3 Gapping

We start our case studies with a detailed analysis of Gapping in English. Gapping is a particularly odd instance of noncanonical coordination in which the (typically finite) main verb/auxiliary—or some larger string containing it—is missing from the noninitial conjunct(s):[1]

(35) Leslie bought a CD, and Robin ∅ a book.

What distinguishes Gapping from other kinds of noncanonical coordinations such as Dependent Cluster Coordination (DCC) and Right-Node Raising (RNR) is that the strings which appear to be coordinated in Gapping do not look very much like each other. In the case of DCC and RNR,

(36) a. I told the same joke to Robin on Friday and (to) Leslie on Sunday. (DCC)
b. I gave Robin, and Leslie offered Terry, a pair of pliars. (RNR)

it is possible to identify two coordinated substrings which are parallel up to the point where they combine with the rest of the sentence; the problem is only that expressions such as *(to) Leslie on Sunday* (in (36a)) and *I gave Robin* (in (36b)) are not constituents of the traditional kind. We have seen in the previous chapter that hypothetical reasoning for the directional slashes can license such strings as constituents in TLCG, thereby enabling straightforward analyses of DCC and RNR. But in the case of Gapping, we seem to be coordinating a whole clause with a sequence of words which would be a clause if a copy of the verb in the first conjunct were introduced into the second

1. Instances of Gapping with nonfinite verbs can be found with "What—me worry?" sentences and infinitival optatives:

(i) a. What—Robin eat vegetables and Leslie whole-grain bread?? You're dreaming!
b. Oh, for Robin to be convicted of fraud and her bootlicking minions fired!

We also find infinitival subject clauses parallel to (ib):

(ii) For Robin to be convicted of fraud and her bootlicking minions fired is all I would ask for in this life.

conjunct. As they stand, however, *Leslie bought a CD* in (35) has a completely different status from *Robin a book*.

The material overtly missing from, but seemingly present in the interpretation of, the second conjunct can be quite a bit more extensive than just the matrix verb of the first; in (37a), a larger string *gave me* properly containing a finite verb undergoes Gapping, and in (37b), the gapped material is an auxiliary + bare verb sequence:

(37) a. One gave me a book, and the other ∅ a CD.
b. Terry can go with me, and Pat ∅ with you.

The examples in (38) are still more complex, where (38a) shows that a chain of infinitives plus the main verb can be gapped; (38b–d) show that the gapped material can even be a discontinuous substring of the sentence:

(38) a. John wants to try to begin to write a novel, and Mary ∅ a play.
b. Robin put a dollar in the meter and Leslie ∅ three quarters ∅ .
c. Some Republicans want Ford to run for the presidency, and others ∅ Reagan ∅ .
d. Too many Irish setters are named Kelly, ∅ German shepherds ∅ Fritz, and ∅ huskies ∅ Nanook.

These examples illustrate the core syntactic properties of Gapping that must be accounted for in any adequate analysis.[2]

Gapping has continued to pose a difficult challenge in both derivational and nonderivational variants of generative grammar. The syntactic asymmetry noted above is already highly problematic, but things are actually worse. A further and even more vexing challenge for any analysis of Gapping comes from the scopal interactions with auxiliaries and quantifiers, exemplified by data such as the following (Siegel 1984, 1987; Oehrle 1987; McCawley 1993):[3]

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2. In addition, it has often been observed that there are typically just two remnants in the gapped conjunct. (Remnants are expressions that remain in noninitial conjuncts.) Thus, examples like the following are marginal at best:

(i) a. ??Alan gave Sandy a book, and Peter Betsy a magazine.
b. ??Alan told Harry that the sky was failing, and Sam Betsy that Chicken Little was right.

Sag (1976), however, notes that if the postverbal remnants contain PPs, the examples sound much better:

(ii) a. Peter talked to his boss on Tuesday, and Betsy to her supervisor on Wednesday.
b. John talked to his supervisor about his thesis, and Erich to the dean about departmental politics.

We (like other authors) do not attempt to explain why (i) and (ii) differ in acceptability but assume that a processing basis is responsible for the difference.

3. Oehrle (1987) notes that this scope anomaly was discussed in Oehrle (1971).

(39) a. Mrs. J can't live in Boston and Mr. J ∅ in LA.
b. Mrs. J can't live in Boston or Mr. J ∅ in LA.
c. No dog eats Whiskas or ∅ cat ∅ Alpo.

Examples of this type are generally ambiguous between two readings. For example, on its most natural reading, (39a) means that it's not possible for Mrs. J and Mr. J to live in the two different respective cities at the same time ($\neg\Diamond(\varphi \wedge \psi)$), where the modal *can't* scopes over the conjunction. The sentence additionally has a reading denying *both* of the two possibilities ($\neg\Diamond\varphi \wedge \neg\Diamond\psi$), which is obtained by distributing the meaning of the modal to each conjunct. (39b) and (39c) are similarly ambiguous. Note here that the ambiguity is diminished or eliminated entirely by the typical prosody for these two distinct readings: in (39a), for example, the wide-scope modal interpretation emerges clearly when the two conjuncts are pronounced on a single prosodic monotone, suggesting a single intonational phrase, whereas for the distributive reading, the first syllable in *Boston* will receive conspicuous stress and the whole word will have sharply higher pitch, while in the second conjunct, both *Mr. J* and *LA* bear contrastive stress.[4]

The existence of the non-distributive, wide-scope reading of auxiliaries in Gapping, and particularly its default status in (39a) and similar examples, may appear rather surprising at first, since auxiliaries can't normally scope out of their local clauses to take scope in a higher clause (e.g., the modal *can't* can't scope over the matrix verb *thinks* in *Kevin thinks that Sandy can't rinse the sink*). Moreover, apart from Gapping, modals never outscope conjunction. Thus, *Mrs. J can't live in Boston and Mr. J lives in LA* does not have a reading analogous to (39a). The generalization here is that scopal operators, when they are gapped, can be interpreted *as if* they were not present in the first conjunct but instead were scoping over the whole coordinate structure (although not necessarily, since there is also the distributive reading). This "deep" symmetry between the two conjuncts is a big hint that the phenomenon itself conceals a hidden symmetry.

We wish to stress at the outset that in the discussion below, we assume (along with Kuno [1976] and many subsequent authors) that the actual set of interpretations available for a particular Gapping sentence results from an interaction between what the combinatoric system of grammar generates, lexical properties of the expressions chosen, and general pragmatic knowledge. The important point is that the combinatoric

4. If the distributive reading of negation "no dog eats Whiskas or no cat eats Alpo" seems difficult to get for (39c), consider the following, uttered in a "no matter which" type context:

(i) There's something wrong with public transportation—no bus is available from Düsseldorf to Cologne, or train from Cologne to Frankfurt—they never make it clear which one is the problem, but in either case, one thing is clear: there's no chance for us to get to Frankfurt in time.

component should make available both the distributive and non-distributive readings for both auxiliaries and quantifiers, leaving to other components of the grammar the relative accessibility of these respective interpretations (thus, one should not be misled by the fact that the distributive reading is difficult to get in some examples, especially without the right kind of contextual support).

The scope anomaly in Gapping, ignored in virtually all discussions of Gapping in the phrase structure theoretic literature (but see Park et al. [2019] for an exception; see below for a critique of phrase structure–based approaches to Gapping), has been addressed extensively in the recent Minimalist studies, starting from Johnson (2004) (originally written in 1996; cf. Johnson 2000, 2009; Lin 2000, 2002; Winkler 2005; Toosarvandani 2013). These proposals have in common the assumptions that, as per the subject-internal VP hypothesis, where subjects originate in the Spec position of VP, Gapping involves coordination at the low VP level (which is below the position where the modal auxiliary is base-generated) and that the subject of the first conjunct moves to some higher syntactic position while the subject of the second conjunct stays in its VP-internal position at surface structure. This approach thus attempts to derive the apparently anomalous scopal property of auxiliaries and quantifiers in examples like (39) from a posited syntactic asymmetry between the two conjuncts in Gapping, solving the two problems noted above (i.e., syntactic asymmetry and semantic scope anomaly) at once. Currently, this low VP coordination analysis is the only extant approach which links the two problems of Gapping and provides a uniform solution for them.[5]

The goal of this chapter is twofold. First, we present some new empirical arguments against the low VP coordination analysis of Gapping. Second, we propose an explicit alternative analysis of Gapping in Hybrid TLCG which does not suffer from the problems of the low VP coordination analysis, while entertaining at least comparable (or better) empirical coverage with respect to any previous account. The empirical arguments consist of both basic syntactic patterns of Gapping (involving largely neglected examples known since at least Sag [1976] as well as novel data reinforcing the point) and standard tests for constituency. These arguments rely on uncontroversial assumptions about syntax, and we believe that they convincingly show that the structural asymmetry that the low VP coordination analysis crucially rests on in deriving the scope anomaly is highly problematic.

The flexible syntax-semantics interface of Hybrid TLCG enables an analysis of Gapping as like-category coordination at the combinatoric structure, and the mismatch between this concealed structure and the visible string is mediated by hypothetical reasoning involving lambda binding in the prosodic component. It thus avoids the unde-

5. Except for Oehrle (1987) and Siegel (1987), whose analyses can, in a sense, be thought of as important precursors of this low VP coordination analysis as well as of our own analysis presented below.

sirable structural asymmetry that the low VP coordination analysis posits between the two conjuncts, which is essentially the source of its mispredictions. Our like-category coordination analysis of Gapping is, moreover, shown to interact properly with independently motivated analyses of scopal operators to immediately yield their apparently anomalous scopal properties in Gapping, offering, uniquely in the literature so far as we are aware, a conceptually simple and empirically adequate solution for both of the two challenges noted above that Gapping poses for previous accounts.

3.1 Gapping: The Research Background

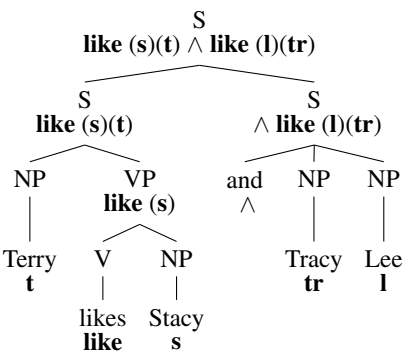
As suggested above, Gapping presents two major challenges to grammatical theories:

- determination of the structural relationship between the two conjuncts
- identification of how this relationship yields the interpretation of the second conjunct based on the interpretation of the first conjunct

In this domain, phrase structure grammar has proven conspicuously inadequate. The difficulty that phrase structure–based approaches face can be illustrated succinctly by briefly reviewing the classical and still representative analysis of Gapping by Sag et al. (1985).

Sag et al. (1985) offer an account of the sentence *Terry likes Stacy, and Tracy Lee* along the following lines:

(40)



This analysis immediately raises the question of how the semantic interpretation of the whole sentence is obtained. Sag et al. (1985, 162) state that the interpretation for the second conjunct of this structure is given "by uniformly substituting its immediate constituents into some immediately preceding structure, and computing the interpretation of the results." Besides being stated in only very vague terms, such an analysis, requiring a global comparison of the two conjuncts, breaks sharply with the strictly

local compositional interpretation mechanism assumed in GPSG (cf. chapter 1; see also Gazdar et al. 1985).

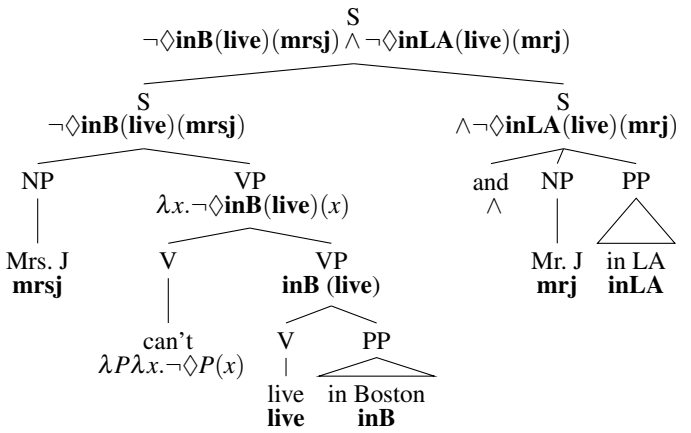
Still more important are the empirical consequences: the Sag et al. (1985) account mispredicts the modal scope ambiguity facts outlined above. For (39a), for example, there appears little basis for any other correlation between the two conjuncts than that in (41):

(41)

Mrs. J	can't	live	in	Boston
↕	↕	↕	↕	↕
Mr. J	∅	∅	in	LA

But this gives us only the distributive reading as in the following:

(42)



Park et al. (2019), the most recent analysis of Gapping in the HPSG literature, makes an important step of addressing the limitations of previous (H)PSG analyses of Gapping (Sag et al. 1985; Abeillé et al. 2014; Chaves 2005). In their analysis, couched in Lexical Resource Semantics (Richter and Sailer 2004), the lexical entries of the clause-level conjunction words *and* and *or* are underspecified as to the relative scope with respect to the propositional operator contributed by the modal auxiliary in the first conjunct. While this approach captures the anomalous scope patterns in Gapping, it does so by stipulation (in the lexical entries for the conjunction words) that does not seem to be motivated independently. Moreover, on Park et al.'s approach, extension to the determiner gapping case is left for future work.[6]

6. Park et al. (2019) note a potential overgeneration problem with our analysis of Gapping (Kubota and Levine 2016a; see section 3.2.1) in relation to cases of Gapping with (what they take to be) certain subordination markers such as *not to mention*:

Transformational approaches fare better with respect to the scope anomaly problem in Gapping. In fact, the family of low VP coordination approaches (for references, see above) are designed to solve precisely this problem. These proposals differ in some details, but they all have in common the assumption that Gapping sentences are derived from underlying sentences involving coordination at the lower VP level. In what follows, we review the adequacy of this assumption by taking Johnson (2000) as a representative case of such transformational analyses.[7]

3.1.1 Gapping as Low VP Coordination: Details and Motivation

The key innovation in Johnson's low VP coordination analysis is that, roughly speaking, what appears to be a coordination of a full clause with a partial clause missing its verb (and possibly other elements) is actually a coordination of two VPs—but where the second VP's subject is in situ in [Spec,VP] and the common verb of both is extracted via ATB movement to a position adjoining the T head whose complement is the conjoined VP. In addition to this more or less conventional movement, there is a second, non-ATB extraction which takes the subject of the first conjunct to the Spec position under

(i) Robin speaks French, not to mention Leslie German. (Culicover and Jackendoff 2005, 278)

Park et al. claim that if one analyzed this type of example along the lines of the analysis we propose in section 3.2, it is unclear how to exclude auxiliary wide-scope readings in examples such as the following ('it is not the case that the following is true: "Robin speaks French, not to mention Leslie German"'):

(ii) Robin doesn't speak French, not to mention Leslie German.

