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Tapping into semantic recovery : an event-related potential study on the processing of gapping and stripping

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CHAPTER 2

Theoretical background of Gapping and Stripping

In this chapter I discuss the distributional properties of Gapping and Stripping. The theoretical accounts that I review can be broadly categorised as syntax-oriented and semantics-oriented. Although this rather simplistic differentiation between syntactic and semantic accounts has been the driving force behind the current project, I argue that Gapping-like constructions cannot be captured in either syntactic or semantic terms. I further discuss an additional level of analysis, namely, prosody.

2.1 Objectives of theoretical ellipsis research

This chapter examines recurring topics in ellipsis research that I introduced in the previous chapter:

- What are the distributional properties of ellipsis: under which conditions is ellipsis permitted?
- How are elided phrases recovered? Which strategies (syntactic, semantic and prosodic-based) are involved?
- What is the division of labour between syntactic, semantic and prosodic-based mechanisms?

As the current study revolves around Gapping and its sub-type Stripping, this chapter defines Gapping-like constructions and explains how they are accounted for in the theoretical literature. Any theory on ellipsis should account for distributional properties – defining under which conditions ellipsis is permitted. Therefore Section 2.2 lists these conditions for Gapping and Stripping. As the differentiation between syntactic and semantic strategies is related to the distinction between "surface" and "deep" ellipsis types, I will take these notions into account in section 2.3 before exploring the different theoretical approaches in section 2.4. The different theoretical approaches will appear to be categorised on the basis of their point of departure: syntactic, semantic, and mixed. Crucially, the starting point pertains to the linguistic representation of the ellipsis site and the representation of the antecedent. In particular, approaches can be differentiated on their treatment of three crucial issues:

- What is the nature of the ellipsis site (i.e. its formal representation)?
- What is the nature of the antecedent (referred to as the "identity" condition)?
- Under which conditions is ellipsis allowed (referred to as the "licensing" condition)?

With respect to the ellipsis site, an ongoing debate concerns the question whether there is unpronounced syntactic structure. Related to this question are two restrictions on ellipsis, namely identity and licensing. Both terms became fashionable in the Generative literature since the 1990s with the publication of Lobeck (1995)'s book and subsequently took a central place in seminal works on ellipsis by Merchant (2001) and Aelbrecht (2010). An antecedent should be identifiable, i.e. recoverable. Identification of the antecedent is subject to some kind of parallelism, but the question is whether the antecedent's relation with the ellipsis site is constituted by means of syntactic or semantic terms. If a theory does not assume structure in the ellipsis site, the identity of the antecedent is by definition non-syntactic. However, structural accounts may differ as to the identity issue.

The notion of parallelism has been entertained not only syntactically and semantically, but also in terms of prosody. The last section of this chapter is dedicated to the prosodic aspect. Whichever theory of Gapping is preferred, it should be able to account for the distributional properties explaining under which conditions Gapping is licensed – finding a proper balance between syntactic, semantic and prosodic factors.

The variety of theories is almost endless. I will be concentrating on accounts that capture Gapping and thereby Stripping, incorporating different perspectives, in order to arrive at a well-balanced – albeit not exhaustive – overview of the literature. Evaluating the two sets of questions posed above, it will become clear why I use Gapping-like constructions in particular to probe ellipsis. Categorised as a highly-constrained surface ellipsis type, such constructions may be used to manipulate syntactic, semantic and prosodic complexity straightforwardly. But let us first observe the distributional properties of Gapping.

2.2 Diagnosing Gapping and Stripping

As discussed in Chapter 1.1, Gapping is characterised by an omission of at least the finite verb in the second conjunct of a coordinate structure as we can see in (1).

(1) a. De man kocht een boek, en de vrouw een krant.
the man buy.3SG.PST a book and the woman a newspaper
'The man bought a book, and the woman a newspaper.'

b. De mannen kochten een boek, maar de vrouw een krant.
the man buy.3PL.PST a book but the woman a newspaper
'The men bought a book, but the woman a newspaper.'

