoken to perceive this contrast. Second, recent work has questioned whether there is reconstruction for Condition C at all with fronted NPs. Much of the syntax literature has claimed that there is reconstruction of arguments to fronted nouns, but not of adjuncts (van Riemsdijk and Williams 1981, Freidin 1986, Barss 1988, 40, Lebeaux 1988, Chomsky 1993, Sauerland 1998, Fox 1999a, Takahashi and Hulsey 2009, among many others). Other literature has contested this, and suggested that there is no reconstruction even with arguments (Bianchi 1995, Lasnik 1998, Safir 1999, 609, Kuno 2004, Henderson 2007, 206–207). Some recent experimental work finds that a majority of English speakers do not show any effect of reconstruction for Condition C at all, and for those who do, the effect decreases with linear distance and is therefore probably not due to Condition C at all (Leddin and Lidz 2006, Adger *et al.* 2016, Al Khalaf and Bruening 2016).

We decided to check Citko's reported judgment directly with a survey using Amazon Mechanical Turk (see Gibson *et al.* 2011, Sprouse 2011). We designed experimental items in a 2x2 design with factors *Wh* (whether the NP underwent wh-movement or not) and *First* (whether the pronoun is in the first or the second conjunct). Since the wh-movement conditions involve ATB movement out of two conjuncts, the non-movement conditions could not simply have the wh-phrase in situ, because if they did, there would be two copies of it. We decided to use right node raising (RNR) as the contrast to wh-movement. Levine (1985) showed that RNR does not bleed Condition C (at least short-distance RNR, as here). The RNR conditions therefore served as good contrasts for the ATB wh-movement conditions. The following is a sample set from the paradigm:

- (10) a. Bill explained which picture of John in renaissance costume he liked but Mary disliked. Who liked the picture that Mary disliked? A: Bill B: John (Wh, First)
- b. Bill explained which picture of John in renaissance costume Mary disliked but he liked. Who liked the picture that Mary disliked? A: Bill B: John (Wh, Second)
- c. Bill explained why he liked, but Mary disliked, that picture of John in renaissance costume. Who liked the picture that Mary disliked? A: Bill B: John (RNR, First)
- d. Bill explained why Mary disliked, but he liked, that picture of John in renaissance costume. Who liked the picture that Mary disliked? A: Bill B: John (RNR, Second)

We included an adjunct in the relevant NP to increase the distance between the R-expression in that NP and the pronoun in the wh-movement conditions. If any obviation effect is due to reconstruction for Binding Condition C, this should have no effect. On the other hand, if some speakers simply disprefer coreference when the linear distance between the R-expression and the pronoun is too short, then this may help to bring out the grammatical potential for coreference. (Increasing the heaviness of the NP also made RNR more natural in the RNR conditions.)

We used embedded wh-questions for two reasons: First, to provide another possible referent for the pronoun, in the form of the matrix subject; and second, so that subjects would not be confused about what question they should be answering. Rather than trying to ask them directly about coreference possibilities, we gave them a forced choice question about who the referent of the pronoun was (given with the items above). The two choices were always the matrix subject and the R-expression embedded within the wh-phrase (or RNR-ed NP), and these always matched in gender (and number). In half of the experimental items, the relevant R-expression was the second choice of the two, and in half it was the first choice, to guard against any bias for picking the first or second of two choices.

This method has the disadvantage that we cannot know for sure from any results whether subjects truly disallow a given referent. However, it has the advantage that it is a very natural task and does not require that the subjects try to engage in any metalinguistic analysis, which could be faulty or trigger reasoning outside the grammar. In practical terms, we believe this method can provide a reasonable amount of evidence for or against a grammatical constraint on coreference. If a referent truly is ruled out by the grammar, then we should see choices of that referent at a rate close to zero. If there is no grammatical constraint, then we should see subjects behaving at around chance, which in a two-choice task is 50%.<sup>2</sup> Since the experimental items are set up to directly compare the position of the pronoun in the first or second conjunct, we will also be able to see if naive subjects treat them differently, as Citko (2005) would lead us to expect.

We distributed the experimental items into four lists so that each subject saw only one of the four sentences in each set (e.g., that in (10)). We created eight such sets, so that each subject judged two of each type. The complete set of items appears in the appendix. We also included sixteen filler items with comprehension questions, to check that subjects were engaged in the task. Subjects therefore read 24 sentences and answered one question about each. Within each list, the order of sentences was randomized.

Using Amazon Mechanical Turk, we recruited 20 subjects for each list, for a total of 80 subjects. Subjects were paid 50 cents for participating. We limited recruitment to subjects with IP addresses in the United States, and also asked them to say what their native language was and what country they were from. Subjects who reported a language other than English as their native language were excluded from the analysis. No subject was excluded for this reason. Subjects were also excluded if they got more than two questions wrong on the filler items. Five subjects were excluded for this reason, leaving a total of 75 subjects in the analysis. Additionally, subjects pointed out that there was a mistake with one particular item: the wrong

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<sup>2</sup>This is assuming that all else is equal, and it may well not be; word order in particular could play a role, such that subjects prefer anaphoric to cataphoric reference, for instance. So rates may differ from chance, but if they are significantly different from zero, we could still conclude that coreference is permitted. In the experiment, we find rates well above zero.

answers were shown. This was one of the RNR, Second items. This item was discarded from the analysis, so for the condition RNR, Second, there were 131 data points rather than 150 as in the other conditions.

Results are shown in (11), in the form of percentage of “B” responses. This is the response that violates Binding Condition C in the RNR conditions, and would violate it if there were complete reconstruction in the Wh conditions:

- (11) a. Bill explained which picture of John in renaissance costume he liked but Mary disliked.  
Who liked the picture that Mary disliked? A: Bill B: John (Wh, First)  
25.33% answer “B”
- b. Bill explained which picture of John in renaissance costume Mary disliked but he liked.  
Who liked the picture that Mary disliked? A: Bill B: John (Wh, Second)  
30.67% answer “B”
- c. Bill explained why he liked, but Mary disliked, that picture of John in renaissance costume.  
Who liked the picture that Mary disliked? A: Bill B: John (RNR, First)  
4.00% answer “B”
- d. Bill explained why Mary disliked, but he liked, that picture of John in renaissance costume.  
Who liked the picture that Mary disliked? A: Bill B: John (RNR, Second)  
5.34% answer “B”

As can be seen, in the two RNR conditions, subjects answer “B” at a rate close to zero. This is because that referent for the pronoun is ruled out by Binding Condition C. In contrast, in the two Wh conditions, subjects answer “B” at a rate significantly higher than zero. This rate is slightly higher in the Second condition than in the First condition, in line with the judgment reported by Citko (2005). However, this difference is very small, and it is not statistically significant.

Statistical analysis was run using R (R Core Team 2012). Responses were analyzed by means of linear mixed-effect modeling using the R-package lme4 (using glmer with family binomial). The two fixed effects in the analysis were Wh/RNR and the pronoun being in the First/Second conjunct. Following the recommendations in Barr *et al.* (2013), we included by-subject random intercepts and slopes and by-item random intercepts. This maximal model failed to converge, so we simplified it successively to a model including only random intercepts for both subjects and items (and this model did not differ in an ANOVA from the more complicated, non-convergent models). Table 1 shows the results.

Table 1: Summary of fixed effects in the mixed-effects model for Experiment 1

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-3.23816	0.52971	-6.113	9.77e-10
Wh/RNR	2.22803	0.61206	3.640	0.000272
First/Second	-0.37357	0.72307	-0.517	0.605405
Wh/RNR:First/Second	0.05622	0.87058	0.065	0.948512

As can be seen from the last column in Table 1, there is a main effect of Wh versus RNR, but no main effect of First versus Second conjunct. There is also no interaction between Wh/RNR and First/Second, contrary to what would be expected given the judgment reported by Citko (2005).

We conclude that the contrast reported by Citko (2005) is not real. There is no asymmetry in reconstruction for Condition C in ATB movement. In fact, recent work has found that there is no reconstruction for Condition C in wh-movement in English at all (Leddon and Lidz 2006, Adger *et al.* 2016, Al Khalaf and Bruening 2016). Those speakers who do prefer disjoint reference in wh-movement do so for reasons other than Binding Condition C. This dispreference weakens with linear distance, explaining why some speakers

feel there is a difference between the first and the second conjunct in ATB movement. However, this is not due to reconstruction for Binding Condition C, and most speakers perceive no such difference.

To summarize, and state the results in a way that will be relevant for building an account in section 4, we find that dependents of a fronted head simply do not reconstruct at all. Arguments and adjuncts to fronted *wh*-phrases do not reconstruct for Binding Condition C. Most importantly, there is no asymmetry in multiple-gap constructions.

## 2.2 Condition A

With Binding Condition A, reconstruction has been claimed to be asymmetric in ATB movement on the basis of examples like the following:

- (12) (Citko 2005, 493, (44))
- a. [Which picture of himself<sub>1</sub>] did John<sub>1</sub> sell \_ and Mary buy \_ ?
  - b. \* [Which picture of himself<sub>1</sub>] did Mary sell \_ and John<sub>1</sub> buy \_ ?

This example uses an anaphor inside a picture-NP. In fact, every such example that has been presented in the literature uses an anaphor inside a picture-NP (Munn 1992, Nissenbaum 2000, Citko 2005; see Levine and Sag 2003). Anaphors inside NPs are known to be exempt from Binding Condition A. Instead, they take a perspective holder as antecedent (Pollard and Sag 1992, Reinhart and Reuland 1993). We note that examples like (12b) become fully acceptable if the perspective holder is established to be *John* in an earlier sentence:

- (13) John<sub>1</sub> is upset. [Which picture of himself<sub>1</sub>] will Mary find \_ and he<sub>1</sub> then have to explain \_?

This means that examples like (12) do not show anything about reconstruction. They are compatible with an analysis where the exempt anaphor is evaluated in its surface position, and an antecedent is found for it in that position. If no perspective taker has been established, then many speakers will take the closest potential antecedent to be the antecedent. This is why the judgment in (12) has been repeated in the literature: many people will only permit the closest potential antecedent as the antecedent for an exempt anaphor. (But note that in an informal poll, six of thirteen speakers found the sentences equally acceptable. These six speakers presumably have no preference for the closest potential antecedent; they just need to find a perspective taker, and in these examples both NPs are possible perspective takers, and neither is a better perspective taker. See also Runner and Kaiser 2005, who find speakers permitting antecedents for exempt anaphors that are not the most local potential antecedent.)

If many speakers permit only the closest potential antecedent to be the antecedent for an exempt anaphor inside a picture-NP, then we make a prediction regarding cases of parasitic gaps where the parasitic gap linearly precedes the real gap. Specifically, we expect to see the appearance of reconstruction only to the parasitic gap, and not to the real gap. This contrasts with the view where reconstruction only takes place to real gaps and never to parasitic gaps, which makes the opposite prediction.

This is one of the few cases where previous literature has looked at parasitic gaps that come first, but two of the works that have done this directly contradict each other. Nissenbaum (2000) gives the following judgments, which no one we have consulted agrees with:

- (14) (Nissenbaum 2000, 41, (17), judgements his)
- a. ? Which portrait of himself<sub>1</sub> do [people who see *pg* for the first time] usually think Picasso<sub>1</sub> spent the most time on \_?
  - b. \* Which portrait of herself<sub>1</sub> do [people who know Gertrude Stein<sub>1</sub> hated *pg*] usually think Picasso spent a lot of time on \_?

Munn (1994) reports the exact opposite judgment, which is consistent with an account based on linear order. Many speakers we have consulted do agree with this judgment:

- (15) (Munn 1994, 407, (31))
- a. \* Which picture of herself<sub>1</sub> did [every boy who saw *pg*] say Mary liked \_?
  - b. Which picture of himself<sub>1</sub> did [every boy who<sub>1</sub> saw *pg*] say Mary liked \_?

This is consistent with a preference for the closest potential antecedent for an exempt anaphor: in (15a), the closest potential antecedent for *herself* is *every boy*, but they do not match in features. In contrast, in (15b), the closest potential antecedent for *himself* is *every boy*, which is a possible antecedent. The judgments in (15) are *not* compatible with a theory where there is only reconstruction to a real gap and never to a parasitic gap. On such a theory, the judgments in (15) should be the opposite.

Levine and Hukari (2006) also present examples of parasitic gaps that precede the real gap. They give the following judgments:

- (16) (Levine and Hukari 2006, 49, (88b), (89b))
- a. There were pictures of herself<sub>1</sub> which once Mary<sub>1</sub> finally decided she liked/approved of *pg*, John put \_ into circulation.
  - b. There are pictures of herself<sub>1</sub> which, after getting Mary<sub>1</sub> to approve of *pg*, John wants to put \_ into circulation.

These judgments are also incompatible with a theory where there is only reconstruction to a real gap and never to a parasitic gap.

Again, though, these examples use exempt anaphors inside picture-NPs. As such, they really show nothing at all about reconstruction. Instead they illustrate speaker preferences for finding antecedents for exempt anaphors. Finding an antecedent for an exempt anaphor does not invoke structural conditions.