However, the scopal relation between logical negation and discourse markers such as *not to mention* follows from independent assumptions about the semantic and pragmatic functions of the respective types of expressions. By their very nature of signaling the discourse statuses of the propositions they combine, discourse connectives have to scope over all logical operators that have their effects strictly at the propositional level. In particular, it simply does not make sense for logical negation to deny a statement that includes in its part the discourse-oriented meta-comment (in the case of *not to mention*, to the effect that the content of the sentence is obvious or taken for granted in the particular discourse context in which it is uttered).

Strong support for this counteranalysis comes from the fact that (iiia) has a wide scope reading for *can't*, while (iiib–d) do not.

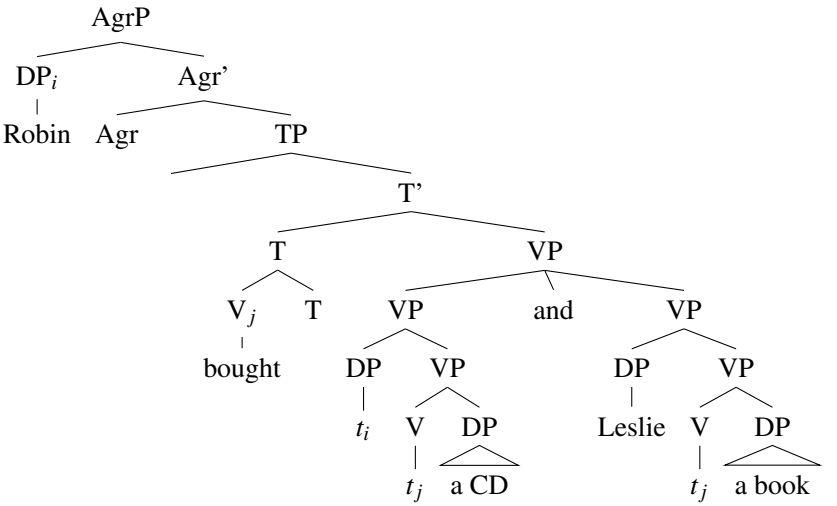
(iii) a. Robin can't eat steak for dinner and Mary pizza.
b. Robin can't eat steak for dinner and, it goes without saying, Mary pizza.
c. Robin can't eat steak for dinner and, unsurprisingly, Mary pizza.
d. Robin can't eat steak for dinner and, a fortiori, Mary pizza.

And, of course, supports both wide and narrow modal interpretations—but not when the right conjunct contains an overt instance of the kind of assumed-common-knowledge metacomment that is implicit in *not to mention*, *it goes without saying*, and so on. Examples of this sort are abundant, and make it clear that it is *exactly* this extra element of the speaker's comment on the discourse that is ruling out such examples.

7. We became aware of Potter et al. (2017) after we finished our research reported in the present chapter. Potter et al. assume that Gapping sentences are structurally ambiguous between high and low coordination and that this structural ambiguity is the source of the scope ambiguity with modals. A detailed comparison between our proposal and Potter et al.'s proposal is a task we leave for future research.

the matrix AgrP, creating the illusion of a full clause on the left and a partial clause on the right. The actual structure is illustrated in (43).

(43)



Cases of Gapping which include not just the verb but more complex structures in the righthand conjunct (e.g., (38a), where the nonconstituent string *wants to try to begin to write* goes missing) are presumably handled by multiple leftward raisings, along lines Johnson (2009) speculates on, though, to our knowledge, no detailed analysis has been offered to date.

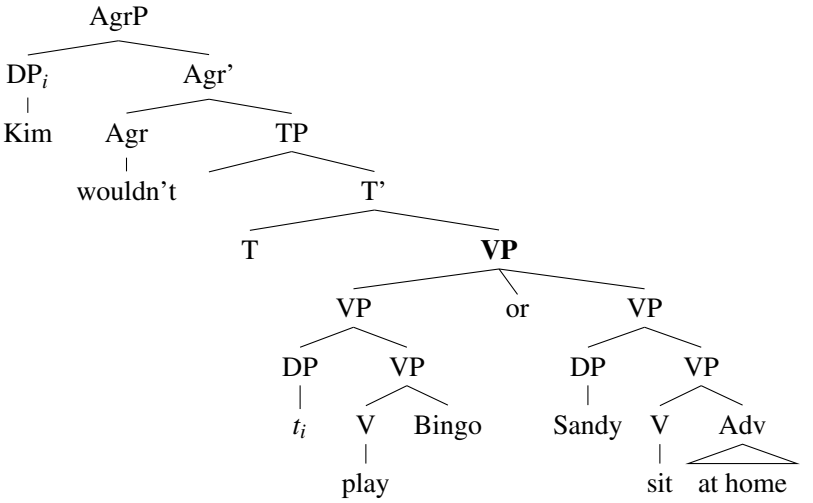
Johnson's analysis contains a number of controversial features, such as the non-ATB movement of the first conjunct subject and the treatment of both conjuncts as VPs rather than clauses (with the second seemingly defective in some way) or a clause and a string of constituents (as in Sag et al. 1985, Culicover and Jackendoff 2005, and Abeillé et al. 2014). Our critique in section 3.1.2 essentially consists in questioning the plausibility of this structural asymmetry in the status of the subjects of the two conjuncts. But it is important to keep in mind that these moves are crucial to Johnson's account of the interaction of Gapping with scopal operators such as modal auxiliaries and negative determiners. Consider first the examples involving auxiliaries.

(44) a. Kim wouldn't play bingo or Sandy sit at home all evening.
b. Kim wouldn't play bingo or Sandy chess.

While (44a) and (44b) differ in that only the auxiliary is gapped in (44a), the scopal facts are parallel. The key to an account of the auxiliary wide-scope reading for (44a) is to somehow separate the semantic action of the auxiliary from its apparent linear position—an outcome which follows directly from Johnson's proposal to take the two

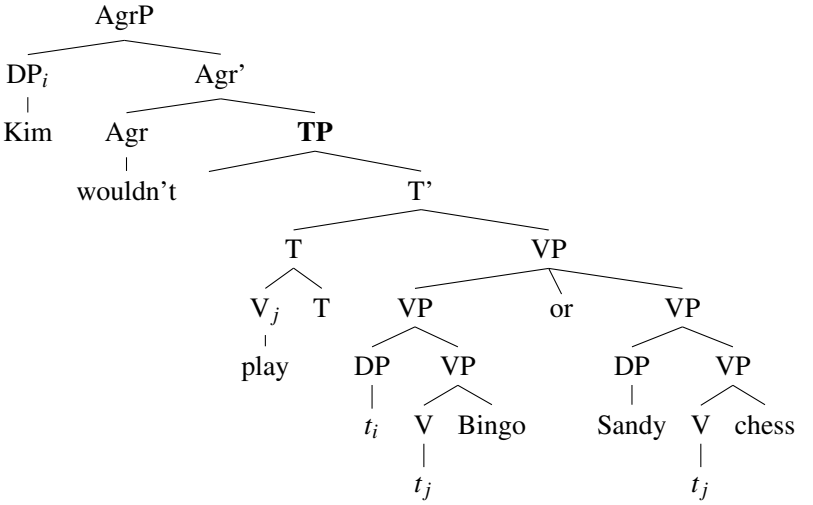
conjuncts in these examples to be VPs, creating a structure above which the auxiliary can appear. The remaining requirement, that of making the auxiliary appear to be embedded in the first conjunct, follows directly from the asymmetrical fronting of the first conjunct subject to [Spec,AgrP]. Thus, (44a) has the following structure:

(45)



Examples like (44b) in which both the auxiliary and the verb are missing are licensed by moving the verb out of the two conjuncts in an ATB fashion (as in the basic Gapping example in (43)).

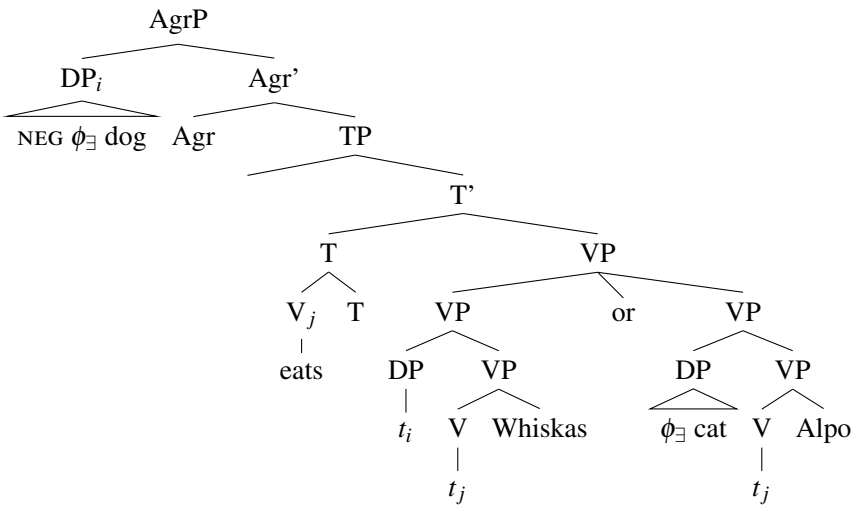
(46)



Finally, for cases involving negative determiners such as (47), Johnson adopts the split scope analysis (Jacobs 1980; Penka 2011) in which these determiners are decomposed into a higher sentential negation and a lower indefinite at LF, and he proposes an analysis along the lines of (48):

(47) No dog eats Whiskas or cat Alpo.

(48)



The ATB movement of the verb is licensed in the same way as (46). The only extra complication involved in this example is the split scope of the subject negative quantifier. The subjects in the two conjuncts both have a phonologically empty indefinite article $\phi_\exists$ as their determiners. This DP moves out of its VP-internal position in the first conjunct (just as in other examples) and attaches to a higher adverbial negation so that this negation and the indefinite $\phi_\exists$ fuse at PF to be spelled out as the morpheme *no*. $\phi_\exists$ and the head noun are reconstructed to their base positions at LF for the purpose of semantic interpretation. Thus, just as in the example above involving an auxiliary, the scopal relation between the quantifier and the coordinate structure is captured by assuming that the negation which is part of the negative quantifier originates syntactically *outside* the coordinate structure.

3.1.2 Low VP Coordination: Contraindications

As should be clear from the above, low VP coordination and the asymmetrical non-ATB movement of the subject of the first conjunct out of its VP-internal position is crucial in this approach for mediating the apparent mismatch between the surface positions of the scopal operators and their semantic scope. We now offer a host of empirical contraindications for this assumption. There are two lines of evidence against the low VP

coordination analyses: on the one hand, the failure of constituency tests that VPs would be expected to satisfy, and on the other, a set of distributional patterns which strongly group Gapping conjuncts with clausal constituents as opposed to VPs. A complete argument against the transformational approach should also refute the islandhood-based arguments *for* it of the sort typically invoked in defense of movement-based analysis in the literature. We defer this task to a later chapter (chapter 10, section 10.2.1). Also, due to space limitations, the following discussion omits some arguments; for a more complete critique of the transformational analyses of Gapping, see Kubota and Levine (2016a). In particular, Johnson's analysis faces a major empirical difficulty in licensing the distributive readings of modals and negation quantifiers in the Siegel/Oehrle data, but we omit this discussion (see Kubota and Levine 2016a, section 2.2.1) in what follows.

3.1.2.1 Basic constituency tests The non-ATB movement of the first conjunct subject in the low VP coordination analysis creates a spurious surface VP (or TP)—the boldfaced constituents in (45) and (46)—asymmetrically containing the subject of the second conjunct. Thus, in (49) (which contains an auxiliary), the subject moves to a higher position, and the verb remains in either the T (in the case of auxiliary + verb gapping in (49a)) or the V (in the case of auxiliary alone gapping in (49b)) head, as in (50a) and (50b).

(49) No positron can occupy the INner shell and electron $\left\{\begin{array}{l}\text{a. } \varnothing \\ \text{b. sit in}\end{array}\right\}$ the OUTer shell of the same atom.

(50) a. $[_{\text{AgrP}}$ No positron$_i$ $[_{\text{Agr}'}$ can $[_{\text{TP}}$ occupy$_j$ $[_{\text{VP}}$ $[_{\text{VP}}$ t_i t_j the INner shell] and $[_{\text{VP}}$ $\phi_{\exists}$ electron t_j the OUTer shell]]]]]

b. $[_{\text{AgrP}}$ No positron$_i$ $[_{\text{Agr}'}$ can $[_{\text{TP}}$ $[_{\text{VP}}$ $[_{\text{VP}}$ t_i occupy the INner shell] and $[_{\text{VP}}$ $\phi_{\exists}$ electron sit in the OUTer shell]]]]]

It is not necessarily clear in advance exactly which category is targeted by phenomena like VP fronting that are standardly taken to diagnose complements of auxiliaries (in theory neutral terms), but given the structures assigned to the two versions of (49) in (50), regardless of whether these tests apply to VP or to TP, one or the other of the two examples in (51)–(53) should be predicted to be grammatical. The robust unacceptability of all of these examples falsifies this prediction very clearly.