In Dutch Gapping constructions, apart from the connective *en* ('and'), *of* ('or') and *maar* ('but') may be used, though *of* and *maar* are not very common, as reported in a corpus study by Hoeksema (2007). The elided elements are semantically identical to their (linguistic) antecedents (see Hankamer & Sag, 1976; Neijt, 1979; Wyngaerd, 2007:2). However, it is not necessary that an elided verb has identical person, number, and gender features to the antecedent verb (see Repp, 2009:8-9).

The phrases in the right conjunct (*de vrouw* 'the woman' and *een krant* 'a newspaper') that contrast with their correlates in the left conjunct are called remnants. Typically, the remnants do not form a syntactic constituent. Kuno (1976) was probably the first to note that remnants must occur in a contrastive relation to their correlates. For example, *vrouw* versus *man* in (1a). Typically,

non-clause-final correlates and remnants bear a rising pitch accent and clause-final correlates and remnants bear falling accents. The conjuncts themselves are separated by an intonational phrase break (Repp, 2009:14). The verb and other material that is elided in the right conjunct is "deaccented" in the first conjunct.

Example (2a) shows that, in tandem with the verb, an object may be elided. Additionally, (2b) shows that multiple remnants are possible, at least in Dutch (this possibility may differ between Dutch and English, see Jackendoff (1971)). Small capital letters indicate accented words.

(2) a. De MAN kocht een boek in LONDEN, en de VROUW in
the man buy.3SG.PST a book in London and the woman in
LEIDEN.
Leiden
'The man bought a book in London, and the woman in Leiden'

b. De MAN kocht een BOEK in LONDEN, en de VROUW een
the man buy.3SG.PST a book in London and the woman a
KRANT in LEIDEN.
newspaper in Leiden
'The man bought a book in London, and the woman a newspaper in Leiden.'

In both (2a) and (2b), the deaccented phrases in the left conjunct are taken into consideration to successfully interpret the right conjunct. Crucially, without drawing on these phrases, the right conjuncts are incomprehensible. In (2a), the phrase *kocht een boek* 'bought a book'and in (2b) *kocht* 'bought'are recovered and integrated with the remnants which yields a successful interpretation.

In principle, an adjunct contained in a Gapping construction is optional, in that it is not obligatorily incorporated in the interpretation; though Coppen, Borght, Dreumel, Oltmans, and Teunissen (1993) note that "adjuncts in the first conjunct that do not have a contrasting element in the second conjunct, are almost always filled in there" as is the case in (3).

(3) De MAN kocht een BOEK in Londen, en de VROUW een
the man buy.3SG.PST a book in London and the woman a
KRANT.
newspaper
'The man bought a book in London, and the woman a newspaper.'

Here, the interpreter automatically assumes *in Londen* to be the location of the woman buying a newspaper. Note that what is omitted – and interpreted – in the second conjunct does not necessarily form a constituent, as in the case of *kocht . . . in Londen* 'bought in London'. This is another key property of Gapping (see for more examples Boone, 2014:21).

Negation, which can be seen as an adjunct in Dutch, is difficult to interpret in a gapped clause. In other words, it cannot be "filled in there". Whereas *in Londen* is recovered as adjunct in the Gapping construction in (3), this does not hold for *nooit* (4) In the examples in this chapter, I adopt conventional notation for indicating the acceptability of sentences, i.e. an asterisk * signals an ungrammatical sentence, while a single question mark indicates that the interpretation may be problematic. The notation "??" indicates that the interpretation is very problematic.

(4) ??De man kocht nooit een boek in Londen, en de vrouw een
the man buy.3SG.PST never a book in London and the woman a
krant.
newspaper
'The man never bought a book in London, and the woman a newspaper.'

I refer the interested reader to a study on negation and Gapping (Repp, 2009). For the time being, I would like to note that Repp's general conclusion is that negation in Gapping constructions can sometimes be interpreted if a proper combination of syntactic, semantic, discourse-pragmatic, and prosodic factors apply.

Hankamer and Sag (1976) have pointed out that as long as there exists a linguistic antecedent, Gapping can occur across a speaker boundary, i.e. with a different speaker producing the second conjunct. The assumption is that in both (5) and (6), speaker *Crit* has to recover the antecedents from a discourse level.