To get at actual reconstruction, we have to look at non-exempt anaphors, that is, anaphors that are arguments. We already presented the following example of a non-exempt anaphor in a parasitic gap construction, from Levine *et al.* (2001, 211, (56)):

- (17) \* Himself<sub>1</sub>, John<sub>1</sub> admires \_ without Mary liking *pg* in the least.

This example shows that there is no asymmetry in reconstruction for Binding Condition A. There must be full reconstruction of the filler even into a parasitic gap site, or the sentence would be grammatical. As shown above, if the parasitic gap is pronounced as an overt pronoun, the sentence is grammatical:

- (18) Himself<sub>1</sub>, John<sub>1</sub> admires \_ without Mary liking him<sub>1</sub> in the least.

This means that the theory that parasitic gaps are copies of null operators cannot be correct. Null operators are generally thought to act like pronouns (e.g., Browning 1987).

We also see symmetric reconstruction in examples where the parasitic gap precedes the real gap:

- (19) a. \* Himself, people criticizing *pg* often leads John to blame \_.  
b. \* Themselves, people criticizing *pg* often leads John to blame \_.

Again, there must be complete reconstruction to the parasitic gap site. If there were instead a null operator that had the binding status of a pronoun, (19a) would be grammatical.

We also presented some data in the introduction where symmetric reconstruction to both the real and the parasitic gap results in a grammatical sentence:



- (20) a. It's herself that [her thinking critically about *pg*] will lead her to understand \_ better.  
 b. It's herself that she should take a hard look at \_ [before she shamelessly promotes *pg* ].

In other words, data from non-exempt anaphors show clearly that parasitic gap sites evidence full reconstruction.

Some further examples appear below:

- (21) a. It is only himself that John('s) blaming *pg* could make him more aware of \_.  
 b. \* It is only himself that John's blaming *pg* could lead others to understand \_ better.  
 c. \* It is only themselves that John's blaming *pg* could lead other people to understand \_ better.  
 (22) a. It's yourself, not other people, that you criticizing *pg* will lead you to understand \_ better.  
 b. \* It's yourself, not other people, that you criticizing *pg* will lead them to understand \_ better.  
 c. \* It's themselves, not you, that you criticizing *pg* will lead other people to understand \_ better.

The above examples involved parasitic gap constructions. We see the same symmetric reconstruction in ATB movement (part of this paradigm was presented in the introduction):

- (23) a. Himself, John always blames \_ and then begins to loathe \_.  
 b. \* Himself, John always blames \_ and Mary begins to loathe \_.  
 c. \* Himself, Mary always blames \_ and John begins to loathe \_.  
 (24) a. It's only themselves that people should blame \_ and then try to improve \_.  
 b. \* It's only themselves that they should blame \_ and Mary should forgive \_.  
 c. \* It's only themselves that Mary should forgive \_ and they should try to improve \_.  
 (25) a. It's each other that we can rely on \_ and depend on \_.  
 b. \* It's each other that we can rely on \_ and John can depend on \_.  
 c. \* It's each other that John can rely on \_ and we can depend on \_.

We also ran a formal judgment survey on similar data (Experiment 2). In this case we made use of the free tools described in Gibson *et al.* (2011) and available at <http://tedlab.mit.edu/software/>, modified for the purposes of this experiment. Subjects were again recruited through Amazon Mechanical Turk.

The experiment had two factors, one of which had two levels and the other of which had three. The first factor was ATB movement versus parasitic gaps. The parasitic gap sentences all involved a parasitic gap inside a subject (so, preceding the "real" gap). The second factor was which gap matched the features of the fronted anaphor (the filler): all, first, or second. This gave us a paradigm of six sentences, as follows:

- (26) a. (ATB\_All) It's himself that John took a hard look at and became more aware of.  
 b. (ATB\_First) It's himself that John took a hard look at and Melinda became more aware of.  
 c. (ATB\_Second) It's himself that Melinda took a hard look at and John became more aware of.  
 d. (PG\_All) It's himself that John taking a hard look at could make him more aware of.  
 e. (PG\_First) It's himself that John taking a hard look at could make Melinda more aware of.  
 f. (PG\_Second) It's himself that Melinda taking a hard look at could make John more aware of.

We elected to use clefting rather than simple fronting because we thought this would be more natural and acceptable to naive subjects with reflexives and reciprocals. We created six sets of sentences on the paradigm above, and subjects saw only one of each set. We were worried that having subjects rate two of each type would create too long an experiment, so we only had subjects rate one of each type.

Experiment 2 asked subjects to rate the sentence on a scale of 1 to 5 (1: Extremely unnatural, 2: Somewhat unnatural; 3: Possible, 4: Somewhat natural, 5: Extremely natural). Each sentence was also accompanied by a comprehension question to make sure that the subjects were not just answering randomly without reading the sentence. Questions were always answered yes or no and always had a right answer (an obvious one). Subjects were discarded from the analysis if they answered more than 25% of the questions incorrectly.

In addition to the six experimental items that each subject judged, each also rated 22 fillers. Eight of these were items for an unrelated experiment. All eight of these were judged by subjects to be in the acceptable range (all means were greater than 3.7). The other sixteen were control sentences that were created by modifying examples taken from the web, typically on-line newspaper articles. Each of the sixteen was manipulated to create an ungrammatical match, where the manipulation was changing the word order of S, O, or V, or a P and its object. A couple of examples follow (the ungrammatical sentences were not presented with the star):

- (27) a. South Africa became the second African country to announce that it would leave the International Criminal Court.
- b. \* South Africa became the second African country to announce that it would the International Criminal Court leave.
- (28) a. One child lives in a second-floor apartment overlooking the Grand Concourse, the Bronx's main thoroughfare.
- b. \* Lives one child in a second-floor apartment overlooking the Grand Concourse, the Bronx's main thoroughfare.

As stated, there were 16 pairs of controls, and once again each subject saw only one member of each pair. Subjects therefore rated a total of 30 sentences (6 experimental items + 8 fillers from another experiment + 16 control items). A different list was created for each subject with the presentation order randomized.

120 participants were recruited from within the USA. Ten subjects were excluded for reporting a language other than English as their first language, for getting less than 75% correct on the comprehension questions, or for leaving more than 20% of the questions unanswered. This left 110 subjects whose data entered into the analysis.

Median ratings and mean ratings and standard deviations are shown below (again, the scale is 1–5, 1: Extremely unnatural, 2: Somewhat unnatural; 3: Possible, 4: Somewhat natural, 5: Extremely natural):

(29)	ATB_All	ATB_First	ATB_Second	PG_All	PG_First	PG_Second
median	3	2	2	1	1	1
mean	2.981818	2.227273	1.809091	1.678899	1.645455	1.581818
SD	1.1492464	0.9829658	0.9035654	0.8911160	0.8414313	0.8057342

For comparison, median and mean ratings on the grammatical and ungrammatical controls are shown below:

(30)	grammatical	ungrammatical
median	5	2
mean	4.364773	2.361143
SD	0.9407401	1.2353854

It appears that our subjects simply rejected all of the parasitic gap examples. All of them were rated lower in acceptability than the ungrammatical control sentences. The only condition that subjects rated close to 3 (the mid-point on the scale) was the ATB\_All condition. We believe that this is the only one that

subjects found acceptable, partially confirming our contention here that only symmetric reconstruction is grammatical in multiple-gap constructions.

Statistical analysis was run using R (R Core Team 2012). Responses were analyzed by means of linear mixed-effect modeling using the R-package lme4 (now using lmer). The two fixed effects in the analysis were ATB/PG and All/First/Second. Following the recommendations in Barr *et al.* (2013), we included by-subject random intercepts and slopes and by-item random intercepts. This maximal model failed to converge, so we simplified it successively to a model including only random intercepts for both subjects and items. Table 2 shows the estimated contrasts, their standard error, and the resulting t-value.

Table 2: Summary of fixed effects in the mixed-effects model for Experiment 2

	Estimate	Std. Error	t-value
(Intercept)	2.9812	0.1013	29.432
ATB/PG	-1.3077	0.1055	-12.394
First	-0.7533	0.1096	-6.875
Second	-1.1697	0.1077	-10.865
ATB/PG:First	0.7242	0.1388	5.216
ATB/PG:Second	1.0784	0.1388	7.768

Since an exact p-value cannot be computed, we consider contrasts with an absolute t-value greater than 2 to be significant (see Baayen 2008, 248). As can be seen in Table 2, all effects are highly significant.

It is not entirely clear how to interpret these results. First, subjects simply found all of the parasitic gap examples unacceptable. Even within the unacceptable range, however, we do see differences, such that the anaphor fitting all gaps is judged best, followed by fitting the first gap and lastly fitting only the second gap. As for the ATB sentences, only the one where the anaphor matched all gaps was judged near the mid-point of the acceptability scale. We interpret this to mean that the ATB\_All condition was actually acceptable, though it was rated low due to complexity and other factors. Within the ATB conditions, again we saw that matching all gaps was best, with acceptability decreasing to matching just the first gap and decreasing further when it matched just the second gap.

Although the results here are not particularly clear, we believe that they are consistent with our contention that only complete symmetry is actually acceptable with anaphors as fillers in multiple-gap constructions. The filler has to match (and hence reconstruct to) all gaps. This view would expect only the ATB\_All and PG\_All conditions to be acceptable. However, subjects rejected all the PG conditions, for reasons that are unclear to us (perhaps they just do not like parasitic gaps). However, the ATB\_All condition was the only one that was rated close to acceptable. We take this to support our claim that reconstruction is symmetrical.

If the fronted anaphor does not match all gaps, we found that matching just the first gap is more acceptable than matching just the second one. One might take this to indicate that there is an asymmetry in reconstruction. An alternative, which we think is correct, is that this difference is a non-grammatical effect of linear distance on the processing of anaphors. Subjects will always find a closer antecedent more acceptable than a farther antecedent. Importantly, we see the same linear effect in the parasitic gap conditions, where the parasitic gap precedes the real gap. This means that there is no support for the view that reconstruction only takes place to real gaps and not to parasitic gaps.

To summarize Experiment 2, it was a failure in the sense that subjects rejected all of the parasitic gap examples. However, it did show that only symmetric reconstruction is acceptable in ATB movement, as we contend. We also find an effect of linear order when the filler fails to match all gaps, and this, we think, supports the view that conjunct asymmetries that have been reported in the literature are not due to the grammar at all, but to linear effects in processing.

To conclude this subsection, reconstruction for Condition A is actually symmetric in both ATB movement and parasitic gap constructions. Asymmetries only arise with exempt anaphors inside picture-NPs, where many speakers prefer the linearly *closest* antecedent for an exempt anaphor. With non-exempt anaphors, we see symmetric reconstruction. Importantly, we see reconstruction into parasitic gap sites, contrary to much previous literature. Our experimental survey was not entirely clear, but it did reveal that matching all gaps was always perceived to be better than matching just one. Matching just the first gap is better than matching just the second, but in all cases ratings were in the unacceptable range. We hypothesize that the difference between matching just the first and matching just the second gap is a non-grammatical effect of linear distance on the processing of anaphors (and filler-gap dependencies in general).

Summarizing this in a way that will be relevant to building an account in section 4, we find that the head of a fronted phrase obligatorily reconstructs to all gap sites. Given what we saw regarding Condition C, we can now say that the head of a fronted phrase obligatorily reconstructs to all gap sites, but any dependents of that head do not reconstruct to any of them.

### 2.3 Weak Crossover

Weak crossover has also been claimed to be asymmetric in ATB movement (Munn 2001). In particular, weak crossover only appears in the first conjunct and not in subsequent conjuncts:

- (31) (Munn 2001, 374, (10b,d))
- a. Which  $man_1$  did you hire  $\_$  and his $_1$  boss fire  $\_$  ?
  - b. \* Which  $man_1$  did his $_1$  boss fire  $\_$  and you hire  $\_$  ?

This is also supposed to be true of parasitic gaps (Lasnik and Saito 1991):

- (32) (Munn 2001, 374, (9a,c))
- a. Who $_1$  did you gossip about  $\_$  despite his $_1$  mother's having vouched for *pg*?
  - b. \* Who $_1$  did his $_1$  mother gossip about  $\_$  despite you having vouched for *pg*?

According to Munn (2001), this asymmetry supports a null operator account of both parasitic gaps and ATB movement. The null operator is basically a pronoun, and its trace is converted into a resumptive pronoun at LF (following Safir 1996). This somehow enables the pronoun to be bound by the *wh*-phrase (see Levine and Hukari 2006 for extensive criticism of this account).

We note instead that these WCO judgments simply follow from linear accounts of weak crossover that have already been proposed (Chomsky 1976, Higginbotham 1980, Shan and Barker 2006; see also the examples in Bruening 2014, 374–375). We state the descriptive generalization about WCO as follows:

- (33) A quantifier Q can bind a pronoun P as a variable only if some A-position occupied by (a copy of) Q precedes an A-position occupied by (a copy of a phrase containing) P.

In (31a), an A-position occupied by a copy of the *wh*-phrase (object of *hire*) precedes the pronoun, and binding is licit. In contrast, in (31b), the pronoun precedes all A-positions occupied by a copy of the *wh*-phrase, and binding is not allowed.