(51) a. No positron can $[_{\text{TP}_i}$ occupy the INner shell and electron the OUTer shell of the same atom]. #Not only that, no neutron can do so$_i$. (*do so*)

b. No positron can $[_{\text{VP}_i}$ occupy the INner shell and electron sit in the OUTer shell of the same atom]. #Not only that, no neutron can do so$_i$.

(52) a. *[$_{TP_i}$ Occupy the INner shell and electron the OUTer shell of the same atom], no positron can t_i. (*fronting*)

b. *[$_{VP_i}$ Occupy the INner shell and electron sit in the OUTer shell of the same atom], no positron can t_i.

(53) a. *No positron can [$_{TP}$ occupy the INner shell and electron the OUTer shell of the same atom], or [$_{TP}$ occupy the inner shell of an atom with another positron]. (*coordination*)

b. *No positron can [$_{VP}$ occupy the INner shell and electron sit in the OUTer shell of the same atom], or [$_{VP}$ occupy the inner shell of an atom with another positron].

It is true that failing a constituency test does not necessarily disprove the constituenthood of the string in question, since the failure may arise for nonstructural reasons. Such accounts are of course always possible, and in certain cases seem quite likely as the source of negative judgments. For example, in the case of (51), we might have used VP ellipsis as our test, rather than *do so* replacement, and the anomalous result (#*Not only that, no neutron can (either)*) might then have been taken to arise from the fact that focused material cannot undergo ellipsis, assuming Gapping remnants are focused. But so far as we can tell, there is no independent explanation—semantic, pragmatic, psycholinguistic or prosodic—for the badness of the examples in (51)–(53). There is, for example, no property of *do so* replacement analogous to that displayed by ellipsis which would allow a parallel argument to be made for (51).[8] Thus, the examples in (51) (at least one or the other) should be well-formed on the low VP coordination analysis, and so should the others cited.[9] It thus seems safe to conclude that the misprediction

8. This of course does not mean that there are no semantic/pragmatic principles governing the use of *do so* anaphora. In fact, there are: according to Ward and Kehler (2005), the acceptability difference in examples such as ?*The tallest teachers do so by example* vs. *The greatest teachers do so by example* (involving deverbal nouns) depends on whether the nominalization makes the associated event (or property) salient enough to support *do so* anaphora. The reason that *do so* has traditionally (but perhaps not totally unproblematically) been taken to be a syntactic constituency test is consistent with this view: if there is an overt syntactic constituent that denotes the relevant property in the preceding discourse, that alone makes the property salient enough. And since there would be nothing semantically or pragmatically incoherent in the denotation of the alleged VP constituent in the case of (51), the prediction follows that, on the low VP coordination analysis, the examples should be grammatical.

9. One might think that examples like (52) could be ruled out by assuming that reconstruction of the subject of the first conjunct to a VP-internal position (which one might motivate either from the CSC (Lin 2001) or perhaps just for the purpose of semantic interpretation) is blocked for fronted VPs. Such an assumption might in turn be taken to receive independent support from the fact that the object quantifier cannot scope over the subject quantifier in such an environment:

(i) See everyone, (I am sure) someone did. ($\exists > \forall$, $*\forall > \exists$; Huang 1993)

But the argument that (i) motivates this assumption is decisively undermined by contrasts such as that between (iia) and (iib).

noted is due to the fact that the low VP coordination approach analyzes Gapping via coordination at the VP level.

3.1.2.2 Gapped conjuncts: VP or S? Moreover, just from the basic syntactic patterns of Gapping (not involving any interactions with other phenomena targeting "VP" constituents), we see evidence against the low VP coordination analysis. The relevant data come from Gapping sentences involving various fronted elements.

(54) a. At our house we play poker, and at Betsy's house, bridge.
b. Yesterday we went to the movies, and last Thursday, to the circus.
(Sag 1976, 265)

(55) a. To Robin Chris gave the book __, and to Leslie, the magazine __.
b. To Leslie I want to write a letter __, and to Robin, a short note __.
c. To Leslie I (had) thought that we'd write a letter __, and to Robin, a short note __.
d. Tweedledee, I intend to argue with __, and Tweedledum, to negotiate with __.
e. Robin, I'm quite disappointed in __, and Leslie, very angry at __.

(56) Which abstract should we send to NELS and which manuscript to LI?

Some of these facts were already known since Sag (1976), and indeed, Repp (2009, 34) briefly notes that examples similar to (54) and (56) are problematic for the low VP coordination analysis of Gapping offered in Winkler (2005). On the low VP coordination analysis, by assumption, the second conjunct contains only an untensed lower VP projection, but then, there are no landing sites for the fronted elements, which are standardly taken to be somewhere above the T node.

Note crucially that, unlike subjects (for which there is at least a theory-internal motivation for a preverbal base position by adopting the VP-internal subject hypothesis), the fronted elements in (54)–(56) do not originate in the conjunct-initial positions in the second conjunct. Thus, the only way to accommodate these examples is to posit an ad hoc landing site just above the lower VP (Winkler [2005, 209] does indeed seem to be alluding to this possibility, without, however, noting its immediate consequence

(ii) a. Some student (or other) wants to hear stories about every physicist. ($\exists > \forall, \forall > \exists$)
b. Stories about every physicist, some student (or other) wants to hear. ($\exists > \forall$, $*\forall > \exists$)

In (iib) there is no question of the existentially quantified subject reconstructing to a position within the fronted constituent, since it did not originate within that constituent to begin with. Yet just as in (i), we find that the wide scope available to the in situ universal is unavailable when the universal is part of a topicalized constituent. Hence the claim that subjects cannot reconstruct back into fronted VPs receives no support from the scopal facts about (i), and appealing to such a claim to explain the pattern in (52) must therefore be purely stipulative.

we discuss below). Positing such a landing site, however, is highly implausible, given the obvious impossibility of topicalizing to this position in non-Gapping contexts, as robustly exemplified in (57) and (58).

(57) a. *I intend$_i$ [$_{VP}$ Tweedledee$_k$ [$_{VP}$ t_i to negotiate with t_k]]. (cf. (55d))
b. *I am Leslie$_i$ very angry at t_i . (cf. (55e))

(58) a. *I want [to Robin]$_i$ to write a letter t_i . (cf. (55b))
b. *I thought [to Robin]$_i$ that we would write a letter t_i . (cf. (55c))
c. *I had [to Robin]$_i$ thought that we would write a letter t_i (cf. (55c))

Tweedledum is fronted in the second conjunct in (55d). The claim that the second conjunct is a VP thus entails that there is a position within a VP which can host a topicalized constituent. But then, this landing site should be available in non-Gapping clauses as well. However, this prediction fails, as attested by the ill-formedness of (57a). Similar arguments go with other examples. To rule out examples like (57) and (58), one would then need to invoke some constraint prohibiting the (future) fronted element to stay in the lower VP adjunction site if the subject moves out of its VP-internal position. But such a complex interdependency between movement operations not only is theoretically dubious but also lacks any independent empirical motivation.

The evidence just outlined from topicalization against the low VP coordination analysis uses a particular syntactic behavior characteristic of clauses but not of VPs as a diagnostic probe. A second argument of the same kind can be made based on a property characteristic of VPs as opposed to clauses: the distribution of the adverb *merely* is a case in point. As shown in (59), *merely* is strictly a VP adjunct; it cannot adjoin to S.

(59) a. Robin { merely said / said merely } that our footnotes were too long.
b. *Merely, Robin said that our footnotes were too long.

On this basis, we predict that *merely* should be eligible to appear preceding the putative VP which the second conjunct consists of in Johnson's analysis. But this prediction is not borne out.

(60) Robin commented only that our margins were too small, and
{ a. Leslie merely / b. *merely Leslie } that our footnotes were too long.

The badness of (60b) follows directly from the fact, exemplified in (59b), that *merely* is strictly a VP modifier, if we assume that the gapped conjunct is clausal. But it is completely unexpected if we take the gapped conjunct to be a VP.

We thus have two diagnostics which independently sort VPs from Ss converging on the identification of the gapped conjunct as an S, not a VP. Ordinary methodological

considerations therefore suggest that, like the data in (51)–(53), these facts impose a very heavy burden of proof on the low VP coordination analysis.

Given the failure of the low VP coordination approach documented above, it seems fair to conclude that there is currently no successful analysis of the apparently anomalous scopal properties of auxiliaries and quantifiers in Gapping that is free from major empirical problems. On the whole, the low VP coordination analysis is the best story that has been produced in previous work on Gapping, but the empirical evidence we have discussed above seems to show conclusively that the particular way in which it links the two puzzles of Gapping is not on the right track.

3.2 An Analysis of Gapping in Hybrid Type-Logical Categorial Grammar

In this section, we propose an analysis of Gapping in Hybrid TLCG. The key property of Hybrid TLCG lies in its "hybrid" architecture involving both the standard directional slashes for regulating word order and the novel nondirectional slash stemming from Oehrle's (1994) work which is suitable for the modeling of movement-like phenomena. This enables simple analyses of various highly complex interactions between "order-sensitive" and "order-insensitive" phenomena in natural language that have proven problematic for previous syntactic theories, as we demonstrate further starting from this chapter. In particular, our analysis of Gapping in this chapter again crucially exploits the flexible (yet systematic) interactions between these two different modes of implication in capturing the apparently recalcitrant empirical properties that Gapping exhibits.

Our analysis of Gapping builds heavily on previous studies in the CG literature but extends their empirical coverage significantly. Implementational details aside, previous literature on Gapping in CG all agree on the fundamental hypothesis about the "underlying" syntactic structure of Gapping: Gapping instantiates like-category constituent coordination, despite the surface asymmetry between the initial and noninitial conjuncts. We take this hypothesis to be basically correct. However, previous analyses of Gapping in CG are all significantly limited in their empirical coverage. As we see it, the problem is that these previous analyses are couched in variants of CG that are suitable for handling only one or the other of the two problems that Gapping poses (i.e., describing the syntactic patterns and explaining the scope anomaly), thus leaving the analysis incomplete in the other respect (see Kubota and Levine [2012] for a more detailed critique of the major previous approaches to Gapping in the CG literature). For example, Steedman's (1990) analysis in CCG is the first analysis of Gapping as like category coordination, and it captures the basic syntactic patterns of Gapping quite successfully. However, it is not clear whether the complex interactions between Gapping and scope-taking expressions like quantifiers and auxiliaries observed above can be captured in a principled manner in CCG (which countenances a relatively constrained

architecture of the syntax-semantics interface as compared to TLCG), even with the latest analysis of quantification proposed by Steedman (2012). By contrast, Oehrle (1987) and Siegel (1987) shed considerable light on this scope anomaly by casting their analyses in frameworks that are essentially the precursors of the contemporary "nondirectional" CGs. By relocating word order out of the combinatoric component, such frameworks are indeed suitable for capturing scope-related phenomena, but this comes with the cost that keeping track of linear order becomes notoriously difficult, resulting in an incomplete analysis of the basic syntactic patterns of Gapping. Our own analysis resembles most closely Morrill et al.'s (2011) (which is a refinement of Hendriks [1995b]) in treating Gapping essentially as coordination of sentences with medial gaps. However, neither Hendriks (1995b) nor Morrill et al. (2011) extend their analyses to the scope anomaly puzzle. (In an earlier version of this chapter, which has appeared as Kubota and Levine [2016a], we conjectured that our empirical analysis of Gapping would carry over straightforwardly to Morrill et al.'s [2011] setup. This point has in fact been demonstrated explicitly in Morrill and Valentín [2017].) We think that the main reason that the discovery of a TLCG solution for this problem did not become available until recently is that previous variants of TLCG employed very complex mechanisms for handling discontinuous constituency in Gapping and the syntax-semantics mismatch of scopal expressions, which obscured the underlying analytic insight considerably. Our setup improves these approaches in this respect, in treating (following Oehrle 1994) discontinuity simply by λ-binding in phonology, thereby making the underlying analytic intuition considerably more transparent.

Gapping presents an important case in relation to a comparison of (Hybrid) TLCG with the mainstream movement-based syntactic theory. At this point it may still appear as though Hybrid TLCG is just a nonstandard variant of movement-based theory which does away with the notion of phrase structural constituency. Gapping turns out to provide one answer to this question. Though the most basic use of the vertical slash connective is to model the notion of syntactic movement, inferences involving the vertical slash are much more general and powerful than the notion of syntactic movement, and this property of Hybrid TLCG turns out to be crucial in the analysis of Gapping.

3.2.1 Gapping as Hypothetical Reasoning

Our analysis of Gapping exploits the order-insensitive nature of the vertical slash $\uparrow$. As discussed in chapter 2, with the vertical slash, expressions containing medial gaps can be modeled straightforwardly via hypothetical reasoning. This enables us to analyze expressions like *Robin* __ *Bill* (a sentence missing the main verb) in Gapping as directly conjoinable constituents. Specifically, as illustrated in the following (partial) derivation, such expressions are derived as constituents of a syntactic category $\mathrm{S}\uparrow((\mathrm{NP}\backslash\mathrm{S})/\mathrm{NP})$ (i.e., an S missing a transitive verb $(\mathrm{NP}\backslash\mathrm{S})/\mathrm{NP}$ in the middle), with a functional phonology of type **st→st** (where the prosodic variable φ_1 of type **st** (string)

bound by the lambda operator explicitly keeps track of the position of the gap in the string). The derivation is parallel to the topicalization derivation in (24) from the previous chapter, except that the missing category is $(\mathrm{NP}\backslash\mathrm{S})/\mathrm{NP}$ rather than NP.