(5) a. Lisa: De man kocht een boek in Londen.
Lisa: the man buy.3SG.PST a book in London
Lisa: 'The man bought a book in London.'

b. Crit: En de vrouw een krant.
Crit: and the woman a newspaper
Crit: 'And the woman a newspaper.'

(6) a. Lisa: Wie gaat er mee een boek kopen?
Lisa who goes there with a book buy.INF
Lisa: 'Who is coming along to buy a book?'

b. Crit: Ik niet.
Crit I not
Crit: 'I am not'

Gapping occurs most often in coordinations connected by *en* ('and'), meanwhile it is disallowed in subordination. This is shown in (7a). Also, an ante-

cedent that is embedded can only be omitted if the clause containing the gap conjoins with the embedded clause as we see in (7b) (Johnson, 2009).

(7) a. *De man kocht een boek, omdat de vrouw een
the man buy.3SG.PST a book because the woman a
krant.
newspaper
'The man bought a book, because the woman a newspaper.'

b. ?De jongen zei dat de man een boek kocht, en
the boy say.3SG.PST that the man buy.3SG.PST a book and
de vrouw een krant.
the woman a newspaper
'The boy said that the man bought a book, and the woman a newspaper.'

(7b) is ungrammatical if the ellipsis is interpreted as conjoining with *De jongen zei*. If it is interpreted as conjoined with the embedded clause, it is grammatical (see also footnote 6 in Johnson, 2009).

On the basis of the impossibility of subordination as seen in (7) and the fact that Gapping occurs in coordinate structures, Boone (2014:11) states that any account of Gapping should implement a restriction capturing the fact that "Gapping only occurs in coordinations where gap and antecedent are directly conjoined". He terms this restriction "Equal Conjunct Requirement". In slightly different terms, Winkler (2005:157) argues that Gapping is possible as long as the "Smallest Conjunct Constraint" is not violated. She further states that elliptical constructions with only one remnant together with an additive marker such as *ook* 'too'(as in (8)) bear a strong resemblance to the distributional properties of Gapping (Winkler, 2005:153-166).

(8) De man kocht vrijdag een boek in Londen, en de vrouw ook.
the man buy.3SG.PST Friday a book in London and the woman too
'The man bought a book in London on Friday, and the woman too.'

The elided structure *de vrouw ook* consists of one remnant (*de vrouw*) and an additive marker (*ook*). Such a construction is called "Stripping" and since it shares the relevant distributional properties of Gapping, I follow Hankamer & Sag, 1976 and Boone, 2014:10 in considering it a sub-type of Gapping.

With just this handful of examples, we have shed light not only on the distributional properties of Gapping, but also the issues that any theory of Gapping and Stripping must be able to account for. Let us now investigate how Gapping-like constructions have been entertained in the theoretical literature.

2.3 Surface versus deep

I have noted in the introduction that for interpretation of Gapping-like constructions a linguistic antecedent is needed. In the literature, Gapping (and other ellipsis types) have been likened to anaphora – items that refer to antecedents in order to recover meaning. Hankamer and Sag (1976) have suggested that elliptical structures may be classified as below, drawing on the distinction between surface and deep anaphora:

- Surface-ellipsis
  - on a par with surface anaphors (e.g. *himself*) which are bound to a linguistic antecedent
  - structural parallelism is a requirement
  - interpretation is done by reconstruction of the syntactic structure
- Deep-ellipsis
  - on a par with deep anaphors such as pronouns (e.g. *he*)
  - interpretation through referral to a conceptual level of representation
  - interpretation by rules of semantic interpretation

This differentiation assumes that surface-ellipsis requires syntactic parallelism between the elliptical structure and its antecedent, while for deep-ellipsis an "interpretive" approach holds. Deep anaphors "are not syntactically derived from full underlying forms" (Hankamer & Sag, 1976:423). According to the authors, surface anaphora must be consistent at a surface level with the anaphoric clause. This proposal is embedded in the context of Transformational Grammar (a precursor of the Minimalist Program) in which sentences are assumed to be transformed (derived) from a deep structure to a surface structure. Replacing the anaphor with the antecedent should yield a grammatical sentence. A surface anaphor is hypothesised to require "superficial syntactic identity of structure between the antecedent segment and the segment to be anaphorized" (1976:423), in contrast to a deep anaphor that is "not derived transformationally but is present in underlying representations" (1976:421) representing a semantic unit. As we will see, it is the distinction between surface and deep that has fuelled the difference between syntactic and semantic approaches to ellipsis. Therefore, we will adopt this classification as guidance for the remainder of this chapter.