If this is correct, we predict that, when we use parasitic gap examples where the parasitic gap precedes the real gap, WCO should reverse. We predict that we should get a WCO violation with a parasitic gap that precedes the real gap:

- (34) *Predicted Judgments:*
- a. \* Which girl $_1$  did her $_1$  teacher('s) criticizing *pg* really upset  $\_$ ?

- b. Which girl<sub>1</sub> did the teacher('s) criticizing *pg* make her<sub>1</sub> mother withdraw \_ from school?

The view that parasitic gaps are not real gaps, and weak crossover only occurs with real gaps, predicts a different pattern of judgments. This account predicts that in (34a) there should be no weak crossover, because the pronoun is crossed by a null operator, not the *wh*-phrase. In (34b), in contrast, weak crossover should occur with the real gap. Hence, the null operator view expects the exact opposite pattern of judgments from what the linear account predicts.

Levine and Hukari (2006) have presented part of this paradigm, namely, the case where the pronoun occurs in the clause with the parasitic gap. They judge it ungrammatical on the bound reading:

- (35) a. \*?? Who<sub>1</sub> did his<sub>1</sub> mother's stories about *pg* annoy \_? (Levine and Hukari 2006, 317, (26))  
b. ??\* Whose<sub>1</sub> work did his<sub>1</sub> fan's ideas about *pg* materially improve \_? (Levine and Hukari 2006, 316, (24))

This is inconsistent with the null operator account, and consistent with the linear account. Levine and Hukari (2006) do not present the case where the pronoun occurs in the clause with the "real" gap; that would be something like the following:

- (36) a. Who<sub>1</sub> did those stories about *pg* lead his<sub>1</sub> mother to punish \_?  
b. Whose<sub>1</sub> work did a fan's ideas about *pg* lead his<sub>1</sub> editor to demand a new version of \_?

A judgment of grammaticality would support the linear account over the null operator account. Informal surveys support the prediction of the linear account: (36) (and (34b)) are acceptable on the bound reading, or at least more acceptable than (35).

We also ran a survey using Amazon Mechanical Turk to try to assess this formally, although the results were inconclusive. We report them here because, while they do not conclusively support our proposals, they also provide no support for the null operator analysis. They are also interesting for what they show about weak crossover in general (that it is very weak to nonexistent).

The study used a 2x2 design, with factors linear order (whether the pronoun follows at least one gap, or not) and multiple versus single gaps. This gave us a paradigm of four sentences, as follows:

- (37) a. Sally is wondering which girl her teacher's shouting at really upset.  
Whose teacher shouted at a girl? A: Sally's B: the other girl's (Precedes, Multiple)  
b. Sally is wondering which girl the teacher's shouting at made her mother take out of school.  
Whose mother took the girl out of school? A: Sally's B: the other girl's (Follows, Multiple)  
c. Sally is wondering which girl her mother shouted at.  
Whose mother shouted at a girl? A: Sally's B: the other girl's (Precedes, Single)  
d. Sally is wondering which girl shouted at her mother.  
Whose mother was shouted at? A: Sally's B: the other girl's (Follows, Single)

As can be seen, Experiment 3 used a forced-choice task again rather than a sentence rating task. Subjects were asked for the identity of the pronoun, and one of the choices was the *wh*-phrase while the other was the matrix subject.

The linear order hypothesis predicts that we will find only a main effect of linear order. Specifically, the sentences where the pronoun follows at least one gap (the two Follows conditions) should permit "the other girl's" as an answer, and the other two sentences should not. In contrast, the null operator theory predicts an interaction, such that judgments should reverse with multiple gaps. In the single-gap conditions, the sentence where the pronoun precedes the gap (37c) should not permit "the other girl's" as an answer. In

the multiple-gap conditions, weak crossover is supposed to arise only with real gaps and not with parasitic gaps, so (37b) should not permit “the other girl’s” as an answer.

We distributed the items into four lists so that each subject saw only one of the four sentences in the set in (37). We created eight such sets, so that each subject judged two of each type. The complete set of items appears in the appendix. We also included sixteen filler items with comprehension questions, to check that subjects were engaged in the task. Within each list, the order of sentences was randomized.

We recruited 20 subjects for each list, for a total of 80 subjects. Subjects were paid 35 cents for participating.<sup>3</sup> We limited recruitment to subjects with IP addresses in the United States, and also asked them to say what their native language was. Subjects who reported a language other than English were excluded from the analysis. In this experiment, 1 subject was excluded for reporting another language as their native language. 10 subjects were excluded for answering more than 2 comprehension questions on the filler items incorrectly. A total of 69 subjects were included in the analysis.

Results are reported below, in the form of percentage of “B” answers. This is the answer that takes the pronoun to be bound by the wh-phrase:

- (38) a. Sally is wondering which girl her teacher’s shouting at really upset.  
Whose teacher shouted at a girl? A: Sally’s B: the other girl’s (Precedes, Multiple)  
**39% answer B**
- b. Sally is wondering which girl the teacher’s shouting at made her mother take out of school.  
Whose mother took the girl out of school? A: Sally’s B: the other girl’s (Follows, Multiple)  
**62% answer B**
- c. Sally is wondering which girl her mother shouted at.  
Whose mother shouted at a girl? A: Sally’s B: the other girl’s (Precedes, Single)  
**30% answer B**
- d. Sally is wondering which girl shouted at her mother.  
Whose mother was shouted at? A: Sally’s B: the other girl’s (Follows, Single)  
**45% answer B**

As can be seen, subjects answered “B” more often in the two Follows conditions, as the linear order hypothesis predicted. We did not find that “B” responses were limited to the Precedes, Multiple and Follows, Single conditions as the null operator hypothesis predicted. In fact, we observed the most “B” responses in the Follows, Multiple condition, which the null operator view would predict not to allow variable binding. We also see a significant number of “B” responses even in the two Precedes conditions, which was unexpected.

The differences in responses listed above turned out not to be significant. Responses were analyzed by means of linear mixed-effect modeling using the R-package lme4 (using glmer with family binomial). The two fixed effects in the analysis were precedence and single/multiple gaps. Following the recommendations in Barr *et al.* (2013), we included by-subject random intercepts and slopes and by-item random intercepts. Again the maximal model failed to converge, so it was simplified successively to a model including only random intercepts for both subjects and items. Table 3 shows the results.

As can be seen from the last column of table 3, there is no significant main effect of either factor, and no interaction. One possible reason for this might come from our finding from Experiment 2 that subjects simply do not accept parasitic gap sentences. If they find the sentence unacceptable or perhaps unprocessable, they may just be answering at random. This does not seem to be what is going on here, however. If we look only at the two Single conditions, we still do not find a significant effect of the factor Precede in a linear mixed-effect model with random intercepts for subjects and items.

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<sup>3</sup>We paid our subjects different amounts in the different experiments because we were unsure how much to pay, and decided to experiment to see if the amount we paid affected how fast we got results (it had only a minor effect).

Table 3: Summary of fixed effects in the mixed-effects model for Experiment 3

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.3048	0.5420	-0.562	0.574
Precede	-0.7146	0.7482	-0.955	0.340
Multiple	0.9172	0.7506	1.222	0.222
Precede:Multiple	-0.5750	1.0564	-0.544	0.586

It turns out that it is the items that are responsible for most of the differences in responses. If the random intercept for items is left out of the model for both factors, then both the factors and their interaction become significant. If the random intercept for items is left out of the model looking only at the two Single conditions, then Precede becomes significant. An ANOVA comparing the two pairs of models indicates that the effect of including items is highly significant in both cases.

We list the items from the single-gap conditions in table 4, along with the numbers of each type of response. (Note that the total number of responses differs according to which list the item was on, because a different number of subjects from each list were discarded from the analysis.)

Table 4: Responses by Item for the Single-Gap Conditions in Experiment 3

Pronoun Precedes Gap (A = number of matrix subject answers, B = number of wh-phrase answers)		
A	B	Item
6	6	The teaching assistant asked which female student her professor wrote a letter for.
9	5	The abbess wants to know which nun her family abandoned as a baby.
14	5	An aide told me which official his friend tried to intercede for.
15	4	The jester doesn't know which prince his horse lunged at.
15	3	The milkmaid tried to find out which princess her friend has a crush on.
15	2	Sally is wondering which girl her mother shouted at.
10	8	The delivery boy asked which apprentice his master punished.
10	8	The headmaster demanded to know which boy his lawyer filed a lawsuit for.
Pronoun Follows Gap (A = number of matrix subject answers, B = number of wh-phrase answers)		
A	B	Item
8	11	The teaching assistant asked which female student wrote a letter to her professor.
3	16	The abbess wants to know which nun ran away from her family as a child.
12	6	An aide told me which official tried to intercede for his friend.
17	1	The jester doesn't know which prince jumped onto his horse.
18	0	The milkmaid tried to find out which princess has a crush on her friend.
13	5	Sally is wondering which girl shouted at her mother.
4	10	The delivery boy asked which apprentice ran away from his master.
1	13	The headmaster demanded to know which boy had his lawyer file a lawsuit.

As can be seen, items differ wildly in the response patterns. At this point, we are not entirely sure what is behind these differences. In a few cases, items where the wh-phrase precedes the pronoun still get overwhelming matrix subject responses, possibly because if the bound interpretation were intended subjects would expect the word *own* with the pronoun. Compare the following with the corresponding items above:

- (39) a. An aide told me which official tried to intercede for his own friend.  
 b. The jester doesn't know which prince jumped onto his own horse.

- c. The milkmaid tried to find out which princess has a crush on her own friend.
- d. Sally is wondering which girl shouted at her own mother.

This may have depressed the number of bound responses for these items, reducing the difference between the two conditions.

At the same time, however, subjects respond with the bound interpretation a surprising number of times even when the pronoun precedes all gaps (39% in the multiple-gap condition and 30% in the single-gap condition). We see two explanations for this. First, weak crossover is indeed weak, as its name implies and as was recognized from the beginning (Wasow 1972). Second, many speakers find that weak crossover is even weaker with *which* questions than it is with *who* questions (Wasow 1972, Eilam 2011). Thornton (1990) found a difference between *who* and *which* questions, with children accepting binding with *which* 60% of the time. Eilam (2011) reports similar discrepancies in judgments for adults. All of our items used *which* phrases, explaining why speakers were quite willing to accept the bound variable reading (but note that the examples from Munn 2001 in (31) also use *which* phrases; we suspect our Amazon Mechanical Turk subjects would not strongly support this contrast).

In addition, Eilam (2011) shows that numerous manipulations reduce weak crossover or make it disappear altogether. Eilam argues that weak crossover is actually a discourse condition, and is not a structural condition on variable binding as it is usually taken to be in the syntax literature. In the same vein, we suggest that weak crossover is probably not a grammatical condition at all. We propose that multiple factors affect the acceptability or availability (*not* grammaticality) of bound variable readings. One of the factors involved is *who* versus *which*. Another is linear order. We offer the linear generalization in (33) above as a descriptive statement concerning one of the factors that affects the availability of a bound reading with a pronoun. In our experiment, we did find an effect of linear order on the responses, although this effect was not significant.

We will leave a full account of weak crossover and the factors that contribute to the availability of bound variable readings to future work. Importantly for our investigation, the facts do not support treating parasitic gaps as different in kind from regular gaps, nor do they support treating non-initial gaps in ATB movement differently. There is only an effect of linear order, such that the pronoun to be bound preferentially follows at least one gap. It does not matter whether this is a “real” gap, or a parasitic gap, meaning that they should not be distinguished.

## 2.4 Secondary Strong Crossover

Our critical re-examination of the evidence for asymmetries in ATB movement and parasitic gap constructions has led to the conclusion that there are none. There is no support for treating the “real” gap in a parasitic gap construction as different from the parasitic gap, and no support for treating the first gap in ATB movement as different in kind from subsequent gaps. We have also seen that the head of a fronted phrase obligatorily reconstructs to all gap sites, but dependents of a fronted phrase do not reconstruct at all.

Data from secondary strong crossover presented in Williams (1990) further supports treating multiple-gap constructions in a completely symmetrical fashion. Secondary strong crossover (Postal 1993b) arises when a pronoun commands the gap left by a moved constituent; in such a case, the pronoun cannot be covalued with a sub-part of the moved constituent:

- (40) a. \* Which manager<sub>1</sub>'s sister did he<sub>1</sub> visit \_?  
 b. Which manager<sub>1</sub>'s sister \_ visited him<sub>1</sub>?

Secondary strong crossover appears in all conjuncts of an ATB movement construction, and with respect to all gaps in a parasitic gap construction (see Williams 1990, Munn 2001, Citko 2005, Salzmann 2012):



- (41) a. \* Which manager<sub>1</sub>'s sister did he<sub>1</sub> call \_ and you send an email to \_?  
 b. \* Which manager<sub>1</sub>'s sister did you call \_ and he<sub>1</sub> send an email to \_?
- (42) a. \* Which detective<sub>1</sub>'s sister did he<sub>1</sub> warn \_ before we arrested *pg*?  
 b. \* Which detective<sub>1</sub>'s sister did you warn \_ before he<sub>1</sub> arrested *pg*?

(Parasitic gaps also give rise to strong crossover effects; see Barss 1986, 380–382.)