(61)
$$\dfrac{\mathsf{robin};\,\mathbf{r};\,\mathrm{NP} \qquad \dfrac{[\varphi_1;P;(\mathrm{NP}\backslash\mathrm{S})/\mathrm{NP}]^1 \quad \mathsf{bill};\,\mathbf{b};\,\mathrm{NP}}{\varphi_1\circ\mathsf{bill};\,P(\mathbf{b});\,\mathrm{NP}\backslash\mathrm{S}}\backslash\mathrm{E}}{\mathsf{robin}\circ\varphi_1\circ\mathsf{bill};\,P(\mathbf{b})(\mathbf{r});\,\mathrm{S}}/\mathrm{E}$$
$$\dfrac{\mathsf{robin}\circ\varphi_1\circ\mathsf{bill};\,P(\mathbf{b})(\mathbf{r});\,\mathrm{S}}{\lambda\varphi_1.\mathsf{robin}\circ\varphi_1\circ\mathsf{bill};\,\lambda P.P(\mathbf{b})(\mathbf{r});\,\mathrm{S}\uparrow((\mathrm{NP}\backslash\mathrm{S})/\mathrm{NP})}\uparrow\mathrm{I}^1$$

Note that the matching index 1 on the hypothesis and the last inference step $\uparrow\mathrm{I}^1$ indicate that the transitive verb hypothesis is withdrawn at this step. Because of this, the derived category is $\mathrm{S}\uparrow((\mathrm{NP}\backslash\mathrm{S})/\mathrm{NP})$, in accordance with what the rule dictates. Note also that the phonology and semantics of the derived expression is obtained by strictly following what is specified in the rule, that is, binding the variable corresponding to the hypothesis by a lambda operator.

The following Gapping-specific lexical entry for conjunction is responsible for coordinating such expressions with functional phonologies of type **st→st**:

(62) $\lambda\sigma_2\lambda\sigma_1\lambda\varphi.[\sigma_1(\varphi)\circ\mathsf{and}\circ\sigma_2(\boldsymbol{\varepsilon})];\,\lambda\mathcal{W}\lambda\mathcal{V}.\mathcal{V}\sqcap\mathcal{W};\,(\mathrm{S}\uparrow X)\uparrow(\mathrm{S}\uparrow X)\uparrow(\mathrm{S}\uparrow X)$

—where $\boldsymbol{\varepsilon}$ is the empty string and $X = \left\{\begin{matrix} Y_0\backslash\mathrm{S} \\ \mathrm{S}/Y_0 \end{matrix}\right\}/Y_1/\ldots/Y_n$ with $n \geq 1$

The side condition on X here is meant to capture the generalization that the gapped expression is of a verbal category (with at least two unsaturated arguments). In most cases, the last argument is an NP sought via $\backslash$, thus instantiating $Y_0\backslash\mathrm{S}$ as $\mathrm{NP}\backslash\mathrm{S}$. (But see the topicalization interaction case in (65) for the need for the S/Y_0 case.) Syntactically, (62) coordinates two sentences missing the main verb (i.e., $\mathrm{S}\uparrow((\mathrm{NP}\backslash\mathrm{S})/\mathrm{NP})$ in the case at hand) to produce a larger expression of the same type, instantiating the general like-category coordination schema; correspondingly, the semantics is that of generalized conjunction, again conforming to the general treatment of coordination. The only slight complication is in the phonology. The output phonology is of the same type **st→st** as the input phonologies, but instead of binding the variables in each conjunct by the same λ-operator, the gap in the second conjunct is filled by an empty string $\boldsymbol{\varepsilon}$, capturing the idiosyncrasy of Gapping (where the verb is not pronounced in the second conjunct) via a lexical specification, without invoking any extra rule or prosodically empty operator.

A couple of comments are in order regarding the lexical entry in (62). First, the brace notation might give the misleading impression that the condition on the missing category is stated purely disjunctively. Recent work by Chris Worth (2016) suggests that it may be possible to model our directional mode of implication within a nondirectional CG via subtyping making use of higher-order logic. We envisage that in this more formally sophisticated implementation of our framework, it will be possible to

treat the two directional slashes as subtypes of a single more general type, and that the disjunction in (62) can then be collapsed to a single more general condition, capturing the underlying analytic intuition more transparently. Second, to capture the generalization that the Gapping-specific entry of the form in (62) is available not just for *and* but for other conjunction markers as well, the entry should be thought of not as simply being listed in the lexicon but as being related to the ordinary string-conjoining entries of conjunction words via a lexical rule of the following form (with the same side condition on X as in (62)):

(63) $\varphi_0; \mathcal{F}; (Z\backslash Z)/Z \Rightarrow \lambda\sigma_2\lambda\sigma_1\lambda\varphi.[\sigma_1(\varphi) \circ \varphi_0 \circ \sigma_2(\boldsymbol{\varepsilon})]; \mathcal{F}; (\mathrm{S}\lceil X)\rceil(\mathrm{S}\lceil X)\rceil(\mathrm{S}\lceil X)$

This rule systematically relates a lexical entry for a conjunction word (which has the syntactic category $(Z\backslash Z)/Z$) to a lexical entry of the form in (62).[10] Gapping is associated with distinct properties both prosodically and pragmatically (cf. the Parallelism requirement [Kuno 1976; Levin and Prince 1986; Kehler 2002] for the latter).[11] The obligatory association with the special prosody and Parallel discourse relation can then be attributed to this lexical rule (or empty operator).[12]

With this conjunction lexical entry, a simple Gapping sentence can be derived as in (64) (in what follows, we abbreviate $(\mathrm{NP}\backslash\mathrm{S})/\mathrm{NP}$ and $\mathrm{NP}\backslash\mathrm{S}$ as TV and VP, respectively):

10. If desired, this lexical rule could be reformulated as an empty operator of the following form:

(i) $\lambda\varphi_0\lambda\sigma_2\lambda\sigma_1\lambda\varphi.[\sigma_1(\varphi) \circ \varphi_0 \circ \sigma_2(\boldsymbol{\varepsilon})]; \lambda\mathcal{F}.\mathcal{F}; (\mathrm{S}\lceil X)\rceil(\mathrm{S}\lceil X)\rceil(\mathrm{S}\lceil X)\rceil((Z\backslash Z)/Z)$

11. This of course does not mean that such pragmatic and prosodic properties can be expressed/realized only in Gapping. It is possible to have a parallel discourse relation and a Gapping-like prosody at the same time in ordinary coordination as well in the right kind of context such as the following:

(i) A: Who ate what?
B: John ate beans, and Bill ate rice.

The difference between Gapping and ordinary coordination is that while the association with this prosody/pragmatics pair is optional in the latter, it is obligatory in the former.

12. There is now increasing recognition in the literature that considerations of discourse coherence play a large role in judgments of well-formedness in such constructions. See, for example, Toosarvandani (2016) for one specific proposal to account for embedding asymmetries between the gapped and ungapped conjuncts in completely pragmatic terms.

(64)

$$\dfrac{\dfrac{\lambda\varphi_1.\text{leslie}\circ\varphi_1\circ\text{sandy};\ \lambda Q.Q(\mathbf{s})(\mathbf{l});\ \mathrm{S}\uparrow\mathrm{TV} \qquad \dfrac{\lambda\sigma_2\lambda\sigma_1\lambda\varphi.\sigma_1(\varphi)\circ\text{and}\circ\sigma_2(\boldsymbol{\varepsilon});\ \lambda\mathcal{W}\lambda\mathcal{V}.\mathcal{V}\sqcap\mathcal{W};\ (\mathrm{S}\uparrow X)\uparrow(\mathrm{S}\uparrow X)\uparrow(\mathrm{S}\uparrow X) \qquad \lambda\varphi_1.\text{robin}\circ\varphi_1\circ\text{bill};\ \lambda P.P(\mathbf{b})(\mathbf{r});\ \mathrm{S}\uparrow\mathrm{TV}}{\lambda\sigma_1\lambda\varphi.\sigma_1(\varphi)\circ\text{and}\circ\text{robin}\circ\boldsymbol{\varepsilon}\circ\text{bill};\ \lambda\mathcal{V}.\mathcal{V}\sqcap\lambda P.P(\mathbf{b})(\mathbf{r});\ (\mathrm{S}\uparrow\mathrm{TV})\uparrow(\mathrm{S}\uparrow\mathrm{TV})}\uparrow\mathrm{E}}{\lambda\varphi[\text{leslie}\circ\varphi\circ\text{sandy}\circ\text{and}\circ\text{robin}\circ\boldsymbol{\varepsilon}\circ\text{bill}];\ \lambda Q.Q(\mathbf{s})(\mathbf{l})\sqcap\lambda P.P(\mathbf{b})(\mathbf{r});\ \mathrm{S}\uparrow\mathrm{TV}}\uparrow\mathrm{E} \qquad \begin{array}{l}\text{met};\\ \mathbf{met};\\ \mathrm{TV}\end{array}}{\begin{array}{l}\text{leslie}\circ\text{met}\circ\text{sandy}\circ\text{and}\circ\text{robin}\circ\boldsymbol{\varepsilon}\circ\text{bill};\\ \mathbf{met}(\mathbf{s})(\mathbf{l})\wedge\mathbf{met}(\mathbf{b})(\mathbf{r});\ \mathrm{S}\end{array}}\uparrow\mathrm{E}$$

In this analysis, two gapped sentences are directly conjoined with each other first, and then the verb "lowers into" this conjoined gapped sentence phonologically. The right surface string is obtained for the whole sentence by giving the two type **st→st** functional phonologies of the conjuncts as arguments to the conjunction and then by applying the resultant **st→st** function to the string of the verb, via three successive applications of $\uparrow$E. Note that the fact that the verb appears to the right of the coordinate structure in the derivation does not have any significance for the surface word order (thus, this should not be thought to reflect the status of the verb as being "extraposed" or "right-node raised"). The surface order is computed based on what is specified in the rules, in particular, here, the $\uparrow$E rule, according to which the phonology of the derived expression is the result of applying the phonology of the functor to that of its argument.

Note also that the right meaning for the sentence is obtained by letting the verb bind the gap positions in the two conjuncts after the coordinate structure is built via generalized conjunction instead of positing a phonetically empty copy of the verb in the gapped conjunct (if the reduction of the semantic translation at the last step isn't obvious, note that Partee and Rooth's [1983] definition of generalized conjunction entails that $[\phi\sqcap\psi](\alpha)=\phi(\alpha)\sqcap\psi(\alpha)$). This aspect of the semantics of coordination turns out to be crucial in assigning the right interpretations for the more complex cases involving scopal expressions like auxiliaries and quantifiers.

As should be clear at this point, the role of both directional and nondirectional implication is crucial in our analysis: the gapped sentence with syntactic type $\mathrm{S}\uparrow\mathrm{TV}$ explicitly keeps track of the position of the medial gap via λ-binding in phonology; on the other hand, directional slashes are crucially employed in the specification of the gapped material $(\mathrm{NP}\backslash\mathrm{S})/\mathrm{NP}$, which is reflected in the linear order in which its arguments appear in the string part of the gapped sentence. Thus, we exploit the hybrid implication architecture of Hybrid TLCG here; keeping track of the right word order becomes a

very challenging problem in Linear Categorial Grammar (LCG; cf. chapter 12), which employs only the nondirectional mode of implication for syntactic composition.[13]

The analysis of Gapping presented above straightforwardly interacts with the analysis of topicalization from chapter 2 to yield an analysis of the topicalization/Gapping interaction example (55a). First, the gapped string *Chris gave* can be derived via hypothetical reasoning in the usual manner:

(65)
$$\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\text{gave};\ \mathbf{gave};\ \text{VP}/\text{PP}/\text{NP} \quad [\varphi_6; w; \text{NP}]^1}{\text{gave}\circ\varphi_6;\ \mathbf{gave}(w);\ \text{VP}/\text{PP}}/\text{E} \quad [\varphi_7; u; \text{PP}]^2}{\text{gave}\circ\varphi_6\circ\varphi_7;\ \mathbf{gave}(w)(u);\ \text{VP}}/\text{E} \quad \text{chris};\ \mathbf{c};\ \text{NP}}{\text{chris}\circ\text{gave}\circ\varphi_6\circ\varphi_7;\ \mathbf{gave}(w)(u)(\mathbf{c});\ \text{S}}\backslash\text{E}}{\text{chris}\circ\text{gave}\circ\varphi_6;\ \lambda u.\mathbf{gave}(w)(u)(\mathbf{c});\ \text{S}/\text{PP}}/\text{I}^2}{\text{chris}\circ\text{gave};\ \lambda w\lambda u.\mathbf{gave}(w)(u)(\mathbf{c});\ \text{S}/\text{PP}/\text{NP}}/\text{I}^1$$

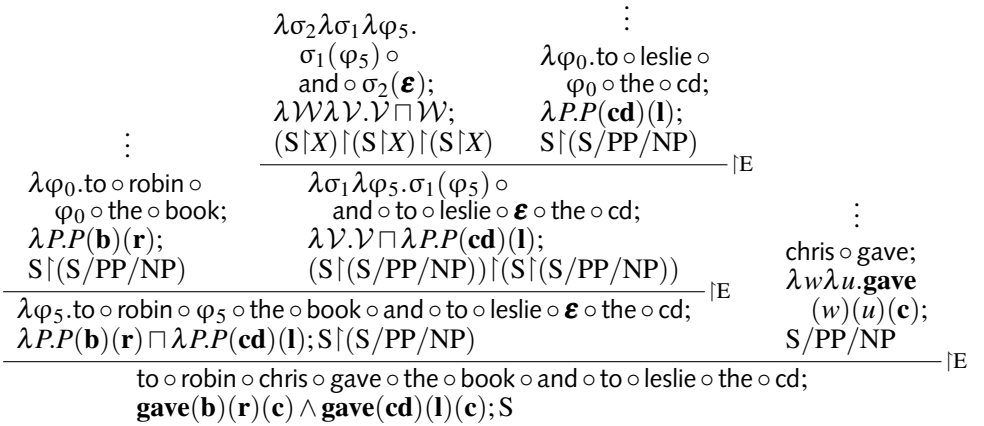
Then the two conjuncts to be coordinated are derived by binding a gap of type S/PP/NP in a topicalized sentence (note that two hypothetical reasonings are involved here, one for Gapping and the other for topicalization):