Just as Gapping and Stripping are regarded as surface anaphora, Verb Phrase Ellipsis (VPE) is considered a surface anaphor as well. (9a) is an example of VPE: the VP *read the newspaper* is elided and replaced by *did too*. Note, that VPE contrasts with Stripping to the extent that VPE preserves a finite verb. The presence of the auxiliary *did* makes this an example of VPE and not a Stripping example.

(9) a. Pat read the newspaper, and Fran did too.
b. The newspaper was read by Pat, and Lee did it too.

[Murphy (1985b)]

According to Hankamer and Sag (1976) the deep anaphor *it* in (9b)[1] is understood at a "presyntactic" pragmatic level. It is "a semantic unit that appears elsewhere in the discourse or in context" (1976:420). Note, that although *did it too* in (9b) is closely related to VP-ellipsis *did too* in (9a), an anaphoric distinction is assumed. In their modified approach, Sag and Hankamer (1984) return to this issue suggesting that the distinction between deep and surface would mean that two different processing mechanisms are in charge, leading to peculiar situations to the extent that (10a) and (10b) would be processed totally differently.

(10) She told me to take the oats down to the bin,
a. so I did. (surface)
b. so I did it. (deep)

[Sag and Hankamer (1984)]

Sag and Hankamer (1984) propose that during sentence comprehension, the listener/reader builds two distinct representations, which are constructed in parallel, namely, "propositional representations (of the sentences of the immediately prior discourse) and discourse models (of the broader discourse context)" (1984:341). Since ellipsis "must be sensitive to scope of logical operators and variable binding", interpretation is assumed to be "determined by a propositional representation of the kind generally called *logical form*" (1984:328) – a representation that is not "surface" at all (but still a linguistic representation). They assume that all 'formerly known as' surface ellipsis types such as VPE, Sluicing, Gapping and Stripping are interpreted in terms of propositional representations. That is, "the interpretation of ellipses remains a rather simple copying of logical form". Additionally, Sag and Hankamer (1984)'s proposal can be used to distinguish general underspecification like the example in (4) (repeated here in (11)), from ellipsis (with linguistic antecedents), in terms of discourse grammar versus logical form.

(11) She waited there but he didn't show up.

While the approach of Hankamer and Sag (1976) sets the stage for comparing different theoretical approaches to the resolution of Gapping in the following sections, it is interesting that their paper analyses anaphoric relations in terms of "processes" rather than derivations. Apparently, they were working towards a bridge between competence and performance, which led to a model presented in 1984. This model can be regarded as 'performance' oriented at the

[1] I use the examples as given by Murphy (1985b) in review of Hankamer and Sag (1976)'s paper. The examples most effectively show the resemblance with Stripping.

core, yet driven by logical form as linguistic representation.

2.4 Approaches to the representation and derivation of ellipsis

Approaches to the representation and derivation of ellipsis may be distinguished as to the degree of syntactic structure assumed in the ellipsis site. As we will see, syntactic accounts argue for internal structure, while semantic accounts generally put more emphasis on the interpretation of elided structures. In addition, syntax-oriented accounts may consider the identity of a possible antecedent for ellipsis to be a fully-fledged syntactic structure. Let us first have a look at syntactic accounts of ellipsis that have focused on Gapping and Stripping.

2.4.1 Syntax-oriented accounts

Syntax-oriented accounts following the Chomskyan tradition assume that there is unpronounced structure in ellipsis sites at some point during the derivation. This is mainly driven by the observation that Gapping leaves non-constituents at surface structure. Assuming unpronounced structure would help to reconcile the syntactic status of remnants. With respect to accounts of Gapping three topics are central and every account utilises one or more of the following operations:

- Deletion: at a relatively late point in a derivation some structure is elided at PF.
- Movement: at some point in a derivation constituents move to take scope over a (later) elided structure, or they move rightwards, or they move without elision establishing a dependency relation between antecedent and gap.
- Copying or sharing: at some point in a derivation some structure is copied or shared at PF/LF.