Following many others (e.g., Chomsky 1981), we take secondary strong crossover (and strong crossover) to be a Binding Condition C violation. The filler is copied into all gap sites, as follows (strikethrough indicates an unpronounced copy):

- (43) a. \* Which manager<sub>1</sub>'s sister did you call [~~which manager<sub>1</sub>'s sister~~] and he<sub>1</sub> send an email to [~~which manager<sub>1</sub>'s sister~~]?  
 b. \* Which detective<sub>1</sub>'s sister did you warn [~~which detective<sub>1</sub>'s sister~~] before he<sub>1</sub> arrested [~~which detective<sub>1</sub>'s sister~~]?

The pronoun coindexed with the possessor A-binds it, giving rise to a Condition C violation.

Importantly, there is no asymmetry with secondary strong crossover. It appears with non-initial gaps in ATB movement and in clauses with parasitic gaps. On the Condition C account, this requires complete reconstruction into all gap sites.<sup>4</sup>

One thing to note is that the *wh*-phrase within the filler in these cases is a possessor, and is not the head of the fronted phrase. Given what we saw above regarding reconstruction for Condition C, we might expect that reconstruction of the possessor would not be required. This is not what we see, however; all speakers that we are aware of feel the effects of secondary strong crossover, in both multiple- and single-gap constructions. We suggest that this is because of the way pied-piping is interpreted at LF. Following von Stechow (1996), the actual *wh*-phrase must move out of the containing phrase at LF:

- (44) which detective [~~which detective's sister~~] did you warn

There are now two filler-gap dependencies. One filler is *which detective's sister*. The head of this filler is *sister*, which must reconstruct to all gap sites. The other filler is *which detective*. The head of this filler is *detective*. As the head, it must also reconstruct to all gap sites. In the case where a filler A is associated with a gap inside another filler B, we interpret this to mean that a copy of the head of A is also included in every copy of the head of B. This gives us the following representations for ATB movement and parasitic gaps:

- (45) a. \* Which manager<sub>1</sub> [~~manager<sub>1</sub>'s sister~~] did you call [~~manager<sub>1</sub>'s sister~~] and he<sub>1</sub> send an email to [~~manager<sub>1</sub>'s sister~~]?  
 b. \* Which manager<sub>1</sub> [~~manager<sub>1</sub>'s sister~~] did you inform him<sub>1</sub> that you were going to fire \_ and also insult \_?  
 c. Which manager<sub>1</sub>'s sister did you insult \_ and inform him<sub>1</sub> that you were going to fire \_?

<sup>4</sup>Munn (2001) disagrees with Williams (1990) that secondary strong crossover appears everywhere in multiple-gap constructions. According to Munn, if a non-initial gap is separated from the offending pronoun by a clause boundary, secondary strong crossover disappears:

- (i) (based on Munn 2001, 375, (14) and note 7)  
 a. \* Which manager<sub>1</sub>'s sister did you inform him<sub>1</sub> that you were going to fire \_ and also insult \_?  
 b. Which manager<sub>1</sub>'s sister did you insult \_ and inform him<sub>1</sub> that you were going to fire \_?
- (ii) (based on Munn 2001, 375, (13) and note 7)  
 a. \* Which manager<sub>1</sub>'s sister did you inform him<sub>1</sub> that you were going to fire \_ after insulting *pg*?  
 b. Which manager<sub>1</sub>'s sister did you insult \_ after informing him<sub>1</sub> that you were going to fire *pg*?

(Salzmann 2012, 433, (66) presents a similar example with strong crossover rather than secondary strong crossover.) Because these data are disputed and unclear, we will not address them here. We will leave further clarification of the data to future research.

- b. \* Which detective<sub>1</sub> [detective<sub>1</sub>'s sister] did you warn [detective<sub>1</sub>'s-sister] before he<sub>1</sub> arrested [detective<sub>1</sub>'s-sister]?

As can be seen, the R-expressions *manager* and *detective* are A-bound by pronouns in these representations, giving rise to Condition C violations.

We will come back to these representations in section 4.3. There we will show exactly how they work in our analysis and how they are interpreted.<sup>5</sup>

The important conclusion to take away from this subsection is that ATB movement and parasitic gap constructions behave identically with respect to secondary strong crossover. In particular, we see full reconstruction to parasitic gap sites and non-initial ATB gap sites.

## 2.5 Summary

This section has critically examined claims that reconstruction is asymmetric in ATB movement and parasitic gap constructions. We have shown that it is not, and reconstruction takes place uniformly in all multiple-gap constructions. There simply is no reconstruction of dependents of a fronted head for Condition C, but there is reconstruction for Condition C with secondary strong crossover (and strong crossover). This reconstruction is completely symmetric. There is also symmetric reconstruction of fronted heads for Binding Condition A. Claims of asymmetries with Binding Condition A were actually about exempt anaphors, not Binding Condition A. As for weak crossover, it is very weak, but it appears to be a preference principle based on linear order. We have suggested that weak crossover is not about the grammar at all. In any case, any asymmetry in weak crossover follows from a linear statement of weak crossover.

## 3 Evidence Claimed to Distinguish Parasitic Gaps from ATB Movement

The previous section investigated claims of asymmetries between gaps where ATB movement and parasitic gap constructions behaved the same. In this section we investigate data that have been presented to argue that ATB movement must be distinguished from parasitic gap constructions. First, reconstruction for variable binding has been claimed to differentiate ATB movement from parasitic gap constructions (Nissenbaum 2000). We show that it does not, and we need full reconstruction into all gap sites, including parasitic gap sites. Second, parasitic gaps have been claimed to be subject to more restrictions than ATB movement (Cinque 1990, Postal 1993a). We show data from Levine *et al.* (2001) that contradicts this claim (see also Engdahl 2001, Levine and Hukari 2006). In general, ATB movement and parasitic gap constructions can be seen to behave identically. Importantly, we need full reconstruction into both kinds of gap sites.

### 3.1 Reconstruction for Variable Binding

Nissenbaum (2000) argues that reconstruction for variable binding can be symmetric in ATB movement but not in parasitic gap constructions. In particular, a pronoun in the filler can be bound by a different quantifier in each conjunct in ATB movement, but not in parasitic gap constructions:<sup>6</sup>

<sup>5</sup>Note that if this is correct, we predict that a PP argument of a noun that does not normally reconstruct for Condition C will have to if it is a wh-phrase that pied-pipes the NP. This is because the wh-phrase will then extract and be the head of a filler. We believe that this is correct:

- (i) a. In which corner of John<sub>1</sub>'s room did he<sub>1</sub> say we could stow our gear?  
 b. \* In a corner of whose<sub>1</sub> room did he<sub>1</sub> say we could stow our gear?

<sup>6</sup>Nissenbaum's proposed answer in (46a) has right-node raising in it, such that the NP corresponding to the wh-phrase follows both quantifiers. In this answer, the variable binding is licit, consistent with our linear account of variable binding in (33). Following

- (46) (Nissenbaum 2000, 43–44, (24), (23))
- a. Which picture of his mother did you give to every Italian \_ and sell to every Frenchman \_?  
(Possible answer: “I gave to every Italian and sold to every Frenchman the picture of his mother that he likes best.”)
  - b. # Which picture of his mother did you give to every Italian \_ after buying from every Frenchman *pg*?  
(Impossible answer: “I gave every Italian<sub>1</sub> the picture of his<sub>1</sub> mother that he<sub>1</sub> liked best after buying from every Frenchman<sub>2</sub> the picture of his<sub>2</sub> mother that HE<sub>2</sub> liked best.”)

This variable binding requires full reconstruction into every conjunct in ATB movement:

- (47) Which picture of his mother did you give to every Italian<sub>1</sub> [~~which picture of his<sub>1</sub> mother~~] and sell to every Frenchman<sub>2</sub> [~~which picture of his<sub>2</sub> mother~~]?

Crucially, according to Nissenbaum there is no such reconstruction into a parasitic gap site. This follows on his theory where parasitic gaps are the trace of a null operator, and not the trace of the overt filler.

We believe that Nissenbaum’s parasitic gap example in (46b) is odd for pragmatic reasons: it requires on the bound reading that the addressee give away one picture after buying a different picture, but this is odd without any way of tying the two pictures together. The ATB example in (46a) does not suffer from this problem, since the two events are not presupposed to be connected. If we create parasitic gap examples that overcome this problem by explicitly stating the relation between the two events, the variable binding that is supposed to be impossible in (46b) is perfectly acceptable:

- (48) a. Which of his holy icons does seeing every Italian kiss *pg* lead every Frenchman to kiss \_, too?  
(Possible answer: “His favorite one.”)
- b. The town he was born in, seeing every American moving away from *pg* ought to lead every expat Canadian to want to move back to \_.
  - c. His favorite statue of the virgin, every alter boy would kiss \_ without waiting for every bishop to kiss *pg* first.

We conclude that it is possible for parasitic gap constructions to have the same symmetric reconstruction for binding that ATB movement can have. (Note that this entails that reconstruction of dependents of a fronted head can optionally reconstruct: they may reconstruct for variable binding, as here, and may fail to reconstruct for Binding Condition C as in the data in section 2.1. See section 4.3.)

Nissenbaum (2000) further claims that reconstruction for variable binding is asymmetric with parasitic gap constructions. Reconstruction is possible to the real gap, but not to the parasitic gap (the “#” is how Nissenbaum marks the ungrammaticality of this variable binding):

- (49) (Nissenbaum 2000, 34, (22))
- a. Which picture of his<sub>1</sub> mother did you give to every Italian<sub>1</sub> \_ [after buying from Mary *pg*]?
  - b. # Which picture of his<sub>1</sub> mother did you give to Mary \_ [after buying from every Frenchman<sub>1</sub> *pg* ]?

According to Nissenbaum, this is because the parasitic gap is the trace of a null operator, which lacks the lexical content of the filler.

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Nissenbaum, we will assume that in these particular examples, wh-movement is fed by heavy shift and then right node raising, so that the gaps occur where we have indicated them. See also Postal (1998) and Bachrach and Katzir (2009) on wh-movement being fed by right-node raising.

This particular asymmetry simply follows from our linear statement of weak crossover in (33). In (49a), the A-position occupied by the reconstructed wh-phrase containing the pronoun (marked “\_”) follows the quantifier, and binding is licit. In contrast, the A-position occupied by the reconstructed wh-phrase containing the pronoun in (49b) precedes the quantifier. This makes variable binding degraded (but perhaps not entirely ruled out, if it is possible to give the quantifier wide scope out of the adjunct clause).

We then predict that when the parasitic gap precedes the real gap, the asymmetry in reconstruction for variable binding ought to reverse. The pronoun should now be able to reconstruct to the parasitic gap site, and not to the “real” gap site. This is correct:

- (50) a. Which picture of his<sub>1</sub> mother did [every Italian<sub>1</sub>’s bringing *pg* along] cause him<sub>1</sub> to lose \_ ?  
 b. \* Which picture of his<sub>1</sub> mother did [Mary’s bringing *pg* along] cause every Italian<sub>1</sub> to lose \_ ?

This is inconsistent with the null operator account, and indicates that parasitic gaps can be full copies of the filler. It also provides additional support for our linear account of weak crossover.

Nissenbaum (2000) also claims that ATB movement and parasitic gap constructions differ in another respect, which is that symmetric reconstruction is *obligatory* in ATB movement:

- (51) (Nissenbaum 2000, 44, (24))  
 a. Which picture of his mother did you give to every Italian \_ and sell to every Frenchman \_ ?  
 (Possible answer: “I gave to every Italian and sold to every Frenchman the picture of his mother that he likes best.”)  
 b. #? Which picture of his mother did you give to every Italian \_ and sell to Mary \_ ?  
 c. #? Which picture of his mother did you give to Mary \_ and sell to every Italian \_ ?

Once again, we think that Nissenbaum’s examples are degraded for pragmatic reasons. Here they require that one and the same picture be given to one person and sold to another, but without any explicit way of relating these events, this is bizarre. We believe that simply adding *then* after *and* improves the examples. Other examples that explicitly relate the events seem fine:<sup>7</sup>

- (52) a. Which picture of his<sub>1</sub> mother did you buy from every Frenchman<sub>1</sub> \_ and then make a copy of \_ for Sue?  
 b. Which of his<sub>1</sub> holy icons did you steal from every priest<sub>1</sub> \_ and then replace \_ with a forgery?

Since parasitic gap constructions always spell out the relationship between the events, this is never an issue with parasitic gap constructions.

We conclude that ATB movement and parasitic gap constructions behave the same regarding reconstruction for variable binding. Both permit symmetrical reconstruction, and both also show an asymmetry based on linear order (but this is not due to a failure of reconstruction, but rather to the linear effect of weak crossover). Parasitic gaps, in particular, do not have a special status. We see full reconstruction to parasitic gap sites.<sup>8</sup>

<sup>7</sup>These examples of coordination are more asymmetric than Nissenbaum’s, in the sense that there is a temporal or causal order among the conjuncts. It is known that asymmetric coordination permits things that symmetric coordination does not (see Chaves 2012b for recent discussion). In particular, symmetric coordination is claimed to require symmetry in variable binding. See Ruys (1992), Fox (2000), Johnson (2009, 294). It is not clear to us whether this is the crucial difference between Nissenbaum’s examples and ours, or whether the difference is merely pragmatic. If it is merely pragmatic, asymmetric reconstruction in an instance of symmetric coordination ought to be acceptable in the right pragmatic context. We have been unable to come up with examples that might test this.