(66)
$$\dfrac{\dfrac{\dfrac{\dfrac{\begin{bmatrix}\varphi_1;\\ x;\\ \text{PP}\end{bmatrix}^1 \quad \dfrac{\begin{bmatrix}\varphi_0;\\ P;\text{S}/\text{PP}/\text{NP}\end{bmatrix}^2 \quad \begin{matrix}\text{the}\circ\text{book};\\ \mathbf{b};\text{NP}\end{matrix}}{\varphi_0\circ\text{the}\circ\text{book};\ P(\mathbf{b});\ \text{S}/\text{PP}}/\text{E}}{\varphi_0\circ\text{the}\circ\text{book}\circ\varphi_1;\ P(\mathbf{b})(x);\ \text{S}}/\text{E}}{\begin{matrix}\lambda\varphi_1.\varphi_0\circ\text{the}\circ\text{book}\circ\varphi_1;\\ \lambda x.P(\mathbf{b})(x);\text{S}\uparrow\text{PP}\end{matrix} \quad \begin{matrix}\lambda\sigma_1\lambda\varphi_3.\varphi_3\circ\sigma_1(\boldsymbol{\varepsilon});\\ \lambda\mathcal{G}.\mathcal{G};(\text{S}\uparrow X)\uparrow(\text{S}\uparrow X)\end{matrix}}\uparrow\text{E} \quad \begin{matrix}\text{to}\circ\text{robin};\\ \mathbf{r};\text{PP}\end{matrix}}{\lambda\varphi_3.\varphi_3\circ\varphi_0\circ\text{the}\circ\text{book};\ \lambda x.P(\mathbf{b})(x);\ \text{S}\uparrow\text{PP}}\uparrow\text{E}}{\text{to}\circ\text{robin}\circ\varphi_0\circ\text{the}\circ\text{book};\ P(\mathbf{b})(\mathbf{r});\ \text{S}}\uparrow\text{I}^2}{\lambda\varphi_0.\text{to}\circ\text{robin}\circ\varphi_0\circ\text{the}\circ\text{book};\ \lambda P.P(\mathbf{b})(\mathbf{r});\ \text{S}\uparrow(\text{S}/\text{PP}/\text{NP})}\uparrow\text{I}^2$$

The derivation completes by conjoining two expressions of type $\text{S}\uparrow(\text{S}/\text{PP}/\text{NP})$ and lowering the type S/PP/NP gapped expression to the first conjunct:

13. See chapter 12, section 12.3, and Moot (2014) for extensive discussions on this point. In particular, Moot (2014) discusses the particular difficulty that these approaches face in the context of Gapping (as well as other empirical phenomena such as [ordinary] coordination and adverb modification), where the interpretation "Leslie saw Sandy and Bill saw Robin" is predicted to be available for *Leslie saw Sandy, and Robin Bill* in a direct translation of the present analysis into LCG.

(67)



Before moving on to the more complex cases involving auxiliaries and determiners, we would like to clarify what our analysis above exactly amounts to. With the lexical entry (62) and the general availability of hypothetical reasoning, our analysis entails that *any* substring of the sentence that is a rightward looking (except for the last argument) functor rooted in S can undergo Gapping and that Gapping is restricted to noninitial conjuncts. As for the latter point, one might question our lexical treatment here since there are attempts to derive this property from basic word order, building on Ross's (1970) classical conjecture. However, the most successful such attempt by Steedman (1990) remains problematic due to the highly controversial status of the key combinatory rule ("Decompose") for deriving Gapping in English (see Kubota and Levine [2012] for some discussion), and for this reason we remain skeptical about such attempts. Moreover, in most other accounts of Gapping, including the low VP coordination analysis, this, or a related aspect, remains a stipulation. (On the latter, the question is why the subject of the second conjunct cannot undergo the non-ATB movement.)

The former question, namely, why Gapping is restricted to verbal categories, is currently a major open question for any theoretical account of Gapping.[14] We conjecture here that this may perhaps be understood as a grammaticalization of a functional constraint on the kinds of meanings typically expressed by Gapping sentences. As noted by many authors (see, e.g., Kuno [1976] for an early reference), Gapping invokes a

14. Yoshida et al. (2012) argue convincingly that the apparent Gapping in NPs like the following (noted by Jackendoff [1971]) had better be analyzed as an elliptical phenomenon licensed by an anaphoric mechanism:

(i) Bill's funny story about Sue and Max's ∅ about Kathy both amazed me.

contrast between parallel "pairs" of items. The relation holding between the elements of each pair is expressed by whatever material is contained in the initial conjunct that is missing in the noninitial conjunct(s). There is a sense in which the verb expresses the most central relation in the propositions expressed by each of the contrasted clauses. It then does not seem entirely implausible to speculate that, for this functionally motivated reason, there is a grammatical constraint that Gapping is restricted to verbs.[15] Cases of auxiliary-alone gapping such as (44a) may then be thought of as an extension of this pattern (where the missing relation is higher-order than in the case of plain verbs).

Finally, we would like to briefly comment on the relationship between the present proposal and the two types of major analyses of Gapping in the transformational literature. Our proposal shares one important property with Johnson's proposal involving ATB movement: in both approaches, Gapping is taken to be a sentence grammar phenomenon. We follow Johnson (2009) in taking this to be a correct feature of the analysis: as is well-known, Gapping is restricted to coordination environments (in the broader sense, including complex conjunction operators such as *not to mention*). In this respect, the present proposal contrasts with the proposals by Coppock (2001), Lin (2002), and Toosarvandani (2013), which crucially involve the anaphoric process of VP ellipsis for "removing" the verb from the second conjunct.[16] But despite the above similarity, the present proposal critically differs from Johnson's in that it does not take Gapping to involve VP coordination. In our analysis, coordination is at the S level, and this sets it free from all the problematic consequences entailed in Johnson's analysis. In a way, one might take Johnson's proposal to be an "approximation" of our S⌈NP-coordination analysis within the movement-based setup. The various undermotivated transformational operations posited in Johnson's analysis seem to speak to the limitations of the transformational setup in mimicking the general mechanism of hypothetical reasoning that is fundamental to (Hybrid) TLCG, revealing the real difference between the transformational architecture of grammar and the logic-based architecture adopted here.

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15. And to matrix verbs, not embedded verbs; thus, we take it that Johnson's (2009) "no embedding" constraint on Gapping follows from this.

16. In connection to this, one might wonder how cross-speaker Gapping like the following is to be handled:

(i) A: Delta will acquire Virgin America.
B: *(And) Burger King, ∅ Wendy's.

Note that the conjunction marker is obligatory in B's utterance. We take this fact to indicate that this type of cross-speaker Gapping is felicitous only when the second speaker's utterance can in effect be interpreted as completing the utterance of the first speaker. As such, we take it that examples like (i) do not constitute counterevidence to our claim that Gapping is a strictly sentence grammar phenomenon licensed in conjunction environments only.

3.2.2 Scopal Interactions with Auxiliaries

The above analysis of the basic syntax of Gapping automatically interacts with independently motivated analyses of auxiliaries and quantifiers that take into account their scope-taking properties to predict their behaviors in Gapping examples.

The key assumption that enables a straightforward analysis of the scopal interactions between auxiliaries and Gapping is that auxiliaries are scope-taking expressions just like quantifiers. Specifically, we assume that morpho-phonologically auxiliaries have the distributional properties of a VP modifier of category VP/VP, but semantically, modals and negation are sentential operators μ, which take some proposition φ as an argument and return another proposition $\mu(\varphi)$. The idea in a nutshell is that auxiliaries are VP-type quantifiers in the same way that GQs are NP-type quantifiers. In the present approach, this syntax-semantics mismatch can be straightforwardly captured by assigning lexical entries of the following form to auxiliaries:

(68) $\lambda\sigma.\sigma(\mathsf{must})$; $\lambda\mathscr{F}.\Box\mathscr{F}(\mathsf{id}_{et})$; $\mathrm{S}\uparrow(\mathrm{S}\uparrow(\mathrm{VP}/\mathrm{VP}))$

——where $\mathsf{id}_{et} =_{def} \lambda P_{et}.P$

This lexical entry says that the auxiliary verb *must* saturates a VP/VP (i.e., forward-looking VP modifier) gap in a sentence to return a fully saturated S. The VP modifier gap is vacuously bound by supplying an identity function id_{et} in its place, and the real semantic contribution of the auxiliary comes from the modal operator that takes as its scope the entire proposition obtained by binding this VP modifier gap of the gapped sentence.

The following derivation for the sentence *Someone must be present (at the meeting)* illustrates this scopal analysis of auxiliaries.[17] This derivation illustrates that the present analysis enables licensing the **must** $>\exists$ reading for the sentence without assuming that the modal subcategorizes for the subject in the GQ type.

17. As it is, the analysis of auxiliaries here overgenerates, since it does not capture the clause-boundedness of the scope of auxiliaries. See chapter 9, section 9.2.2, for how this constraint can be captured by an indexing mechanism we introduce in chapter 7 which keeps track of the depth of (clausal) embedding which is independently needed for other purposes.

(69)

$$\dfrac{\lambda\sigma.\sigma(\text{must});\ \lambda\mathscr{F}.\Box\mathscr{F}(\mathsf{id}_{et});\ \mathrm{S}\uparrow(\mathrm{S}\uparrow(\mathrm{VP}/\mathrm{VP}))\qquad \dfrac{\lambda\sigma.\sigma(\text{someone});\ \exists_{\mathbf{person}};\ \mathrm{S}\uparrow(\mathrm{S}\uparrow\mathrm{NP})\qquad \dfrac{\dfrac{\dfrac{\begin{bmatrix}\varphi_2;\\ x;\\ \mathrm{NP}\end{bmatrix}^2\qquad \dfrac{\begin{bmatrix}\varphi_1;\\ f;\\ \mathrm{VP}/\mathrm{VP}\end{bmatrix}^1\qquad \text{be}\circ\text{present};\ \textbf{present};\ \mathrm{VP}}{\varphi_1\circ\text{be}\circ\text{present};\ f(\textbf{present});\ \mathrm{VP}}/\mathrm{E}}{\varphi_2\circ\varphi_1\circ\text{be}\circ\text{present};\ f(\textbf{present})(x);\ \mathrm{S}}\backslash\mathrm{E}}{\lambda\varphi_2.\varphi_2\circ\varphi_1\circ\text{be}\circ\text{present};\ \lambda x.f(\textbf{present})(x);\ \mathrm{S}\uparrow\mathrm{NP}}\uparrow\mathrm{I}^2}{\text{someone}\circ\varphi_1\circ\text{be}\circ\text{present};\ \exists_{\mathbf{person}}(\lambda x.f(\textbf{present})(x));\ \mathrm{S}}\uparrow\mathrm{E}}{\lambda\varphi_1.\text{someone}\circ\varphi_1\circ\text{be}\circ\text{present};\ \lambda f.\exists_{\mathbf{person}}(\lambda x.f(\textbf{present})(x));\ \mathrm{S}\uparrow(\mathrm{VP}/\mathrm{VP})}\uparrow\mathrm{I}^1}{\text{someone}\circ\text{must}\circ\text{be}\circ\text{present};\ \Box\exists_{\mathbf{person}}(\lambda x.\textbf{present}(x));\ \mathrm{S}}\uparrow\mathrm{E}$$

(①→ on the $\uparrow\mathrm{I}^1$ step; ②→ on the final $\uparrow\mathrm{E}$ step)

Just as in the quantifier example in (22), a hypothetical VP/VP expression is posited and this hypothesis is withdrawn once the whole sentence is built (①). This has the effect that the corresponding semantic and phonological variables are bound. The resultant type $\mathrm{S}\uparrow(\mathrm{VP}/\mathrm{VP})$ expression is of the right type to be given as an argument to the auxiliary. The two are then combined by function application via $\uparrow$E (②), and the phonology of the auxiliary fills in the gap position of its argument. The semantic effect is somewhat more complex (and this might be thought of as a limiting case of "split scope" that we discuss below for negative quantifiers, where the lower meaning component is an identity function). An identity function is first filled in to the gap position of the sentence, which yields the proposition $\exists_{\mathbf{person}}(\lambda x.\mathbf{present}(x))$. And then the modal operator $\Box$ (which is the "real" semantic contribution of the auxiliary) scopes over this proposition to derive the translation of the whole sentence. As will become clear below, this higher-order treatment of auxiliaries turns out to be crucial in assigning the right meaning to the auxiliary gapping examples. Note also here that, since the quantifier is introduced in the derivation below the modal auxiliary, we obtain the **must** $>\exists$ reading.

We are now ready to illustrate how the auxiliary wide-scope, non-distributive readings are obtained for Gapping sentences. We start with a variant in which only the auxiliary is gapped (70a) (the derivation for which is a bit simpler) and then move on to the case in which the whole auxiliary + verb sequence is gapped (70b).

(70) a. John can't eat steak and Mary eat pizza.
b. John can't eat steak and Mary pizza.