The informed reader may notice that anaphoric accounts such as Fiengo and May (1994), nowadays referred to as proform theories, are not listed. Syntax-oriented accounts which assume that throughout a derivation the ellipsis (VPE in particular) is treated as null-element or anaphor which can be linked to an antecedent structure, usually understand Gapping as a separate form of ellipsis – as surface instead of deep anaphor (c.f. Lobeck, 1995; Williams, 1977). Generally, such accounts strive to characterise symmetrical (or parallel) anaphoric relations. For example, Fiengo and May (1994:83) propose that "what is structurally represented are indices, which by hypothesis are complex objects, consisting of a value and a type, and it is indices and their relations that

ultimately have semantic import." As we will see in section 2.4.2, there is a possibility to incorporate a representation of elided phrases in mere semantic terms, but theories that do so put less burden on syntactic structure. Let us first start with the first theory of Gapping.

Deletion: the emergence of Gapping research

In the generative literature, Ross' dissertation (1967) is regarded as the first attempt to account for conjunction ellipsis. He proposes that the derivation of Gapping constructions is subject to a "Conjunction Reduction Rule" (Ross, 1967:100), which should be taken as a general assumed rule within the transformational framework (a precursor of Minimalism). For example, such a rule would also reduce sentences as (12a) and (13a):

(12) a. John knows the answer and Bill knows the answer.
b. John and Bill know the answer.

(13) a. Otto sells Buicks and Otto sells Fords.
b. Otto sells Buicks and Fords.

[Ross (1967:116)]

In the b-examples above, Ross assumes that – underlyingly – a full structure is available. Elaborating on conjunctions, Ross (1967) proposes the "Coordinate Structure Constraint" as defined in (14).

(14) **The Coordinate Structure Constraint**
In a coordinate structure, no conjunct may be moved, nor any element contained in a conjunct be moved out of that conjunct.

[Ross (1967:161)]

Ross (1967) notes that (14) is needed since a conjoined NP cannot be questioned. In the transformational framework and its successors, movement is assumed to be a core operation to linearise phrases while keeping track of the original positions for interpretation purposes (among other things). It is a way of establishing a dependency relation. *What sofa* in (15) has been moved out of the conjunction, which is impossible as no dependency between the source and the moved element can be established.

(15) *What sofa will he put the chair between some table and?

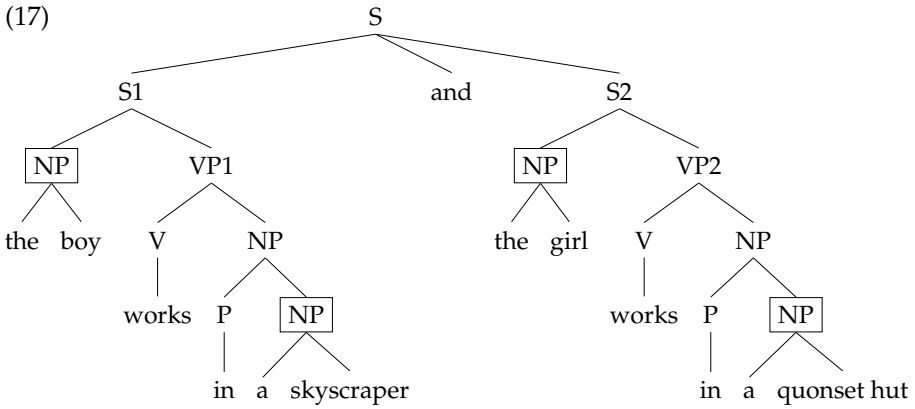
[Ross (1967:158)]

Further, Ross (1967:171) suggests that (14) could "provide a test for coordinate structure" to the extent that Gapping constructions *are* coordinate structures. As a consequence, the underlying structure of a Gapping construction should reflect this, i.e. two conjoined sentence nodes. In (16b) we see Ross' example of Gapping, which he assumes to have an underlying structure as (16a) – represented in a tree structure (17).