<sup>8</sup>Citko (2005) argues that symmetric reconstruction is also visible in ATB movement constructions in the available readings for *how many* questions (building on Moltmann 1992) and in “idiomatic” interpretations. We have been unable to construct parasitic

### 3.2 Some Claimed Differences

Cinque (1990) and Postal (1993a) claim that there are numerous restrictions on parasitic gap constructions that do not hold of ATB movement, and these differences necessitate treating them differently. Parasitic gaps according to these authors are limited to NPs and may not be APs, adverbs, PPs, or other categories, including predicate nominals. Parasitic gaps are also claimed to be banned from contexts that disallow definite pronouns.

Levine *et al.* (2001), Engdahl (2001), and Levine and Hukari (2006) show that none of these restrictions are real. Parasitic gaps are allowed with APs, PPs, and adverbs, as well as predicate nominals. The following examples come from Levine *et al.* 2001 (capitalization indicates contrastive stress):

- (53) (Levine *et al.* 2001, 185, (7c), (7b), (7a), (7g))
- a. I wonder just how nasty you can PRETEND to be \_ without actually BECOMING *pg.* (AP)
  - b. That's the kind of table ON WHICH it would be wrong to put expensive silverware \_ without also putting a fancy centerpiece *pg.* (PP)
  - c. How harshly do you think we can treat THEM \_ without in turn being treated *pg* OURSELVES? (adverb)
  - d. A doctor, you could spend your whole life trying to be \_ without ever becoming *pg!* (predicate nominal)

Parasitic gaps are also allowed in contexts that disallow definite pronouns, for instance “change of color” contexts:

- (54) (Levine *et al.* 2001, 193, (23))
- a. \* We painted the walls it.
  - b. Mint green is a color that you might want to paint your CEILING \_ without necessarily wanting to paint the surrounding WALLS *pg.*

We conclude that ATB movement and parasitic gaps are entirely parallel. There are no restrictions that are specific to parasitic gaps but not ATB gaps.<sup>9</sup>

### 3.3 Summary

To summarize this section, parasitic gap constructions and ATB movement constructions behave identically with respect to reconstruction for variable binding, and categorial (and other) restrictions. Importantly, both show complete reconstruction into all gap sites for variable binding, including parasitic gap sites.

## 4 A Symmetric Analysis of Multiple-Gap Constructions

All of the data that we have seen indicate that we need a completely symmetric analysis of both ATB movement and parasitic gap constructions. These should be treated uniformly, as a monolithic *multiple-gap construction*.

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gap examples that would show reconstruction with *how many* questions. As for “idioms,” by this Citko means the phrase *take pictures*. This phrase does not require reconstruction when *pictures* is dislocated, because even pronouns can have the relevant interpretation: *Q: Where did these pictures come from? A: Bill took them, aren't they nice?* Such phrases are therefore fully compatible with null operator/null pronoun theories of parasitic gap constructions.

<sup>9</sup>Munn (2001) claims that ATB movement and parasitic gap constructions also differ in the availability of functional readings and amount readings. Levine and Hukari (2006, 326–333) show that this claim is unfounded.

Symmetric analyses with this character have been proposed before. These include both movement analyses and non-movement analyses. The non-movement analysis is by far the most successful. A non-movement HPSG analysis is proposed in Sag (1983) and developed in Pollard and Sag (1994), Levine and Hukari (2006), Chaves (2012b), among others. Its primary success lies in the fact that the existence of multiple-gap constructions simply follows from the treatment of single-gap constructions, with no additional stipulations or constraints. This analysis is consistent with all the data here. It would take us too far afield to try to compare this account with our own. Our goal in this section is instead to construct a movement-based analysis that is just as successful.

Previous movement-based analyses that are completely symmetric include the ATB formalism proposed by Williams (1978) and applied to parasitic gap constructions in Williams 1990 (by treating them as a type of coordination); multidominance approaches like those of Goodall (1987), Moltmann (1992), Citko (2005); and the sideward movement account of Hornstein and Nunes (2002) and Nunes (2004).

The basic problem with all movement-based approaches is that they start from the gap site and move a constituent to the site of the filler. The problem is that there are multiple gap sites, but only one filler. Some special, otherwise unmotivated mechanism is necessary to somehow fuse two moving constituents into a single filler. Williams (1978) does this by brute force. The multidominance analyses do it by relaxing standard constraints on trees so that a single node can have more than one mother. This opens up possible representations to all kinds of things that standard constraints on trees rule out, and the onus is on proponents of multidominance to show that their accounts do not overgenerate (it is difficult to see how they could not). There is also the problem of the lack of reconstruction we found for Binding Condition C: in the multidominance account, moved XPs literally occupy more than one position in the tree, so that copies are not copies but *the exact same item*. We see no way for a lower copy to differ from a higher copy in such an account. As for the sideward movement account, it is actually the least stipulative and appears to work quite well. However, to get the lack of reconstruction for Condition C, it will have to use some mechanism like countercyclic late merger of dependents of fronted Ns (e.g., Lebeaux 1988, Chomsky 1993, and much subsequent work). Our account will need no such operation. All it needs is an independently necessary mechanism for interpreting lower copies (the Trace Conversion algorithm of Fox 2002).

We suggest that movement approaches have been looking at movement the wrong way. If movement starts from the filler and proceeds to the gaps instead of the other way around, the problem of merging multiple fillers into one disappears. All we need to do is make multiple copies of the filler for multiple gap sites, but making multiple copies is something we need anyway for successive-cyclic movement, where there is good evidence that copies are placed in intermediate locations along the path of movement. We will also account for the lack of Condition C reconstruction in a more natural way if copies are always *minimal* copies, lacking much of the lexical content of the overt filler. This makes sense from a computational economy perspective: it is not necessary to keep making copies of the entire content of a filler, since that only needs to be represented once; the computational system will copy the minimum amount of material that will be necessary for the derivation to converge and for semantic interpretation to go through. We suggest that it does this by a minimal application of Fox's Trace Conversion algorithm (Fox 2002) in the mechanism of copying itself (and not at a later stage of interpretation).

We therefore propose that syntactic derivations take place in a left-to-right, mostly top-down manner, as has been proposed in various ways by Phillips (1996, 2003), Richards (1999), Zwart (2009), and Bruening (2010, 2014). This means that in most cases of A-bar movement in English, the filler will be encountered before its associated gap(s). Null copies of the filler will then be merged into any gap positions associated with the filler. We also adopt a standard view of successive-cyclic movement whereby derivations take place in cycles, and once a cyclic domain boundary is crossed a null copy of a filler held in working memory will also be placed in an A-bar position at the edge of the new cyclic domain. For this purpose we will adopt a version of Chomsky's *phase* theory (Chomsky 2000), described in more detail below.

We first begin by addressing the distribution of ATB and parasitic gaps, and dismissing the idea that

parasitic gaps are in any way parasitic (section 4.1). We then spell out how successive-cyclic movement works in a single-gap construction (section 4.2). Section 4.3 then shows how this proposal captures all the facts of reconstruction that we have seen in this paper. Section 4.4 turns to multiple-gap constructions, and shows that they require no new mechanisms beyond those required for single-gap constructions. Finally, section 4.5 addresses case, and shows that the widely attested pattern of case matching falls out in the left-to-right model.

#### 4.1 On Parasitism

Parasitic gaps are called that because they were originally thought to be parasitic upon another, independently licensed, filler-gap dependency (Engdahl 1983). They typically occur inside domains that are thought to be islands to extraction, primarily adjunct clauses and NPs, especially subject NPs. The claim was that a gap in the position of a parasitic gap is ungrammatical, unless there is another gap that is licensed independently. Thus Engdahl (1983) gives triplets like the following:<sup>10</sup>

- (55) (Engdahl 1983, 14, (35a–c))
- a. Here is the paper that John read \_ before filing *pg*.
  - b. \* Here is the paper that John read his mail before filing *pg*.
  - c. Here is the paper that John read \_ before filing his mail.
- (56) (Engdahl 1983, 14, (36a–c))
- a. Who did John’s talking to *pg* bother \_ most?
  - b. \* Who did John’s talking to *pg* bother you most?
  - c. Who did John’s talking to Mary bother \_ most?

In the (c) examples, filling the parasitic gap with another NP and leaving the “real” gap is grammatical, but, according to Engdahl, filling the “real” gap and leaving only the parasitic gap in the (b) examples is ungrammatical. This is supposed to mean that the parasitic gap is only licensed by the existence of the “real” filler-gap dependency, which is independently licensed.

This characterization has been shown to be false, however (e.g., Pollard and Sag 1994, Levine and Sag 2003, Chaves 2012b). It is possible to have a gap as the sole gap in the sentence in every position where parasitic gaps are possible. Below are some examples of gaps in adjunct clauses from Chaves (2012b).

- (57) (Chaves 2012b, 468, (5))
- a. That’s the symphony that Schubert died [without finishing \_].
  - b. Which report did Kim go to lunch [without reading \_]?
  - c. A problem this important, I could never go home [without solving \_ first].
  - d. What did he fall asleep [complaining about \_]?
  - e. What did John drive Mary crazy [trying to fix \_]?
  - f. Who did you go to Girona [in order to meet \_]?

It is also possible to have a gap inside a subject NP as the sole gap in a sentence:

- (58) (Chaves 2012b, 467, (4d,e,g))
- a. Who does [being able to bake ginger cookies for \_] give her great pleasure?
  - b. Which president would [the impeachment of \_] cause more outrage?

<sup>10</sup>Engdahl (1983, 14) marks the (b) examples with a superscript question mark, but states in the text that they are “quite bad.”

- c. Which problem will [no solution to \_] ever be found?

It is also possible to have a multiple-gap construction, but where both gaps are inside constituents that are commonly viewed as islands. In this case both gaps would have to be parasitic, but there is no independently licensed “real” gap that they could be parasitic on:

- (59) a. a man who(m) [everyone who meets *pg*] knows [someone who likes *pg*] (Chomsky 1982, 57, (79a))  
 b. What kinds of books do [authors of *pg*] argue about royalties [after writing *pg*]? (Levine and Sag 2003, 243, (10a))

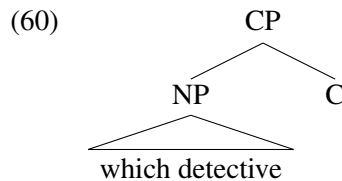
All of these data indicate that parasitic gaps are not actually parasitic. Everywhere a parasitic gap can appear, a gap can be the sole gap in the sentence. It is also possible to have multiple gaps without any “real” gap that they could be parasitic on. This means that parasitic gaps are not parasitic at all, they are simply normal gaps. We adopt the view that adjunct clauses and subject NPs are not actually syntactic islands to extraction, and gaps are grammatical inside those constituents. For discussion of why some examples of parasitic gaps are judged to be unacceptable without another gap, see especially Chaves (2012b, 2013).<sup>11</sup>

Given this, there is no reason to view parasitic gaps as different from ATB gaps in coordination. The one thing that distinguishes them is that, in truly symmetric instances of coordination, extraction has to be parallel, such that there is a gap in every conjunct. We treat this as an independent parallelism constraint on symmetric coordination, which we say more about in section 4.4.<sup>12</sup>

## 4.2 Single-Gap Constructions

As stated above, we propose that derivations are constructed left-to-right, meaning that in most cases of A-bar movement, the filler is constructed before its associated gap(s). In this subsection, we spell out how this will work in single-gap constructions.

Take an example like *Which detective did you warn?* In a left-to-right syntax, the NP *which detective* is constructed and merged as Spec-CP:

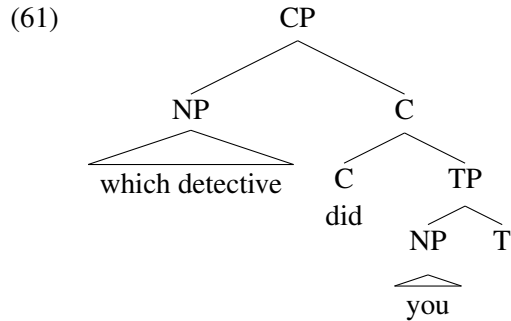


The auxiliary *did* is merged in C, which takes a TP as its complement, and the subject *you* is merged in Spec-TP:

<sup>11</sup>On the question of whether islands are syntactic in nature in general, see Kluender and Kutas (1993), Hofmeister and Sag (2010), Chaves (2012b, 2013), versus Sprouse, Wagers, and Phillips (2012), Phillips (2013). See also the papers collected in Sprouse and Hornstein (2013). We take the acceptability of apparent island violations like those in (57) and (58) to be devastating for a syntactic approach to adjunct and subject islands. A syntactic theory would have to say that these examples are ungrammatical, but acceptable for some reason. We think it is much more plausible to view island violations as grammatical, but they may be reduced in acceptability in some cases for reasons relating to processing or discourse coherence or expectations.