The overall structure of the derivation for the auxiliary wide-scope reading is the same as in the simpler Gapping analysis in (64): we coordinate two expressions which are in effect clauses missing VP/VP functors, forming a larger expression of the same category:

(71)

$$\dfrac{\dfrac{\text{john};\ \mathbf{j};\mathrm{NP} \qquad \dfrac{\left[\begin{array}{l}\varphi_1;\\ f;\mathrm{VP/VP}\end{array}\right]^1 \quad \begin{array}{l}\mathsf{eat}\circ\mathsf{steak};\\ \mathbf{eat}(\mathbf{s});\mathrm{VP}\end{array}}{\begin{array}{l}\varphi_1\circ\mathsf{eat}\circ\mathsf{steak};\\ f(\mathbf{eat}(\mathbf{s}));\mathrm{VP}\end{array}}\,/\mathrm{E}}{\begin{array}{l}\mathsf{john}\circ\varphi_1\circ\mathsf{eat}\circ\mathsf{steak};\\ f(\mathbf{eat}(\mathbf{s}))(\mathbf{j});\mathrm{S}\end{array}}\,\backslash\mathrm{E}}{\begin{array}{l}\lambda\varphi_1.\mathsf{john}\circ\varphi_1\circ\mathsf{eat}\circ\mathsf{steak};\\ \lambda f.f(\mathbf{eat}(\mathbf{s}))(\mathbf{j});\mathrm{S}\uparrow(\mathrm{VP/VP})\end{array}}\uparrow\mathrm{I}^1 \qquad \dfrac{\begin{array}{l}\lambda\sigma_2\lambda\sigma_1\lambda\varphi.\sigma_1(\varphi)\circ\\ \quad\mathsf{and}\circ\sigma_2(\boldsymbol{\varepsilon});\\ \lambda\mathcal{F}_2\lambda\mathcal{F}_1.\mathcal{F}_1\sqcap\mathcal{F}_2;\\ (\mathrm{S}\uparrow X)\uparrow(\mathrm{S}\uparrow X)\uparrow(\mathrm{S}\uparrow X)\end{array} \qquad \begin{array}{l}\vdots\\ \lambda\varphi_2.\mathsf{mary}\circ\varphi_2\circ\\ \quad\mathsf{eat}\circ\mathsf{pizza};\\ \lambda g.g(\mathbf{eat}(\mathbf{p}))(\mathbf{m});\\ \mathrm{S}\uparrow(\mathrm{VP/VP})\end{array}}{\begin{array}{l}\lambda\sigma_1\lambda\varphi_0.\sigma_1(\varphi_0)\circ\mathsf{and}\circ\\ \quad\mathsf{mary}\circ\boldsymbol{\varepsilon}\circ\mathsf{eat}\circ\mathsf{pizza};\\ \lambda\mathcal{F}_1.\mathcal{F}_1\sqcap\lambda g.g(\mathbf{eat}(\mathbf{p}))(\mathbf{m});\\ (\mathrm{S}\uparrow(\mathrm{VP/VP}))\uparrow(\mathrm{S}\uparrow(\mathrm{VP/VP}))\end{array}}\uparrow\mathrm{E}}{\begin{array}{l}\lambda\varphi_0.\mathsf{john}\circ\varphi_0\circ\mathsf{eat}\circ\mathsf{steak}\circ\mathsf{and}\circ\mathsf{mary}\circ\boldsymbol{\varepsilon}\circ\mathsf{eat}\circ\mathsf{pizza};\\ \lambda f.f(\mathbf{eat}(\mathbf{s}))(\mathbf{j})\sqcap\lambda g.g(\mathbf{eat}(\mathbf{p}))(\mathbf{m});\mathrm{S}\uparrow(\mathrm{VP/VP})\end{array}}\uparrow\mathrm{E}$$

This coordinated "gapped" constituent is then given as an argument to the auxiliary to complete the derivation, in the same way as in the previous simpler example involving an auxiliary.

(72)
$$\dfrac{\begin{array}{l}\lambda\sigma_0.\sigma_0(\mathsf{can't});\\ \lambda\mathscr{F}.\neg\Diamond\mathscr{F}(\mathsf{id}_{et});\\ \mathrm{S}\uparrow(\mathrm{S}\uparrow(\mathrm{VP/VP}))\end{array} \qquad \begin{array}{l}\vdots\\ \lambda\varphi_0.\mathsf{john}\circ\varphi_0\circ\mathsf{eat}\circ\mathsf{steak}\circ\mathsf{and}\circ\mathsf{mary}\circ\boldsymbol{\varepsilon}\circ\mathsf{eat}\circ\mathsf{pizza};\\ \lambda f.f(\mathbf{eat}(\mathbf{s}))(\mathbf{j})\sqcap\lambda g.g(\mathbf{eat}(\mathbf{p}))(\mathbf{m});\mathrm{S}\uparrow(\mathrm{VP/VP})\end{array}}{\mathsf{john}\circ\mathsf{can't}\circ\mathsf{eat}\circ\mathsf{steak}\circ\mathsf{and}\circ\mathsf{mary}\circ\boldsymbol{\varepsilon}\circ\mathsf{eat}\circ\mathsf{pizza};\ \neg\Diamond[\mathbf{eat}(\mathbf{s})(\mathbf{j})\wedge\mathbf{eat}(\mathbf{p})(\mathbf{m})];\ \mathrm{S}}\uparrow\mathrm{E}$$

Note crucially that the auxiliary is a higher-order functor and what gets distributed to each conjunct is an identity function, not the modal meaning itself. More specifically, the reduction of the semantic term at the last step is unpacked in (73):

(73)
$$\begin{aligned}&\lambda\mathscr{F}[\neg\Diamond\mathscr{F}(\mathsf{id}_{et})](\lambda f.f(\mathbf{eat}(\mathbf{s}))(\mathbf{j})\sqcap\lambda g.g(\mathbf{eat}(\mathbf{p}))(\mathbf{m}))\\ &=\neg\Diamond[[\lambda f.f(\mathbf{eat}(\mathbf{s}))(\mathbf{j})\sqcap\lambda g.g(\mathbf{eat}(\mathbf{p}))(\mathbf{m})](\mathsf{id}_{et})]\\ &=\neg\Diamond[[\lambda f.f(\mathbf{eat}(\mathbf{s}))(\mathbf{j})](\mathsf{id}_{et})\sqcap[\lambda g.g(\mathbf{eat}(\mathbf{p}))(\mathbf{m})](\mathsf{id}_{et})]\\ &=\neg\Diamond[\mathbf{eat}(\mathbf{s})(\mathbf{j})\sqcap\mathbf{eat}(\mathbf{p})(\mathbf{m})]\\ &=\neg\Diamond[\mathbf{eat}(\mathbf{s})(\mathbf{j})\wedge\mathbf{eat}(\mathbf{p})(\mathbf{m})]\end{aligned}$$

Thus, we get an interpretation in which the modal scopes over the conjunction, as desired. Note also that the right surface string is obtained in which the auxiliary is pronounced only once in the first conjunct, as per the lexical specification of the Gapping-type conjunction.

The analysis of the full-gapping example like (70b) is somewhat more complex, but the way the wide-scope reading is predicted for the auxiliary is essentially the same. The technical complication lies in the fact that both the verb and the auxiliary strings

need to be lowered to the first conjunct. We first lower a constituent of type TV (= VP/NP; consisting of the verb itself and an unbound variable representing the gap position for the auxiliary) to a gapped sentence of type S↑TV. Then, by binding the VP/VP gap for the auxiliary with ↑, an S↑(VP/VP) expression is derived which can then be given as an argument to the auxiliary:

(74)

$$\dfrac{\dfrac{\dfrac{\left[\begin{array}{l}\varphi_0;\\ f;\mathrm{VP/VP}\end{array}\right]^0 \quad \dfrac{\begin{array}{l}\mathsf{eat};\\ \mathbf{eat};\mathrm{VP/NP}\end{array} \quad \left[\begin{array}{l}\varphi_1;\\ x;\mathrm{NP}\end{array}\right]^1}{\mathsf{eat}\circ\varphi_1;\ \mathbf{eat}(x);\ \mathrm{VP}}/\mathrm{E}}{\varphi_0\circ\mathsf{eat}\circ\varphi_1;\ f(\mathbf{eat}(x));\ \mathrm{VP}}/\mathrm{E} \quad \begin{array}{l}\vdots\\ \lambda\varphi_2.\mathsf{john}\circ\varphi_2\circ\mathsf{steak}\circ\\ \mathsf{and}\circ\mathsf{mary}\circ\boldsymbol{\varepsilon}\circ\mathsf{pizza};\\ \lambda Q.[Q(\mathbf{s})(\mathbf{j})]\sqcap\lambda P.[P(\mathbf{p})(\mathbf{m})];\\ \mathrm{S}\uparrow(\mathrm{VP/NP})\end{array}}{\varphi_0\circ\mathsf{eat};\ \lambda x.f(\mathbf{eat}(x));\ \mathrm{VP/NP}}/\mathrm{I}^1}{\mathsf{john}\circ\varphi_0\circ\mathsf{eat}\circ\mathsf{steak}\circ\mathsf{and}\circ\mathsf{mary}\circ\boldsymbol{\varepsilon}\circ\mathsf{pizza};\ f(\mathbf{eat}(\mathbf{s}))(\mathbf{j})\wedge f(\mathbf{eat}(\mathbf{p}))(\mathbf{m});\ \mathrm{S}}\uparrow\mathrm{E}}{\begin{array}{c}\lambda\varphi_0.\mathsf{john}\circ\varphi_0\circ\mathsf{eat}\circ\mathsf{steak}\circ\mathsf{and}\circ\mathsf{mary}\circ\boldsymbol{\varepsilon}\circ\mathsf{pizza};\\ \lambda f.[f(\mathbf{eat}(\mathbf{s}))(\mathbf{j})\wedge f(\mathbf{eat}(\mathbf{p}))(\mathbf{m})];\mathrm{S}\uparrow(\mathrm{VP/VP})\end{array}}\uparrow\mathrm{I}^0$$

Then, by giving the sign just derived as an argument to the auxiliary, the derivation completes and we obtain the same auxiliary wide-scope reading as in (71).

(75)

$$\dfrac{\begin{array}{l}\lambda\sigma_0.\sigma_0(\mathsf{can't});\\ \lambda\mathscr{F}.\neg\Diamond\mathscr{F}(\mathsf{id}_{et});\mathrm{S}\uparrow(\mathrm{S}\uparrow(\mathrm{VP/VP}))\end{array} \quad \begin{array}{l}\vdots\\ \lambda\varphi_0.\mathsf{john}\circ\varphi_0\circ\mathsf{eat}\circ\mathsf{steak}\circ\mathsf{and}\circ\mathsf{mary}\circ\boldsymbol{\varepsilon}\circ\mathsf{pizza};\\ \lambda f.[f(\mathbf{eat}(\mathbf{s}))(\mathbf{j})\wedge f(\mathbf{eat}(\mathbf{p}))(\mathbf{m})];\mathrm{S}\uparrow(\mathrm{VP/VP})\end{array}}{\mathsf{john}\circ\mathsf{can't}\circ\mathsf{eat}\circ\mathsf{steak}\circ\mathsf{and}\circ\mathsf{mary}\circ\boldsymbol{\varepsilon}\circ\mathsf{pizza};\ \neg\Diamond[\mathbf{eat}(\mathbf{s})(\mathbf{j})\wedge\mathbf{eat}(\mathbf{p})(\mathbf{m})];\ \mathrm{S}}\uparrow\mathrm{E}$$

Essentially, in the present account, the wide-scope option for the auxiliary in examples like (70a) and (70b) trivially follows from the fact that the (combinatoric) syntax of Gapping involves *directly* coordinating sentences with missing elements and supplying the missing element at a later point in the derivation.

The present analysis predicts the availability of distributive readings for Gapping sentences with auxiliaries as well. Importantly (and interestingly), as shown in (76), in the present approach, a VP/VP entry for the auxiliary (identical to the familiar entry for auxiliaries in nontransformational approaches like G/HPSG and earlier versions of CG) that has a simple string phonology can be derived as a theorem from the more basic type assigned in the lexicon above in the category S↑(S↑(VP/VP)) (thus, the former does not need to be separately stipulated in the lexicon).

(76)

$$\dfrac{\dfrac{\lambda\sigma.\sigma(\mathsf{can't});\ \lambda\mathscr{F}.\neg\Diamond\mathscr{F}(\mathsf{id}_{et});\mathrm{S}\uparrow(\mathrm{S}\uparrow(\mathrm{VP}/\mathrm{VP}))\qquad \dfrac{\dfrac{[\varphi_1;x;\mathrm{NP}]^1\qquad \dfrac{[\varphi_2;g;\mathrm{VP}/\mathrm{VP}]^2\quad [\varphi_3;f;\mathrm{VP}]^3}{\varphi_2\circ\varphi_3;\ g(f);\ \mathrm{VP}}/\mathrm{E}}{\varphi_1\circ\varphi_2\circ\varphi_3;\ g(f)(x);\ \mathrm{S}}\backslash\mathrm{E}}{\lambda\varphi_2.\varphi_1\circ\varphi_2\circ\varphi_3;\ \lambda g.g(f)(x);\mathrm{S}\uparrow(\mathrm{VP}/\mathrm{VP})}\uparrow\mathrm{I}^2}{\varphi_1\circ\mathsf{can't}\circ\varphi_3;\ \neg\Diamond f(x);\ \mathrm{S}}\uparrow\mathrm{E}}{\mathsf{can't}\circ\varphi_3;\ \lambda x.\neg\Diamond f(x);\ \mathrm{VP}}\backslash\mathrm{I}^1}{\mathsf{can't};\ \lambda f\lambda x.\neg\Diamond f(x);\ \mathrm{VP}/\mathrm{VP}}/\mathrm{I}^3$$

Then, by giving this derived auxiliary as an argument to the same $\mathrm{S}\uparrow(\mathrm{VP}/\mathrm{VP})$ constituent used in (75), we obtain the distributive reading for the auxiliary.

(77)

$$\dfrac{\begin{array}{ll}\mathsf{can't};\ \lambda f\lambda x.\neg\Diamond f(x);\ \mathrm{VP}/\mathrm{VP} & \lambda\varphi.[\mathsf{john}\circ\varphi\circ\mathsf{eat}\circ\mathsf{steak}\circ\mathsf{and}\circ\mathsf{mary}\circ\boldsymbol{\varepsilon}\circ\mathsf{pizza}];\\ & \lambda h.[h(\mathbf{eat}(\mathbf{s}))(\mathbf{j})\wedge h(\mathbf{eat}(\mathbf{p}))(\mathbf{m})];\mathrm{S}\uparrow(\mathrm{VP}/\mathrm{VP})\end{array}}{\mathsf{john}\circ\mathsf{can't}\circ\mathsf{eat}\circ\mathsf{steak}\circ\mathsf{and}\circ\mathsf{mary}\circ\boldsymbol{\varepsilon}\circ\mathsf{pizza};\ \neg\Diamond\mathbf{eat}(\mathbf{s})(\mathbf{j})\wedge\neg\Diamond\mathbf{eat}(\mathbf{p})(\mathbf{m});\ \mathrm{S}}\uparrow\mathrm{E}$$

The derivation of the VP/VP category from the lexically specified higer-order category $\mathrm{S}\uparrow(\mathrm{S}\uparrow(\mathrm{VP}/\mathrm{VP}))$ for the auxiliary in (76) is an instance of *slanting*, a family of theorems for deriving Lambek cateogry specifications from the more abstract vertically slashed category specifications for linguistic expressions in Hybrid TLCG. We discuss corresponding theorems for generalized quantifiers in chapter 4, section 4.5, and study in more detail the consequences of slanting for auxiliaries when we revisit the syntax-semantics interface of English auxiliaries in greater detail in chapter 9.