(16) a. The boy works in a skyscraper and the girl works in a quonset hut.
b. The boy works in a skyscraper and the girl in a quonset hut.

[Ross (1967:171)]

(17)



[Ross (1967:171); I follow him in projecting prepositional phrases as NPs.]

Ross evaluates the underlying structure of (16b) as is pictured in (17). He assumes the second conjunct to be a full bodied sentence structure: in his terms the S2 node is not "pruned", contrasting the VP2 node that *can* be pruned in order to attach the NP containing *in a quonset hut* to the S2 node. This would still yield a coordination of two clauses. Ross further argues that if S2 is pruned, only one clause would remain in which the boxed NPs should be movable. However, this is not the case as is seen in (18).

(18) a. *Which boy works in a skyscraper and the girl works in a quonset hut?
b. *The skyscraper which the boy works in and the girl in a quonset hut belongs to Uncle Sam
c. *The girl who the boy works in a skyscraper and in a quonset hut has a dimple on her nose
d. *Which quonset hut does the boy work in a skyscraper and the girl in?

[Ross (1967:172)]

Since movement of NPs of either conjunct leads to ungrammaticality, Ross suggests that both conjuncts have the same (parallel) underlying syntactic structure – in other words they are two conjoined sentences.

Although frameworks have changed throughout the years, ever since Ross' work scholars have been continuing to put forward proposals based on his ideas. In the current framework, Minimalism, the level of PF is generally assumed to be the point at which deletion takes place. It should be noted that

from the very beginning, together with the syntax-centred approach, additional licensing constraints have been put forward (although the term "licensing" would be coined later). For example, Sag (1976) and Neijt (1979) already considered semantic identity of antecedent and gap necessary. This idea has stood the test of time and can be found in adapted forms in Merchant (2001), an influential work on Sluicing and ellipsis in general, and in Coppock (2001), who builds on this in combination with movement. Hartmann (2000) is an example of combining prosodic elements in a deletion account, a suggestion already made by Sag (1976:294-295) while only touching on this topic briefly.

Movement and deletion

Recently, Boone (2014) offered an account in which Gapping, Stripping and Fragment Answers are derived by movement of remnants followed by deletion. Building on earlier movements accounts (such as proposed by Aelbrecht, 2007; Johnson, 2009; Merchant, 2005) he assumes that remnants "escape" the ellipsis site by moving leftward (higher up the structure) while remaining phrases are subject to deletion. The method is shown in (19a) and crucially, the movement is exceptional since it may not occur when ellipsis does not take place as in (19b). A "t" indicates a trace of a moved phrase.

(19) a. $[_{S1}$ The boy works in a skyscraper] and $[_{S2}$ $[_{NP}$ the girl$]_i$ $[_{PP}$ in a quonset hut$]_j$ $[_{XP}$ t_i ~~works~~ t_j]]]]
b. *$[_{S1}$ The boy works in a skyscraper] and $[_{S2}$ $[_{NP}$ the girl$]_i$ $[_{PP}$ in a quonset hut$]_j$ $[_{XP}$ t_i works t_j]]]]

Boone shows in his dissertation that movement of the remnants solves the issue of non-constituency of the elided structure. In (19) *XP* marks the constituent that may be targeted for ellipsis. The advantages of his approach is even more evident if the ellipsis is discontinuous as is shown in (20).

(20) a. The boy works in a skyscraper with great pleasure and the girl ~~works~~ in a quonset hut ~~with great pleasure~~.
b. $[_{S1}$ The boy works in a skyscraper with great pleasure] and $[_{S2}$ $[_{NP}$ the girl$]_i$ $[_{PP}$ in a quonset hut$]_j$ $[_{XP}$ t_i ~~works~~ t_j ~~with great pleasure~~]]]]