<sup>12</sup>Parasitic gaps are also often said to be subject to an anti-c-command requirement, such that the parasitic gap may not be c-commanded by the real gap. ATB constructions act no differently in this respect: no gap c-commands any other gap in coordinated structures. We tentatively assume this to simply follow from Binding Condition C: if one gap were to c-command another with which it was co-valued, it would A-bind it, violating Condition C (since the null copy in the gap site is an R-expression). See section 4.4 for further discussion. On the other hand, see the numerous problematic examples and references cited in Culicover (2001).





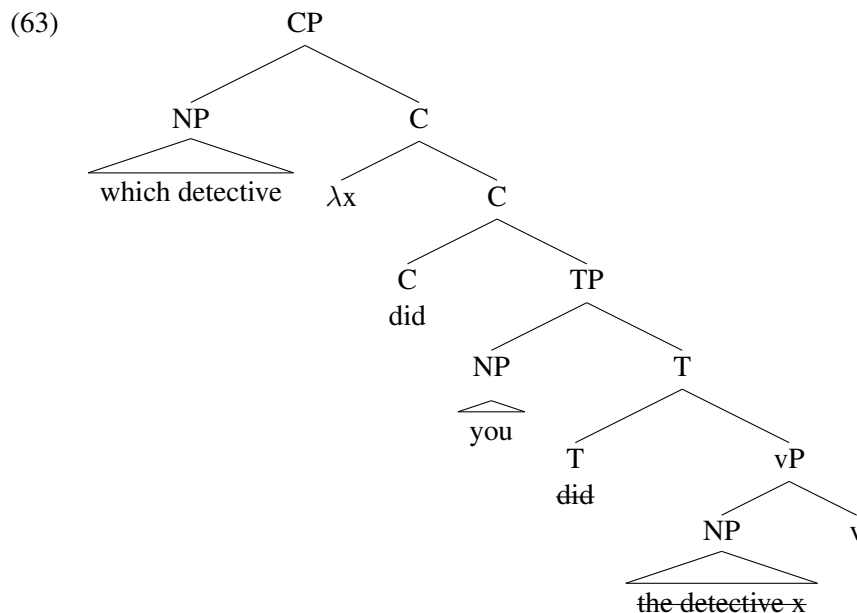
As stated above, we adopt the view that long-distance A-bar movement takes place in successive local steps. We adopt Chomsky's *phase* theory, where the cyclic domains, or *phases*, are CP and vP (NP is probably also a phase). So, the complement of T in our derivation is vP, which is a phase. At this point a null copy of the filler *which detective* must be made and merged in the specifier of vP.

However, null copies are not just complete, identical copies of the filler. Instead, their form is determined by the Trace Conversion algorithm proposed by Fox (2002):

(62) *Trace Conversion* (Fox 2002, 67, (10); to be modified)

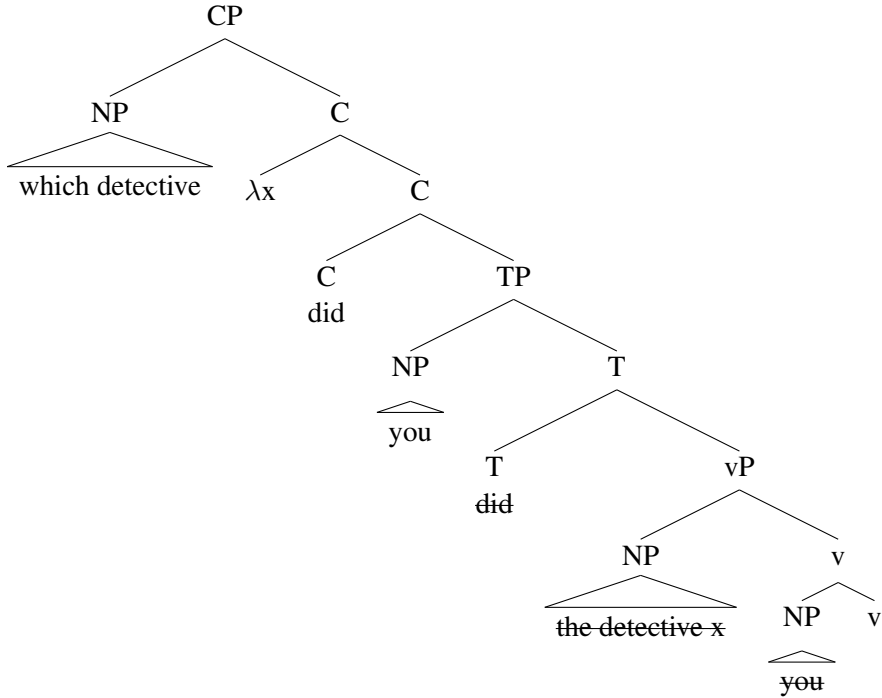
- a. Variable Insertion: (Det) Pred  $\rightarrow$  (Det) [Pred  $\lambda y(y=x)$ ]
- b. Determiner Replacement: (Det) [Pred  $\lambda y(y=x)$ ]  $\rightarrow$  the [Pred  $\lambda y(y=x)$ ]

What this rule does is insert a variable, and replace the determiner (typically a wh-determiner) with the definite determiner *the*. The variable will be bound by a lambda operator right below the wh-phrase that is inserted as part of the movement operation; from now on we add this right below the highest Spec-CP. So *which detective* becomes *the detective*  $\lambda y(y=x)$ , which we will simplify to *the detective x*. All copies of the filler will be converted in this way. So, in our example, a copy with that form will be inserted in Spec-vP:



A null copy of the moved auxiliary will also be merged in the T position. We will have no more to say about this here. We also assume that the subject started out in a lower Spec-vP, so a null copy of the subject will then be merged:

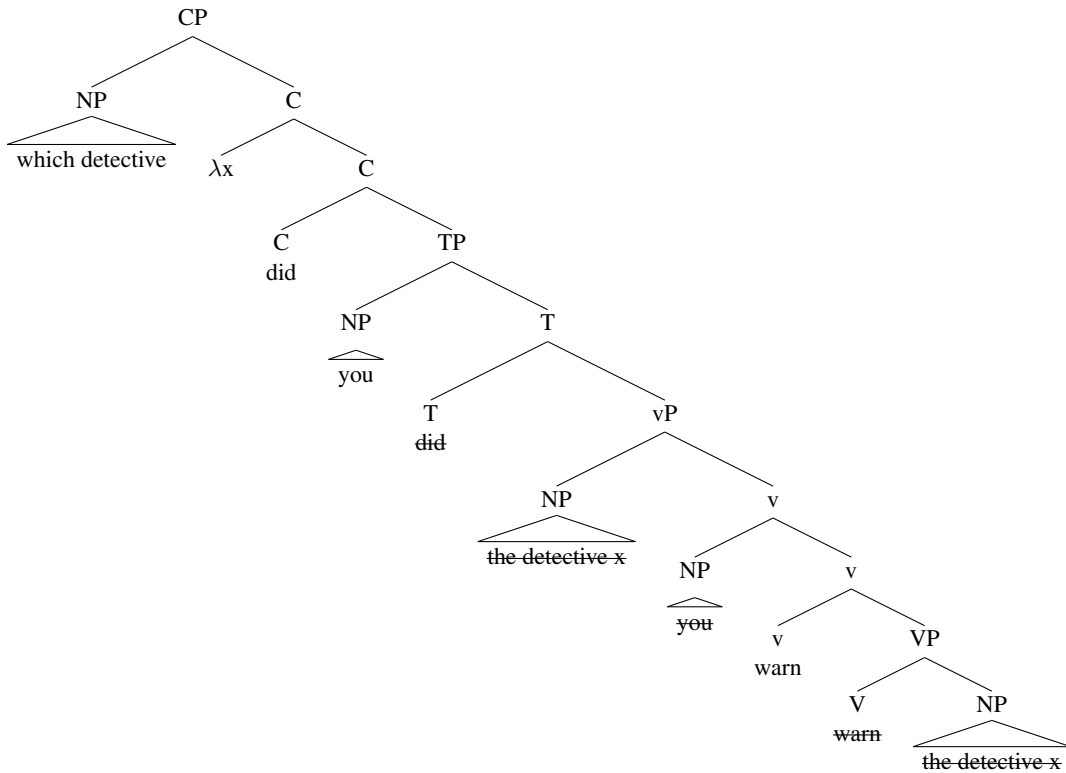
(64)



We will also ignore this movement in what follows.

Next, the verb is merged in v, a null copy of the verb is merged in V, and another null copy of the filler will be merged as the complement of V:

(65)



This is the final representation. Intermediate copies do not really play any role in interpretation, and so we will ignore them for most of what follows. A rough paraphrase of the semantic interpretation is, *For*

*which detective x did you warn the detective x?* For details of interpretation, including how intermediate copies are treated, see Fox (2002).

### 4.3 Reconstruction

We now go through the various facts of reconstruction from sections 2 and 3. First, we saw that dependents of fronted Ns, whether arguments or adjuncts, do not reconstruct for Condition C. We propose that this is because they are simply dropped as part of Trace Conversion. Only the *head* of “Pred” in the Trace Conversion rule is retained. We therefore revise the Trace Conversion rule, which we also rename the *Copy Algorithm* to reflect the role it plays in our analysis:

(66) *The Copy Algorithm*

Where (Det) ZP is a filler, ZP is a predicate, and Z is the head of ZP, copy (Det) ZP as follows:

- a. Predicate Simplification: (Det) ZP  $\rightarrow$  (Det) Z
- b. Variable Insertion: (Det) Z  $\rightarrow$  (Det) [Z  $\lambda y(y=x)$ ]
- c. Determiner Replacement: (Det) [Z  $\lambda y(y=x)$ ]  $\rightarrow$  the [Z  $\lambda y(y=x)$ ]

This means that a wh-phrase like *which corner of John’s room* is copied as *the corner x* (we ignore intermediate copies and copies of other constituents here):

(67) Which corner of John<sub>1</sub>’s room  $\lambda x$  was he<sub>1</sub> sitting in ~~the corner x~~?

In this representation, the R-expression *John* is not A-bound, and Condition C is not violated.

In an example like *Which picture of himself did John sell?*, *which picture of himself* is copied as *the picture x*:

(68) Which picture of himself  $\lambda x$  did John sell ~~the picture x~~?

As stated in section 2.2, there is no reconstruction of the anaphor here. Since the anaphor occurs inside an NP, it is actually an exempt anaphor, not subject to Binding Condition A, and it finds an antecedent according to other principles (point of view, etc.).

In contrast, if an anaphor is fronted, the anaphor itself is the head of the filler. It must totally reconstruct:

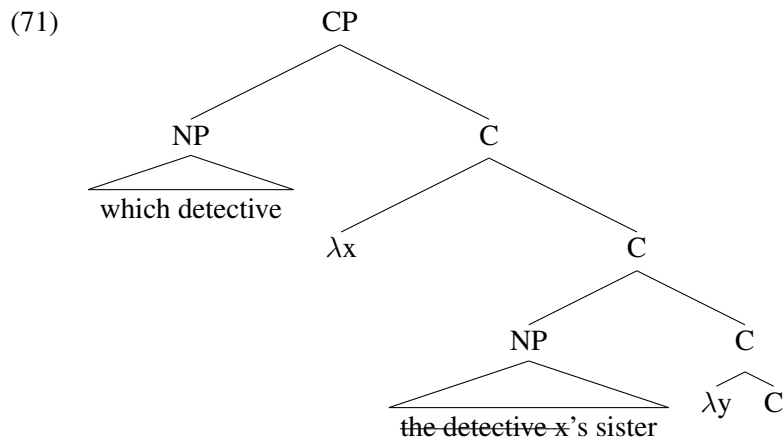
(69) Himself, John admires himself.

The higher copy is relevant for notions of topic and focus, which we do not address here. For the purposes of binding, the anaphor is put back in its entirety, and Condition A is evaluated within the TP. The lower copy of *himself* can be bound by *John* in Spec-TP, in satisfaction of Condition A.

In section 2.4, we saw that a wh-phrase as a possessor must reconstruct, because it gives rise to secondary strong crossover. We proposed there (following von Stechow 1996) that a possessor wh-phrase is extracted out of the fronted constituent that pied-pipes with it:

(70) which detective [~~which detective’s sister~~] did he warn

In our left-to-right syntax, we propose that this happens immediately. *Which detective’s sister* is pronounced together but the syntactic tree is immediately modified to the following LF:



The Copy Algorithm puts a null copy of *which detective*, modified according to the Copy Algorithm to *the detective x*, inside the lower Spec-CP, as shown.

We now have two fillers. The head of one is *detective*, so every lower copy of this filler will take the form *the detective x*. The other filler is now the lower Spec-CP, *the detective x's sister*. The head of this filler is *sister*. The Copy Algorithm will copy this one as *the sister y*. However, this filler is unusual in containing another gap. In section 2.4, we proposed that in such cases, every copy of such a filler must contain a copy of the other filler. We formalize this as follows:

- (72) If a filler A is associated with a gap inside another filler B, a copy of the head of A must be included with every copy of the head of B.

Applying this to our example, and restating the possession relation with *of*, we will get the following:

- (73) \* Which detective<sub>1</sub> λx [~~the detective x's sister~~] λy did he<sub>1</sub> warn [~~the sister y of the detective<sub>1</sub> x~~]?