3.2.3 Scopal Interactions with Negative Quantifiers

We have seen above that the apparent scope anomaly in Gapping sentences with auxiliaries is in fact a *predicted* consequence of the most straightforward analysis of Gapping embodying the idea of like-category coordination in our approach. In short, the unexpected wide-scope interpretation for auxiliaries follows from the fact that the auxiliary is introduced in the derivation after the whole coordinate structure is built. This analysis extends directly to the case of determiner gapping, including cases involving negative quantifiers such as (39c). Here, too, the apparently anomalous scope relation between quantifiers and coordination immediately falls out from the fact that the quantificational determiner is gapped and appears only in the first conjunct on the surface string. Though conceptually the analysis is a straightforward extension, the technical details are somewhat demanding since quantifiers (and negative quantifiers in particular) are more complex types of scopal expressions than auxiliaries. For this reason, we choose to outline the key points of the analysis in broad terms in what follows. The full details of the analysis are found in appendix B of Kubota and Levine (2016a).

Following Johnson (2000), we take the split scope property of negative quantifiers to be the key driving force of their apparently anomalous scope in determiner gapping. Thus, we first need an analysis of "split scope," where negative quantifiers like *no*, *few*, and *hardly any* are decomposed into sentential negation and an existential quantifier (or an indefinite) that scopes below the negation (Jacobs 1980; Penka 2011). It turns out that a fully lexical analysis of split scope is available in the present framework.[18] Specifically, we assume that the quantificational determiners forming negative quantifiers are lexically type-raised higher-order determiners of type $\mathrm{S}\uparrow(\mathrm{S}\uparrow\mathrm{Det})$, where Det abbreviates the syntactic type of ordinary determiners $\mathrm{S}\uparrow(\mathrm{S}\uparrow\mathrm{NP})\uparrow\mathrm{N}$. By assigning negative determiners in this type, it becomes possible to specify the scope of the higher negation and the lower existential separately in the lexical meaning of the negative determiner:[19]

(78) $[[\text{no}]] = \lambda\mathscr{P}_{(et\to et\to t)\to t}.\neg\mathscr{P}(\exists)$

That is, the lexically type-raised determiner feeds an ordinary positive quantifier meaning (of type $(et \to et \to t)$) to its argument, thus saturating its determiner-type variable position, and additionally contributes negation which scopes over the whole sentence.

The full lexical entry for the negative determiner is then formulated as follows:

(79) $\lambda\rho.\rho(\lambda\varphi\lambda\sigma.\sigma(\mathsf{no}\circ\varphi))$; $\lambda\mathscr{P}.\neg\mathscr{P}(\exists)$; $\mathrm{S}\uparrow(\mathrm{S}\uparrow\mathrm{Det})$

——where Det abbreviates $\mathrm{S}\uparrow(\mathrm{S}\uparrow\mathrm{NP})\uparrow\mathrm{N}$

Determiner gapping can then be treated as a case of multiple gapping involving both the verb and the determiner. The only complication here is that the "gap" corresponding to the determiner is of a higher-order type phonologically, so an identity element of this higher-order phonological type needs to be fed to the second conjunct. This is done by the following entry for the conjunction word, which generalizes the Gapping-type conjunction entry to the $\mathrm{S}\uparrow\mathrm{Det}\uparrow\mathrm{TV}$ type (again, this is to be derived by a lexical rule):

(80) $\lambda\rho_2\lambda\rho_1\lambda\varphi\lambda\sigma.\rho_1(\varphi)(\sigma)\circ\mathsf{and}\circ\rho_2(\boldsymbol{\varepsilon})(\varepsilon_{\mathsf{d}})$; $\sqcap$; $\mathbf{GC}(\mathrm{S}\uparrow\mathrm{Det}\uparrow\mathrm{TV})$

——where $\mathbf{GC}(A) =_{def} A\uparrow A\uparrow A$ for any syntactic type A
and $\varepsilon_{\mathsf{d}} =_{def} \lambda\varphi\lambda\sigma.\sigma(\boldsymbol{\varepsilon}\circ\varphi) = \lambda\varphi\lambda\sigma.\sigma(\varphi)$

Sentences containing both a verb gap and a determiner gap are obtained via hypothetical reasoning in the usual way:

18. For a recent alternative analysis of split scope, see Abels and Martí (2010). The key component of Abels and Martí's analysis consists in treating negative quantifiers (and related expressions) as quantifiers over choice functions (of type $((et \to e) \to t) \to t$). We believe that this approach is also compatible with the syntax-semantics interface of determiner gapping in our analysis.

19. Steedman (2012) proposes an analysis of split scope in CCG that embodies a similar idea, though technically implemented in a somewhat different way.

(81) $\lambda\varphi_1\lambda\tau.\tau(\mathsf{dog})(\lambda\varphi_2.\varphi_2 \circ \varphi_1 \circ \mathsf{whiskas})$;
$\lambda P\lambda\mathscr{F}.\mathscr{F}(\mathbf{dog})(\lambda x.P(\mathbf{w})(x))$; S⇂Det⇂TV

Then, conjunction of two such expressions via (80) yields the following sign:

(82) $\lambda\varphi_1\lambda\tau.\tau(\mathsf{dog})(\lambda\varphi_2.\varphi_2 \circ \varphi_1 \circ \mathsf{whiskas}) \circ \mathsf{or} \circ \mathsf{cat} \circ \mathsf{alpo}$;
$\lambda P\lambda\mathscr{F}.\mathscr{F}(\mathbf{dog})(\lambda x.P(\mathbf{w})(x)) \sqcup \lambda P\lambda\mathscr{F}.\mathscr{F}(\mathbf{cat})(\lambda x.P(\mathbf{a})(x))$; S⇂Det⇂TV

Note in particular that the right string is obtained for the second conjunct.

Finally, the missing verb and determiner are successively lowered to the first conjunct to yield the following sign:

(83) $\mathsf{no} \circ \mathsf{dog} \circ \mathsf{eats} \circ \mathsf{whiskas} \circ \mathsf{or} \circ \mathsf{cat} \circ \mathsf{alpo}$;
$\neg[\exists_{\mathbf{dog}}(\lambda x.\mathbf{eat}(\mathbf{w})(x)) \vee \exists_{\mathbf{cat}}(\lambda x.\mathbf{eat}(\mathbf{a})(x))]$; S

Crucially, just as in the analysis from the previous section, since the negative determiner scopes over the whole coordinated gapped sentence in the combinatoric structure, the right semantic scope between the two operators is predicted. Thus, here again, the apparently anomalous scope relation between the negative quantifier and disjunction is a predicted consequence of the "gapped" status of the former. The syntactic analysis of Gapping requires the determiner to syntactically scope over the whole coordinate structure, and the semantic scope between the two transparently reflects this underlying structural relationship.

Finally, just as a lower-order auxiliary entry of type VP/VP can be derived from the lexically specified higher-order entry of type S⇂(S⇂VP/VP), the higher-order entry for the negative determiner can be lowered to the ordinary determiner type Det (= S⇂(S⇂NP)⇂N) via hypothetical reasoning in the present framework. The syntax and semantics of this derived entry is just the familiar GQ-type quantifier entry for the word *no*:[20]

(84) $\lambda\varphi\lambda\sigma.\sigma(\mathsf{no} \circ \varphi)$; $\lambda P.\lambda Q.\neg\exists(P)(Q)$; S⇂(S⇂NP)⇂N

With this derived entry for *no*, the distributive reading for the negative quantifier in examples like (39c) (or (i) in footnote 4 on p. 43) can be derived straightforwardly. The derivation will be identical in form to the one for the non-distributive reading for the negative quantifier up to the point where the verb is lowered into the first conjunct (which can be obtained by feeding a TV as an argument to (82)) and differs only in the last step, where we simply let the derived S⇂Det take the lowered Det type determiner in (84) as an argument.[21]

20. Note that the derivability relation here is asymmetrical: (79) ⊢ (84) is a theorem but (84) ⊢ (79) isn't.

21. Note also that, in the present analysis, cases such as (38d) involving nonnegative quantifiers are equally straightforward. The only difference from the negative quantifier case outlined in the main text is that

Morrill and Valentín (2017) note an overgeneration problem for the analysis of determiner gapping we have presented above and argue that recasting essentially the same analysis in Displacement Calculus (Morrill et al. 2011) overcomes this problem while retaining all the essential features of the scopal interactions between Gapping and scopal operators. The problem essentially is that the lexical entry for the conjunction word for determiner gapping in (80) does not keep track of the relative order between the two gaps in the multiply-gapped sentences that it takes as its arguments. Thus, any sentence missing a determiner and a transitive verb somewhere inside can be licensed in the type $S\uparrow Det\uparrow TV$, overgenerating examples such as the following:

(85) a. *Most cats like Alpo and John ~~likes~~ ~~most~~ dogs.
b. *John likes most dogs and ~~most~~ cats ~~like~~ Alpo.

Since Morrill and Valentín's own proposal is technically quite complex and sophisticated, we do not review it here. The essential point is that in their approach, "gap" positions in the prosodic representations of linguistic expressions are explicitly indexed from left to right, and this enables them to keep track of the order of the determiner and verb gaps in examples like (39c). Morrill and Valentín additionally note that, unlike our analysis in Hybrid TLCG, the reformulation in Displacement Calculus enables them to collapse the lexical entries for the conjunction word for the continuous and discontinuous gapping into a single entry, thereby achieving a more uniform analysis of the two cases.

While Morrill and Valentín frame their discussion in terms of an overall comparison of Hybrid TLCG and Displacement Calculus as a theory of natural language syntax, we do not think that their argument conclusively eliminates the possibility that the overgeneration issue merely reflects inadequacies of the particular analysis of determiner gapping we have proposed in Kubota and Levine (2013b, 2016a) rather than showing fundamental inadequacy of the theory in which the analysis is formulated.

One possible response to the overgeneration issue would be to abandon the higher-order analysis of determiner gapping and stick to a simpler analysis in which all gapped constituents have simple string prosodies. This will still enable us to analyze determiner gapping since Hybrid TLCG allows for slanting of linguistic signs with higher-order prosodies. Specifically, since all (unequivocally) well-formed examples of determiner gapping have the determiner in the subject position, the following would be a reason-

non-negative quantifiers have only the ordinary GQ-type lexical entries, and thus, only the latter type of derivation is available for them. This yields the distributive reading for the quantifier. Since split scope is not an issue, so far as we can tell, this suffices to derive the correct truth conditions for sentences like (38d).

able entry for licensing determiner gapping, where *and* conjoins sentences missing a transitive verb and a subject position slanted GQ (where GQs = $S/(NP\backslash S)/N$):[22]

(86) $\lambda\sigma_2\lambda\sigma_1\lambda\varphi_1\lambda\varphi_2.\sigma_1(\varphi_1)(\varphi_2)\circ \mathsf{and}\circ\sigma_2(\boldsymbol{\varepsilon})(\boldsymbol{\varepsilon})$;
$\sqcap;(S\uparrow GQs\uparrow TV)\uparrow(S\uparrow GQs\uparrow TV)\uparrow(S\uparrow GQs\uparrow TV)$

A determiner in the object position slants down to the Lambek type $((S/NP)\backslash S)/N$. Since this type is distinct from the subject position determiner type $S/(NP\backslash S)/N$ (= GQs) in (86), this approach avoids the overgeneration problem noted by Morrill and Valentín. It is true that this approach still requires duplicate entries for continuous and discontinuous gapping. But the alternative, as embodied in Morrill and Valentín's analysis, requires an explicit indexing of gap positions involving a kind of counting mechanism implemented as part of the (extended) type logic. The comparison then seems to be one between lexical redundancy and an overall revision of the core architecture of the theory. While there may be other motivations (empirical or otherwise) to prefer Displacement Calculus, since the only known case documented in the literature is the one involving determiner gapping, we take the position that lexical redundancy is a more parsimonious choice.