As licensing condition, Boone proposes a discourse-dependent constraint which checks that a non-hierarchical structure exists between two conjuncts. The proposal is very much inspired by the notion of D(iscourse)-linking originally proposed by Pesetsky (1987). While Pesetsky used this notion to argue for syntactic movement at the level of LF of non-D-linked *wh*-phrases, D-linking has been widely used by syntax-oriented scholars to accommodate discourse (or semantics) related representations. Boone takes seriously the symmetric discourse relation that exists between remnants and antecedents (as argued by Culicover & Jackendoff, 2005; Kehler, 2000; Levin & Prince,

1986) though he represents the discourse relation as syntactic trees. However, it is questionable to what extent a discourse relation fits in a Minimalistic model as depicted in Figure 1.2. Such a relation might be better abstracted in semantic terms. His approach is attractive in that "the licensing condition on ellipsis is not a condition specific to ellipsis, but follows from a general requirement on recoverability" (Boone, 2014:9). In other words, since no special stipulations for ellipsis need to be postulated, as a consequence, the essence of ellipsis processing may not be different from normal sentence processing.

Boone further states that:

> Theories that refrain from postulating syntactic structure in Gapping and Fragments must invoke mechanisms that ensure that the remnants of ellipsis have the same properties and show the same behavior as they do in the corresponding non-elliptical utterance. Although such mechanisms can no doubt be hypothesized, they unnecessarily complicate the grammar. If we accept that there is syntactic structure in the ellipsis site, the connectivity facts follow straightforwardly, without the need to postulate additional conditions and constraints.
>
> [Boone (2014:33)]

One could take issue with the notion of "complicating the grammar". Boone proposes that Gapping and Fragments are subject to movement and deletion procedures. A theory that does not assume these mechanisms as core operations may use other ones. This does not entail that an alternative theory complicates the grammar by definition. Further, he proposes the rather circular argument "the fact that remnants move out of the ellipsis site, constitutes additional evidence for structure in the ellipsis site, since extraction entails that there is syntactic structure to extract from" (2014:33). If one assumes structure, one could assume movement – in this order. If hidden levels of structure are not assumed, movement can never be acknowledged as "fact". Furthermore, his assumption concerning movement of the remnants is a case of "Exceptional Movement" which is only applicable to ellipsis. Quite easily, this specialised mechanism may be considered as an instance of complicating the grammar in its own right.

Copying

While Sag and Hankamer (1984) can be seen as a precursor of LF-copy accounts, a recent derivational copying account for Gapping is put forward by Repp (2009). Kobele (2015) has also proposed a general copying account of ellipsis derivation including Gapping. Let us look at them briefly in turn.

Repp (2009) proposes that in Gapping the second conjunct is derived by copying the remnants from the left conjunct that are spelt out at PF. The elided material in the right conjunct is only visible at LF. In that sense, the copying mechanism is comparable to an LF-copy account, as is proposed for Sluicing by Chung, Ladusaw, and McCloskey (1995). However, Repp implements the

copying mechanism as "sideward movement" which means that copied material may be merged with unconnected independently-derived syntactic objects. Sideward movement could be seen as a repair mechanism for derivations that may crash (Repp, 2009:31) and occurs in two steps. The second conjunct is derived in parallel with the first conjunct and after the first conjunct has been sent off to PF, missing material may be copied. For example, an elided verb is copied from the left conjunct and is moved to the right conjunct and merged with the remnant object. If not, the "numeration" of the remnants would yield an incomplete sentence – a crash.

While a verb (lexical projections) and object (functional projection) may be copied, Repp argues that adjuncts are not "sentential functional projections" (2009:43) and can therefore not be copied. This is helpful to account for the behaviour of negation in Gapping as Repp shows in her book. However, we have seen that adjuncts in Dutch may be filled in (see section 2.2 above). Repp (2009:80) argues that adjuncts in Dutch are not obligatorily filled in and assumes that processes of "accommodation", mechanisms at the level of discourse and pragmatics, are at work in such cases. While the details of accommodation are lacking, it is not made clear why negation should be immune to accommodation. Also, a consequence of her approach would be that in Dutch sentences such as (3) repeated here in (21), two mechanisms of different levels of representation would be at work in parallel by default – sideward movement and accommodation. If the adjunct is taken into consideration for further interpretation, it is generally assumed by structural accounts that it attaches directly to the recovered VP node *kocht een krant*.