We assume that the lower fronted NP (the one headed by *sister*) is interpreted however NP fronting is interpreted. One possibility is that it is simply interpreted only in the lower copy position. This gives us a rough paraphrase of the sentence as, *For which detective x did he warn the sister of the detective x?* This is an appropriate paraphrase. Importantly, the R-expression *detective* is A-bound by the pronoun, which is a Condition C violation. This is why we get a secondary strong crossover effect.

Finally, a filler may include a pronoun that is bound by a lower quantifier, as in *Which picture of his<sub>1</sub> mother did you give to every Italian<sub>1</sub>?* There are various options for how this binding might come about. We tentatively adopt the view that the copy mechanism may optionally include all material, *if* it is necessary. Here the need for binding may force a full copy in a position to the right of the quantifier:<sup>13</sup>

- (74) Which picture of his<sub>1</sub> mother did you give to every Italian ~~the picture of his<sub>1</sub> mother~~?

(Recall that we suggested that wh-movement was fed by rightward movement in examples like this; this would require another copy after *give*, and that copy may or may not include non-head material.)

This accounts for all of the data that we have seen here, in single-gap constructions at least. In the next subsection, we show how the proposal extends to multiple-gap constructions. As we will see, nothing is required beyond what is necessary for single-gap constructions.

<sup>13</sup>This predicts that if the wh-phrase includes both an R-expression and a pronoun that must be bound as a variable, then we will see reconstruction for Binding Condition C. Fox (1999b) and Legate (2003), among others, claim that this is correct. We find the judgments very uncertain, and so leave open the question of whether this is correct or not. If it is not correct, then we may need some mechanism for variable binding other than full reconstruction.

#### 4.4 Multiple-Gap Constructions

In a single-gap construction, merging null copies will stop once a null copy is merged in a theta position. In a multiple-gap construction, we need to allow it to continue. To allow for this possibility, we simply state that nothing in the grammar would stop it. As noted in note 12, Binding Condition C will rule out any representation where a null copy in an A-position binds another null copy in an A-position.<sup>14</sup> This will rule out cases like the following:

- (75) a. \* Which girl  $\lambda x$  ~~the girl  $x$~~  saw ~~the girl  $x$~~ ?  
b. \* Which girl  $\lambda x$  ~~the girl  $x$~~  thinks he likes ~~the girl  $x$~~ ?  
c. \* Which articles  $\lambda x$  ~~the articles  $x$~~  got filed by John without him reading ~~the articles  $x$~~ ? (Engdahl 1983, 20, (53))

In all these cases, the lower null copy is A-bound by the higher one, violating Condition C.

If Binding Condition C is not violated, nothing will rule out continuing to merge null copies. In fact, this has to be allowed by the grammar, because of a parallelism requirement on symmetric coordination. As is well-known, symmetric coordination, unlike asymmetric coordination, does not allow extraction from just one conjunct. Extraction *must* be across the board in symmetric coordination (for recent discussion and references, see Chaves 2012b). Symmetric coordination requires parallelism in other ways, too, for instance in variable binding (Ruys 1992, Fox 2000), and it has been proposed that these are part of the same parallelism requirement (e.g., Johnson 2009, 294). Regardless, there is a parallelism requirement on symmetric coordination, with the effect that a filler outside the coordination must bind a null copy in every conjunct. In our left-to-right syntax, this requires that merging null copies be allowed to continue after a null copy has been merged in a theta position. Consider the following example:

- (76) What comic books does James buy  $\_$ , sell  $\_$ , and trade  $\_$ ?

Here, the first conjunct will be constructed, and a null copy of the filler will be merged in object position:

- (77) What comic books  $\lambda x$  does James buy ~~the comic books  $x$~~

When the second conjunct is added, another null copy will have to be merged in the second object position, and so on to the final conjunct.<sup>15</sup>

- (78) What comic books  $\lambda x$  does James [ [buy ~~the comic books  $x$~~ ] [sell ~~the comic books  $x$~~ ] [and trade ~~the comic books  $x$~~ ] ]

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<sup>14</sup>This actually needs to be qualified for A-chains. The *highest* member of an A-chain cannot be A-bound, but lower members can be (and in fact must be). We do not formalize this, but do point out that this leads to another difference between parasitic gap and ATB constructions. ATB constructions can involve A-movement, but only A-bar movement licenses parasitic gaps (Engdahl 1983):

- (i) a. This substance is bought  $\_$ , sold  $\_$ , and traded  $\_$ , but never kept  $\_$ .  
b. \* This substance shouldn't be bought  $\_$  without examining *pg* first.

This difference falls out because an A-chain can be formed in the ATB movement case, but not in the case of a parasitic gap construction. In parasitic gap constructions, the filler is never local enough to the parasitic gap to form an A-chain with it. They are always separated by a clause boundary or an NP boundary. This results in the filler A-binding the highest member of a separate A-chain, which violates Condition C.

<sup>15</sup>Multiple-gap constructions often have an identity reading. In (78), this would be an interpretation where James buys, sells, and trades the same set of comic books. However, multiple-gap constructions also permit non-identity readings, for instance *respectively* and *cumulative* readings. For instance, in (78) one could answer, *James buys "Superman," sells "Batman," and trades everything else*. Following Chaves (2012a, 2014), we believe these readings to simply follow from the way plurals and coordination work. They do not require any distinct syntactic representation.

Otherwise, the parallelism constraint will be violated:

(79) \* What comic books does James buy  $\_$ , sell videos, and trade  $\_$ ?

The analysis of coordination is not important here, and so we will adopt no particular structure for coordination. There are also various ways that ATB movement could take place. For instance, it could take place as just represented, with only a copy in the theta position within each conjunct. Or, a null copy could also be merged at the left edge of each conjunct. If the conjuncts are larger, for instance crossing clause boundaries, then we assume that null copies would be merged at intermediate phase edges. With smaller conjuncts like VP in the example above, we leave open whether every conjunct is a phase and whether a null copy must be merged at the edge of the conjunct. What is important here is that there is a parallelism requirement on symmetric coordination, and this forces the grammar to allow merging null copies to continue even after a null copy has been merged in a theta position, so long as Condition C is not violated.<sup>16</sup>

This means that we cannot adopt a biconditional Theta Criterion (Chomsky 1981) in our model of grammar, or anything like the Activity Condition of Chomsky (2000). We assume instead only a Principle of Full Interpretation (e.g. Chomsky 1993), such that every element must receive a valid interpretation. In multiple-gap constructions, a single filler-gap dependency (or movement chain) can receive multiple thematic roles. Full Interpretation requires that one be assigned, at minimum, but it requires no maximum. On the other side, all thematic roles are assigned by the predicates that have them. This leads to a legitimate interpretation, so nothing rules it out. As for case, a single filler-gap dependency can also be assigned multiple cases. This means that checking one case value does not render a filler inactive, as with Chomsky's Activity Condition. We therefore have no such condition in our model of grammar. The only constraint is that the feature values of the filler must match every case-checking position that a copy of it is merged into. We return to this in section 4.5.

Since nothing rules out continuing to merge null copies in coordination, nothing rules it out outside of coordination, either.<sup>17</sup> A null copy can be merged inside a subject NP, and then another one merged in the main clause, for instance:

(80) Which car  $\lambda x$  did [their attempt to repair ~~the car  $x$~~ ] only damage ~~the car  $x$~~  more?

Or, a null copy can be merged in an object position, and then another one inside an adjunct clause:

(81) Which form  $\lambda x$  should one never sign ~~the form  $x$~~  [without reading ~~the form  $x$~~  first]?

Here, since the adjunct clause is a phase, an intermediate copy must first be merged at the edge of the clause. We also take NPs to be phases, so the example of a parasitic gap inside a subject NP would also include an intermediate copy:

(82) a. Which car  $\lambda x$  did [~~the car  $x$~~  their attempt to repair ~~the car  $x$~~ ] only damage ~~the car  $x$~~  more?

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<sup>16</sup>Note that two clauses each with their own subject can be coordinated below a shared fronted auxiliary, as in *What does John like and Mary hate?* The simplest analysis would be to analyze this as coordination of TP, with ATB head movement of T to C. However, this type of clause has a number of peculiar properties. For instance, the fronted auxiliary can fail to agree with the subject of the second conjunct (An 2007). The second main verb can also be tensed, even with a shared fronted *did*, as in *Who did the police believe was murdered but the mob boss **thought** left town?* We will leave apparent ATB verb movement aside in this paper.

<sup>17</sup>A reviewer states that all languages allow ATB movement in coordination, but not all languages have parasitic gaps, and asks why, if they are the same. If this is true (and we do not know if it is), then it might follow from some languages imposing an economy condition with the effect that merging null copies is forced to stop once a null copy is merged in a theta position. This can be overcome only by the demands of another constraint, like the parallelism constraint on symmetric coordination.

- b. Which form  $\lambda x$  should one never sign ~~the form  $x$~~  [~~the form  $x$~~  without reading ~~the form  $x$~~  first]?

There will also be copies at vP phase edges, not shown.

Finally, one null copy can be merged in a theta position inside a subject NP, while another one is merged inside an adjunct clause:

- (83) What kinds of books  $\lambda x$  do [~~the kinds  $x$~~  authors of ~~the kinds  $x$~~ ] argue about royalties [~~the kinds  $x$~~  after writing ~~the kinds  $x$~~ ]? (example from Levine and Sag 2003, 243, (10a))

Since neither A-position commands the other, Condition C is not violated.

As for reconstruction, we already showed in section 4.3 how the facts are accounted for in single-gap constructions. As sections 2 and 3 showed, reconstruction is completely symmetric in multiple-gap constructions, so there is nothing more to say. The null copies in second and subsequent gaps are completely identical to the null copy in the first gap. The symmetry of reconstruction follows.

As can be seen, our left-to-right derivation of successive-cyclic movement needs no additions to extend to multiple-gap constructions. All we need is the ability to make multiple null copies of the filler, which we need anyway for successive-cyclic movement in single-gap constructions. We can do without additional mechanisms that have been proposed, like multidominance (Goodall 1987, Moltmann 1992, Citko 2005), sideward movement (Hornstein and Nunes 2002, Nunes 2004), or some way of fusing two movement chains into one in ATB movement (Williams 1978). We can also do without “chain composition” (Chomsky 1986) and countercyclic lambda abstraction plus predicate modification (Nissenbaum 2000) for parasitic gap constructions. Our copy mechanism also obviates the need for countercyclic late merger as a mechanism for accounting for the lack of Condition C reconstruction (Lebeaux 1988, Chomsky 1993, Fox 1999b, and much subsequent work). Multiple-gap constructions and the lack of Condition C reconstruction simply follow from the way null copies are created in movement in a left-to-right derivation.

#### 4.5 On Case and Case Matching

We now return to the issue of case, mentioned briefly above. It is generally thought that a single chain can only receive one case (and one theta role), but this is violated in multiple-gap constructions. It would also be expected that a chain with multiple gaps could end up conflicting in case values, if the different gaps are assigned different cases. Regarding the first issue, we simply assume that there is nothing that would block a chain from receiving more than one case value. As with thematic roles, the requirement seems to be that a chain receive at least one case, but more than one is allowed, too. As stated above, we do not assume anything like the Activity Condition, which renders an element inactive after it has checked case. Our model of grammar is therefore simpler, as it has fewer conditions.

As for the second issue, we do assume that there is a constraint against a single chain receiving conflicting case values. The empirical fact is that, cross-linguistically, case matching is required in multiple-gap constructions. The most widely reported pattern is one where the filler must be morphologically compatible with the case assigned to both gaps. This means that both gaps must be assigned the same case, or they can be assigned different cases just where the form of the filler is syncretic for the two different cases. This has been shown for Hungarian (É. Kiss 1985), German (e.g., Huybregts and van Riemsdijk 1985, Kathol 2001, Himmelreich 2016), and various Slavic languages (Borsley 1983; Franks 1992, 1993; Bondaruk 2003; Citko 2005). It has also been claimed for English (É. Kiss 1985, Levine and Sag 2003).