22. The analysis of negative quantifiers needs to be modified slightly. One possible approach would be to replace the entry in (79) with the following one in which the negative determiner binds a type NP/N indefinite instead of an existential GQ (here ε_P is a term [of type e] corresponding to the "indefinite" satisfying the property P under the scope of negation introduced by the negative quantifier; we remain agnostic about the exact semantic analysis of indefinites—one could adopt the Skolem term analysis by Steedman [2012] or the proof theoretic analysis in Dependent Type Semantics [Bekki 2014; Bekki and Mineshima 2017] proposed by Kubota et al. [2019]):

(i) $\lambda\sigma.\sigma(\mathsf{no});\ \lambda\mathscr{P}.\neg\mathscr{P}(\lambda P.\varepsilon_P);\ S\uparrow(S\uparrow(NP/N))$

The derivation for the negation wide-scope reading then goes as follows:

(ii)

$$\dfrac{\lambda\sigma.\sigma(\mathsf{no});\ \lambda\mathscr{P}.\neg\mathscr{P}(\lambda P.\varepsilon_P);\ S\uparrow(S\uparrow(NP/N)) \qquad \dfrac{\varphi_3\circ\mathsf{dog}\circ\mathsf{eats}\circ\mathsf{whiskas}\circ\mathsf{or}\circ\mathsf{cat}\circ\mathsf{alpo};\ \mathbf{eat}(\mathbf{w})(\mathscr{F}(\mathbf{dog}))\vee\mathbf{eat}(\mathbf{a})(\mathscr{F}(\mathbf{cat}));S}{\lambda\varphi_3.\varphi_3\circ\mathsf{dog}\circ\mathsf{eats}\circ\mathsf{whiskas}\circ\mathsf{or}\circ\mathsf{cat}\circ\mathsf{alpo};\ \lambda\mathscr{F}.\mathbf{eat}(\mathbf{w})(\mathscr{F}(\mathbf{dog}))\vee\mathbf{eat}(\mathbf{a})(\mathscr{F}(\mathbf{cat}));S\uparrow(NP/N)}\uparrow I^3}{\mathsf{no}\circ\mathsf{dog}\circ\mathsf{eats}\circ\mathsf{whiskas}\circ\mathsf{or}\circ\mathsf{cat}\circ\mathsf{alpo};\ \neg[\mathbf{eat}(\mathbf{w})(\varepsilon_{\mathbf{dog}})\vee\mathbf{eat}(\mathbf{a})(\varepsilon_{\mathbf{cat}})];S}$$

$$\dfrac{\dfrac{\dfrac{\dfrac{\begin{bmatrix}\varphi_3;\\ \mathscr{F};\\ NP/N\end{bmatrix}^3\quad\begin{bmatrix}\varphi_4;\\ P;\\ N\end{bmatrix}^4}{\varphi_3\circ\varphi_4;\ \mathscr{F}(P);NP}\quad\begin{bmatrix}\varphi_5;\\ Q;\\ NP\backslash S\end{bmatrix}^5}{\varphi_3\circ\varphi_4\circ\varphi_5;\ \mathscr{F}(P)(Q);\ S}}{\varphi_3\circ\varphi_4;\ \lambda Q.\mathscr{F}(P)(Q);\ S/(NP\backslash S)}/I^5}{\varphi_3;\ \lambda P\lambda Q.\mathscr{F}(P)(Q);\ S/(NP\backslash S)/N}/I^4 \qquad \dfrac{\begin{array}{l}\text{eats};\\ \mathbf{eat};\\ TV\end{array}\quad\begin{array}{l}\lambda\varphi_2\lambda\varphi_1.\varphi_1\circ\mathsf{dog}\circ\varphi_2\circ\\ \quad\mathsf{whiskas}\circ\mathsf{or}\circ\mathsf{cat}\circ\mathsf{alpo};\\ \lambda R\lambda\mathscr{P}.\mathscr{P}(\mathbf{dog})(R(\mathbf{w}))\\ \quad\vee\mathscr{P}(\mathbf{cat})(R(\mathbf{a}));\\ S\uparrow(GQs/N)\uparrow TV\end{array}}{\begin{array}{l}\lambda\varphi_1.\varphi_1\circ\mathsf{dog}\circ\mathsf{eats}\circ\\ \quad\mathsf{whiskas}\circ\mathsf{or}\circ\mathsf{cat}\circ\mathsf{alpo};\\ \lambda\mathscr{P}.\mathscr{P}(\mathbf{dog})(\mathbf{eat}(\mathbf{w}))\\ \quad\vee\mathscr{P}(\mathbf{cat})(\mathbf{eat}(\mathbf{a}));\\ S\uparrow(GQs/N)\end{array}}$$

[22] The analysis of negative quantifiers needs to be modified slightly. One possible approach would be to replace the entry in (79) with the following one in which the negative determiner binds a type NP/N indefinite instead of an existential GQ (here ε_P is a term [of type e] corresponding to the "indefinite" satisfying the property P under the scope of negation introduced by the negative quantifier; we remain agnostic about the exact semantic analysis of indefinites—one could adopt the Skolem term analysis by Steedman [2012] or the proof theoretic analysis in Dependent Type Semantics [Bekki 2014; Bekki and Mineshima 2017] proposed by Kubota et al. [2019]):

(i) $\lambda\sigma.\sigma(\mathsf{no});\ \lambda\mathscr{P}.\neg\mathscr{P}(\lambda P.\varepsilon_P);\ S\uparrow(S\uparrow(NP/N))$

The derivation for the negation wide-scope reading then goes as follows:

(ii)

$$\dfrac{\lambda\sigma.\sigma(\mathsf{no});\ \lambda\mathscr{P}.\neg\mathscr{P}(\lambda P.\varepsilon_P);\ S\uparrow(S\uparrow(NP/N)) \qquad \dfrac{\varphi_3\circ\mathsf{dog}\circ\mathsf{eats}\circ\mathsf{whiskas}\circ\mathsf{or}\circ\mathsf{cat}\circ\mathsf{alpo};\ \mathbf{eat}(\mathbf{w})(\mathscr{F}(\mathbf{dog}))\vee\mathbf{eat}(\mathbf{a})(\mathscr{F}(\mathbf{cat}));S}{\lambda\varphi_3.\varphi_3\circ\mathsf{dog}\circ\mathsf{eats}\circ\mathsf{whiskas}\circ\mathsf{or}\circ\mathsf{cat}\circ\mathsf{alpo};\ \lambda\mathscr{F}.\mathbf{eat}(\mathbf{w})(\mathscr{F}(\mathbf{dog}))\vee\mathbf{eat}(\mathbf{a})(\mathscr{F}(\mathbf{cat}));S\uparrow(NP/N)}\uparrow I^3}{\mathsf{no}\circ\mathsf{dog}\circ\mathsf{eats}\circ\mathsf{whiskas}\circ\mathsf{or}\circ\mathsf{cat}\circ\mathsf{alpo};\ \neg[\mathbf{eat}(\mathbf{w})(\varepsilon_{\mathbf{dog}})\vee\mathbf{eat}(\mathbf{a})(\varepsilon_{\mathbf{cat}})];S}$$

$$\dfrac{\dfrac{\dfrac{\dfrac{\begin{bmatrix}\varphi_3;\\ \mathscr{F};\\ NP/N\end{bmatrix}^3\quad\begin{bmatrix}\varphi_4;\\ P;\\ N\end{bmatrix}^4}{\varphi_3\circ\varphi_4;\ \mathscr{F}(P);NP}\quad\begin{bmatrix}\varphi_5;\\ Q;\\ NP\backslash S\end{bmatrix}^5}{\varphi_3\circ\varphi_4\circ\varphi_5;\ \mathscr{F}(P)(Q);\ S}}{\varphi_3\circ\varphi_4;\ \lambda Q.\mathscr{F}(P)(Q);\ S/(NP\backslash S)}/I^5}{\varphi_3;\ \lambda P\lambda Q.\mathscr{F}(P)(Q);\ S/(NP\backslash S)/N}/I^4 \qquad \dfrac{\begin{array}{l}\text{eats};\\ \mathbf{eat};\\ TV\end{array}\quad\begin{array}{l}\lambda\varphi_2\lambda\varphi_1.\varphi_1\circ\mathsf{dog}\circ\varphi_2\circ\\ \quad\mathsf{whiskas}\circ\mathsf{or}\circ\mathsf{cat}\circ\mathsf{alpo};\\ \lambda R\lambda\mathscr{P}.\mathscr{P}(\mathbf{dog})(R(\mathbf{w}))\\ \quad\vee\mathscr{P}(\mathbf{cat})(R(\mathbf{a}));\\ S\uparrow(GQs/N)\uparrow TV\end{array}}{\begin{array}{l}\lambda\varphi_1.\varphi_1\circ\mathsf{dog}\circ\mathsf{eats}\circ\\ \quad\mathsf{whiskas}\circ\mathsf{or}\circ\mathsf{cat}\circ\mathsf{alpo};\\ \lambda\mathscr{P}.\mathscr{P}(\mathbf{dog})(\mathbf{eat}(\mathbf{w}))\\ \quad\vee\mathscr{P}(\mathbf{cat})(\mathbf{eat}(\mathbf{a}));\\ S\uparrow(GQs/N)\end{array}}$$

3.2.4 Is Gapping a Type of Movement?

At this point, we would like to step back from the specific analysis of Gapping and ponder a somewhat more general question of theory comparison. There are certain observations that seem to be relevant for clarifying the similarities and differences between hypothetical reasoning with $\restriction$ and the notion of movement in derivational approaches. In the previous chapter, we noted that in our setup the difference between "overt" and "covert" movement boils down to what happens to the phonology of the "gap"-containing expression. "Covert" movement is modeled by an operator with a functional phonology whose string component is embedded in the "gap" position of its semantic argument. By contrast, for "overt" movement, we have an operator that fills in an empty string to the gap. But nothing in the formal setup says that these are the only two things that one can do with linguistic signs containing gap positions. This is perhaps a subtle, but, we think, crucial difference between our approach and the derivational architecture of grammar. In the latter, where movement is conceived of as inherently ordered structure-building/manipulation operations, these two options would indeed seem to exhaust the set of logical possibilities: if you move constituents before computing word order (i.e., before SpellOut), then what you have is an instance of overt movement, whereas if you move constituents after computing word order, then what you have is an instance of covert movement. But in our calculus, the two types of "movement" are not ordered with respect to one another. Rather, they are just two types of inference that are both simultaneously available at any step of the proof. (It is precisely for this reason that the analogies to "overt" and "covert" movements that we have informally introduced above should be taken only as rough and crude metaphors.)

This, then, opens up an interesting analytic possibility: in our system, it is possible to do "overt" movement and "covert" movement *at the same time*, as it were, or, to put it differently, do something that cannot be broken down into a successive application of separate overt and covert movements. An anonymous reviewer for an earlier version of this chapter (Kubota and Levine 2016a, published as an article in *Natural Language and Linguistic Theory*) made the following remark, which we think gets at the key difference between Hybrid TLCG and derivational frameworks:

> [In Hybrid TLCG, with the use of functional phonologies] it becomes possible to state a conjunction rule for gapping that combines likes. If I'm not mistaken, in a derivational framework like Minimalism, such signs cannot be created, since it does not countenance the idea of prosodic variables that can later be filled in. Traces of movement are semantic placeholders, but not phonological ones.

As this reviewer correctly notes, the analysis of Gapping we have presented above crucially exploits this property of the system: the coordination operator takes two pieces of phonology, both missing some material inside themselves. It fills in the gap of the second conjunct with an empty string (as in "overt" movement) and fills in the gap of

the first conjunct with the phonology of the missing verb (as in "covert" movement). Crucially, there is no movement-based analog of a complex operation on functional phonologies like this, since there is no genuine analog of linguistic signs with functional phonologies in derivational approaches. We have already seen the robust empirical payoff of this analysis. The difference between this analysis and other competing analyses (such as one that posits an empty verb in the second conjunct) is not clear in simple cases in which what is missing is just the verb. However, in more complex cases where (part of) what is missing is a scopal operator, our analysis *predicts* the availability of both the wide-scope reading and the narrow-scope reading for the relevant operator, based on an independently motivated form/meaning mismatch encoded in the lexical entries of such operators.

3.3 A Note on Stripping

Interestingly, Gapping is not the only coordination construction which motivates the treatment of modal auxiliaries as higher-order operators. As noted by Puthawala (2018), Stripping displays the same pattern, as shown in (87):

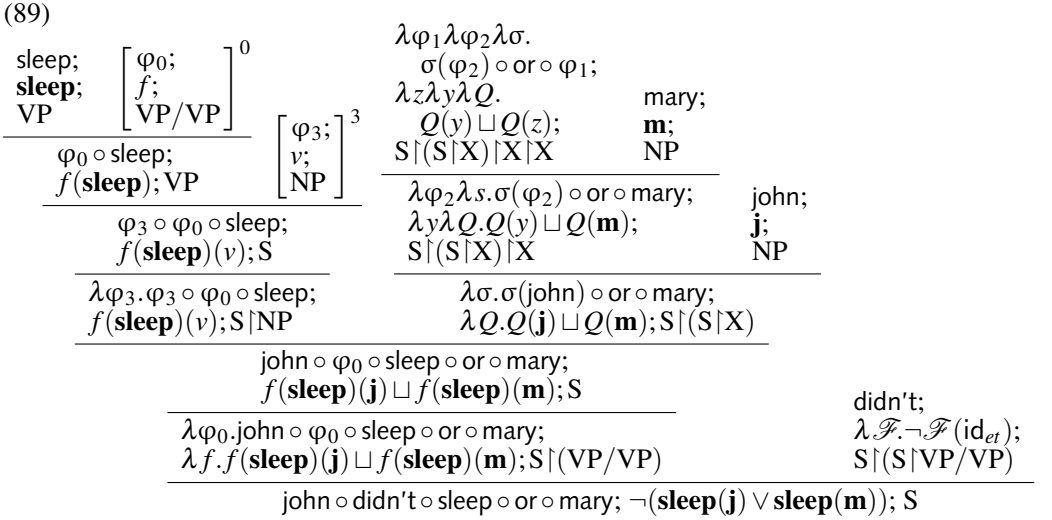
(87) John didn't sleep, or Mary.

This example has both wide-scope ('neither John nor Mary slept') and narrow-scope ('John was the one who didn't sleep, or maybe that was Mary') interpretations for negation.

Puthawala (2018) shows that the analysis of Gapping we have proposed in the present chapter straightforwardly extends to the Stripping cases as well. The key to this analysis is the lexical entry for the conjunction word in (88) which licenses Stripping. With this lexical entry, the complete derivation for (87) (for the wide-scope reading for negation) goes as in (89).

(88) $\lambda\varphi_1\lambda\varphi_2\lambda\sigma.\sigma(\varphi_2) \circ \mathsf{or} \circ \varphi_1; \lambda z\lambda y\lambda Q.Q(y) \sqcup Q(z); \mathrm{S}\uparrow(\mathrm{S}\uparrow\mathrm{X})\uparrow\mathrm{X}\uparrow\mathrm{X}$

(89)



The narrow-scope reading for negation can be derived in a way parallel to the Gapping case. See Puthawala (2018) for further details.

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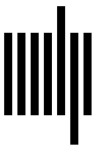

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