We illustrate the pattern with German. If both gaps are assigned the same case, parasitic gaps are possible. If they are not, neither case form for the filler is allowed:

- (84) German (Himmelreich 2016, 261, (3a–c))

- a. weil Hans die<sub>ACC</sub> Frau [ohne *pg*<sub>ACC</sub> anzusehen] <sub>ACC</sub> geküsst hat  
 because Hans the woman without to.look.at kissed has  
 ‘because Hans has kissed the woman without looking at her’
- b. weil Hans der<sub>DAT</sub> Frau [anstatt *pg*<sub>DAT</sub> zu helfen] <sub>DAT</sub> schadete  
 because Hans the woman instead.of to help] hurt  
 ‘because Hans hurt the woman instead of helping her’
- c. \* weil Hans der<sub>DAT</sub>/die<sub>ACC</sub> Frau [anstatt *pg*<sub>DAT</sub> zu helfen] <sub>ACC</sub> behinderte  
 because Hans the woman instead.of to help hampered  
 ‘because Hans hampered the woman instead of helping her’

However, if the form of the filler is syncretic for both case forms, then a case mismatch is allowed:

- (85) weil Hans der<sub>GEN/DAT</sub> Verstorbenen [anstatt *pg*<sub>DAT</sub> ein Gedicht zu widmen] in einer  
 because Hans the dead.one instead.of a poem to dedicate in a  
 Gradrede <sub>GEN</sub> gedachte  
 eulogy commemorate  
 ‘because Hans commemorated the dead one in a eulogy instead of dedicating a poem to her’  
 (Himmelreich 2016, 262, (3e))

This pattern falls out quite naturally in our left-to-right syntax. In this type of derivation, the filler is constructed first, with a case value. Its case value will have to be checked later in the derivation, in a case-checking A-position. All copies of the filler will have the exact same case values, since copies are just that, copies. Consider (84a). The filler is *die Frau*. This form is compatible with both nominative and accusative case. For the purposes of this paper, we will simply state that it has the value [Nom/Acc], which means it is compatible with either one and can be checked by either one. (A more sophisticated analysis would break cases down into a set of features, and use underspecification for feature values with forms like this that are compatible with more than one case.) As the sentence is built, a copy of *die Frau* with the value [Nom/Acc] will be merged in the adjunct clause, in the position of the parasitic gap. This is a position where [Acc] case can be checked. Since [Nom/Acc] is compatible with [Acc], case checking occurs and the derivation so far is licensed. Next, another null copy of *die Frau* is merged in the main clause, as object of the verb ‘kissed’. This is also a position where [Acc] case can be checked. Again, [Nom/Acc] is compatible with [Acc], and so the derivation is licensed.

Consider now (84c). Here *der Frau* is [Dat/Gen]. A null copy merged in the adjunct clause is compatible with [Dat] being checked there. However, when a null copy is merged in the main clause, as the object of *behinderte*, only [Acc] case can be checked, and this is not compatible with [Dat/Gen]. Case checking will fail, and the sentence will be ruled out. If *die Frau*, which is [Nom/Acc], is used instead, the conflict will be with [Dat] in the adjunct clause, and again the sentence will be ruled out. In contrast, in (85), *der Verstorbenen* is [Dat/Gen], which is obviously compatible with both [Dat] in the adjunct clause and [Gen] in the main clause.

As can be seen, the widely attested pattern of case matching in multiple-gap constructions simply falls out in our left-to-right proposal. Absolutely nothing needs to be added to account for the facts. We do need to permit a single filler to end up checking more than one case and receive more than one theta role, but that is simply a fact about multiple-gap constructions that has to be captured by every theory. In our account, nothing rules it out, and so it is allowed.<sup>18</sup>

<sup>18</sup>One instance of case mismatch has been noted in the literature. Polish generally requires case matching, with one exception. As described by Bondaruk (2003, 230–231, (23–24)), it is possible for a multiple-gap construction to check accusative case in one gap and the genitive of negation in the other. As Bondaruk notes, the genitive of negation is the same as accusative on an abstract level, so this case is not actually a mismatch under the appropriate analysis.



## 5 Conclusion

This paper has re-examined claims of asymmetric reconstruction in ATB movement and parasitic gap constructions. We showed that reconstruction is actually symmetric in both constructions. Contra much previous literature, we see full reconstruction to parasitic gap sites. Moreover, where there are asymmetries, for instance in weak crossover and in finding a perspective holder for an exempt anaphor (for some speakers), these asymmetries are due to linear order, not to any inherent asymmetries between gap sites.

We also re-examined claims that ATB movement and parasitic gap constructions behave differently and need to be distinguished. We showed that these claims are unfounded, and the two constructions behave the same. This indicates that we need to analyze them the same.

We proposed an analysis in which ATB movement and parasitic gap constructions are treated the same. Having the derivation take place left to right overcomes problems that beset movement approaches to multiple-gap constructions. In our left-to-right analysis, we need nothing particular to multiple-gap constructions. Their existence and behavior simply follow from the way single-gap constructions work. In all cases, null copies of the filler are merged at the edge of cyclic domains and in gap sites. Since we need the ability to make multiple copies for successive-cyclic movement in general, the existence of multiple-gap constructions follows, with the merging of null copies continuing beyond the first gap site.

The pattern of reconstruction that we found follows from null copies being modified according to our Copy Algorithm, based on Fox's (2002) Trace Conversion Algorithm. As part of the Copy Algorithm, copies include only head material, and not dependents of the head of the filler. This results in no reconstruction for Binding Condition C, but complete reconstruction of a fronted anaphor. Wh-phrases as possessors are extracted from the fronted phrase, forming their own filler-gap dependency, giving us an account of secondary strong crossover.

As we have shown, the left-to-right model of syntax is able to provide a simpler account of multiple-gap constructions. Given this result, we suggest that researchers explore possible further benefits of moving to a left-to-right model of syntax rather than a bottom-up one. In this model, linear order is present from the beginning, rather than being specified only at PF as in Kayne (1994) and much other work. Bruening (2014) shows that a left-to-right model explains numerous facts about binding. We suggest that it is possible that such a model will lead to improved understanding of numerous syntactic phenomena.

## Appendix: Experimental Items

### Experiment 1: Condition C

1. (a) Bill explained which picture of John in renaissance costume he liked but Mary disliked.  
(b) Bill explained which picture of John in renaissance costume Mary disliked but he liked.  
(c) Bill explained why he liked, but Mary disliked, that picture of John in renaissance costume.  
(d) Bill explained why Mary disliked, but he liked, that picture of John in renaissance costume.
2. (a) Fred is not sure which book about Stan and his family he enjoyed but Anna hated.  
(b) Fred is not sure which book about Stan and his family Anna hated but he enjoyed.  
(c) Fred is not sure why he enjoyed, but Anna hated, that book about Stan and his family.  
(d) Fred is not sure why Anna hated, but he enjoyed, that book about Stan and his family.
3. (a) The reporter clarified which report about the president and his cabinet he denounced but the first lady praised.

- (b) The reporter clarified which report about the president and his cabinet the first lady praised but he denounced.
  - (c) The reporter clarified why he denounced, but the first lady praised, that report about the president and his cabinet.
  - (d) The reporter clarified why the first lady praised, but he denounced, that report about the president and his cabinet.
4.
    - (a) The vice president told us which allegation about the CEO's unlawful business practices he had admitted to but the PR agent had denied.
    - (b) The vice president told us which allegation about the CEO's unlawful business practices the PR agent had denied but he had admitted to.
    - (c) The vice president told us why he had admitted to, but the PR agent had denied, one allegation about the CEO's unlawful business practices.
    - (d) The vice president told us why the PR agent had denied, but he had admitted to, one allegation about the CEO's unlawful business practices.
  5.
    - (a) Bettie said on her blog which video of Claire with a kitten she liked but Adam was embarrassed by.
    - (b) Bettie said on her blog which video of Claire with a kitten Adam was embarrassed by but she liked.
    - (c) Bettie said on her blog why she liked, but Adam was embarrassed by, that video of Claire with a kitten.
    - (d) Bettie said on her blog why Adam was embarrassed by, but she liked, that video of Claire with a kitten.
  6.
    - (a) The princess revealed which movie about the queen and her relationships she was curious about but the king refused to see.
    - (b) The princess revealed which movie about the queen and her relationships the king refused to see but she was curious about.
    - (c) The princess revealed why she was curious about, but the king refused to see, that movie about the queen and her relationships.
    - (d) The princess revealed why the king refused to see, but she was curious about, that movie about the queen and her relationships.
  7.
    - (a) A confidante divulged how many rumors about the duchess and her fabulous wealth she herself had started but family members had denied.
    - (b) A confidante divulged how many rumors about the duchess and her fabulous wealth family members had denied but she herself had started.
    - (c) A confidante divulged why she herself had started, but family members had denied, all those rumors about the duchess and her fabulous wealth.
    - (d) A confidante divulged why family members had denied, but she herself had started, all those rumors about the duchess and her fabulous wealth.
  8.
    - (a) The spokeswoman was asked which corner of the diva's incredibly large drawing room she found blood in but the police totally ignored.

- (b) The spokeswoman was asked which corner of the diva's incredibly large drawing room the police totally ignored but she found blood in.
- (c) The spokeswoman was asked whether she found blood in, but the police totally ignored, one corner of the diva's incredibly large drawing room.
- (d) The spokeswoman was asked whether the police totally ignored, but she found blood in, one corner of the diva's incredibly large drawing room.

## **Experiment 2: Condition A**

1.
  - (a) It's himself that John taking a hard look at could make him more aware of.
  - (b) It's himself that John taking a hard look at could make Melinda more aware of.
  - (c) It's himself that Melinda taking a hard look at could make John more aware of.
  - (d) It's himself that John took a hard look at and became more aware of.
  - (e) It's himself that John took a hard look at and Melinda became more aware of.
  - (f) It's himself that Melinda took a hard look at and John became more aware of.
2.
  - (a) It's themselves that those children relying on will lead them to trust in.
  - (b) It's themselves that those children relying on will lead their mother to trust in.
  - (c) It's themselves that that woman relying on will lead those children to trust in.
  - (d) It's themselves that those children can rely on and trust.
  - (e) It's themselves that those children can rely on and their mother can trust.
  - (f) It's themselves that that woman can rely on and those children can trust.
3.
  - (a) It's herself that that author writing about will bring her to make peace with.
  - (b) It's herself that that author writing about will bring her father to make peace with.
  - (c) It's herself that her father writing about will bring that author to make peace with.
  - (d) It's herself that that author will write about and make peace with.
  - (e) It's herself that that author will write about and her father make peace with.
  - (f) It's herself that her father will write about and that author make peace with.
4.
  - (a) It's herself that that director making a film about will bring her some closure with.
  - (b) It's herself that that director making a film about will bring her partner some closure with.
  - (c) It's herself that your making a film about will bring that director some closure with.
  - (d) It's herself that that director made a film about and gained some closure with.
  - (e) It's herself that that director made a film about and her partner gained some closure with.
  - (f) It's herself that you made a film about and that director gained some closure with.
5.
  - (a) It's each other that those mobsters ratting on will turn them against.
  - (b) It's each other that those mobsters ratting on will turn the cops against.
  - (c) It's each other that the informant ratting on will turn those mobsters against.
  - (d) It's each other that those mobsters will rat on and then turn against.
  - (e) It's each other that those mobsters will rat on and the cops turn against.

- (f) It's each other that the informant will rat on and the mobsters turn against.
- 6. (a) It's each other that us being jealous of will lead us to fight against.
- (b) It's each other that us being jealous of will lead our enemy to fight against.
- (c) It's each other that our enemy being jealous of will lead us to fight against.
- (d) It's each other that we are jealous of and fighting against.
- (e) It's each other that we are jealous of and our enemy fighting against.
- (f) It's each other that our enemy is jealous of but we are fighting against.

### **Experiment 3: Weak Crossover**

1. (a) The teaching assistant asked which female student her professor writing a letter for helped to get into nursing school.
- (b) The teaching assistant asked which female student the professor writing a letter for led her advisor to treat better.
- (c) The teaching assistant asked which female student her professor wrote a letter for.
- (d) The teaching assistant asked which female student wrote a letter to her professor.
2. (a) The abbess wants to know which nun her family abandoning as a baby still really upsets.
- (b) The abbess wants to know which nun a family abandoning as a baby made her distant relatives adopt.
- (c) The abbess wants to know which nun her family abandoned as a baby.
- (d) The abbess wants to know which nun ran away from her family as a child.
3. (a) An aide told me which official his boss's throwing the book at made reporters scramble to get an interview with.
- (b) An aide told me which official the boss's throwing the book at made his friend try to intercede for.
- (c) An aide told me which official his friend tried to intercede for.
- (d) An aide told me which official tried to intercede for his friend.
4. (a) The jester doesn't know which prince his horse lunging at made really angry.
- (b) The jester doesn't know which prince an apple falling on made his horse lunge at.
- (c) The jester doesn't know which prince his horse lunged at.
- (d) The jester doesn't know which prince jumped onto his horse.
5. (a) The milkmaid tried to find out which princess her friend having a crush on really offended.
- (b) The milkmaid tried to find out which princess dancing with at a ball made her friend fall in love with.
- (c) The milkmaid tried to find out which princess her friend has a crush on.
- (d) The milkmaid tried to find out which princess has a crush on her friend.
6. (a) Sally is wondering which girl her teacher's shouting at really upset.
- (b) Sally is wondering which girl the teacher's shouting at made her mother take out of school.

- (c) Sally is wondering which girl her mother shouted at.
  - (d) Sally is wondering which girl shouted at her mother.
7. (a) The delivery boy asked which apprentice his master's yelling at caused to run away.
  - (b) The delivery boy asked which apprentice a customer yelling at caused his master to punish.
  - (c) The delivery boy asked which apprentice his master punished.
  - (d) The delivery boy asked which apprentice ran away from his master.
8. (a) The headmaster demanded to know which boy his assistant slapping on the wrist sent to the hospital.
  - (b) The headmaster demanded to know which boy a teacher slapping on the wrist led his lawyer to file a lawsuit for.
  - (c) The headmaster demanded to know which boy his lawyer filed a lawsuit for.
  - (d) The headmaster demanded to know which boy had his lawyer file a lawsuit.

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