(21) De man kocht een boek in Londen, en de vrouw een
the man buy.3SG.PST a book in London and the woman a
krant.
newspaper
'The man bought a book in London, and the woman a newspaper.'

Kobele (2015) takes a more loose attitude as to the question of whether there is structure in the ellipsis site. Rather, he asks how much syntactic information is needed to account for structural requirements on grammatical ellipsis. Instead of reconstructing syntactic structure, possible antecedents should have the proper syntactic category. In that sense Kobele apprehends ellipsis as reuse of some syntactic structure rather than "recomputation". During the derivation, it would suffice to select the semantically appropriate antecedent from a possible set while syntax is mainly working as a "filter".

Not stated as such in his paper, Kobele's proposal contrasts with a sideward movement approach to accounting for repair operations. He further points to the fact that copying is related to deletion, that is, "copying theories should be thought of as descriptions of the algorithm implementing deletion theories". Furthermore, proposing a copying mechanism, although stated as derivation "procedure", still leaves us with the question of how it would be

implemented as a parser. It is therefore impossible to distinguish between deletion (possibly in combination with leftward movement as Boone proposes) and copying accounts using psycholinguistic data, meaning that – from a processing perspective – we may lump deletion and copy accounts together.

Although Kobele's approach is syntactic in nature, contingent on Minimalist notions such as merge and move, he takes seriously the semantic relation that the antecedent and ellipsis site constitute. In contrast to the LF-copy account by Chung et al. (1995) (who regard the basic nature of LF as structural rather than semantic), ellipsis sites are thought to be resolved by replacing them with their antecedents semantically, while antecedents are delimited syntactically. In this sense, he is leaning towards semantic approaches using insights that we will consider in the next section.

2.4.2 Semantics-oriented accounts

Semantics-oriented accounts put less emphasis on syntax (though they do not neglect it) and are therefore autonomous from a strictly derivational model as shown in Figure 1.2, but can be related to the tripartite model as presented in Figure 1.1. After introducing a "matching" condition, I will briefly discuss a related discourse condition, a Head-driven Phrase Structure Grammar approach and a Categorial Grammar solution. I will end with a proposal within the framework of Simpler Syntax that may be understood as a refined version of an integrated matching and discourse condition.

Matching condition

Although the importance of a semantic match between antecedent and ellipsis was already known in the early days of ellipsis research, Dalrymple, Shieber, and Pereira (1991)'s paper marks the beginning of approaches that emphasise the semantic import during resolution, moving syntax into the background. Using lambda abstraction (i.e. symbolic expressions of semantic abstraction), they propose a higher unification algorithm to be in charge of the recovery of the ellipsis antecedent. Unification is an algorithmic process – used in logic and computer science – to solve equations between symbolic expressions. Notably, this process goes beyond the (structural) representation at LF that is assumed in syntax-oriented accounts. At the same time, the authors argue that their proposed process maps easily onto a discourse model. Therefore, CS in the tripartite framework in Figure 1.1 seems the appropriate level at which this process may take place.

The clause *Fran likes cheese* in (22a) can be decomposed into an underspecified property *P*. When this property is applied to the interpretation of the subject (*Fran*), it will yield the interpretation of the clause. (22b) shows how the property maps to a lambda expression in which the subject is a variable. Predicating the property of the subject *Fran* as is done in (22c) will yield the interpretation of (22a). Quite often, the reduced denotation as in (22d) is used

to show the end product. Note that these denotations assume a configuration in which a property is applied to the interpretation of the *subject* and not the *object*. This decision may hinge on syntactic information types.

(22) a. Fran likes cheese.
b. $P \mapsto \lambda x.like(x, cheese)$
c. $\lambda x.like(x, cheese)(Fran)$
d. $like(Fran, cheese)$

Expanding this idea to ellipsis, as exemplified in the Stripping example in (23a), recovery can be a matter of finding the matching property shown in (23b), which can be predicated of the subjects accordingly to get the interpretation of both the left and the right conjunct. The simplified solution to the equation of the lambda expression is shown in (23c) giving the interpretation of both conjuncts.

(23) a. Fran likes cheese, and Leo too.
b. $\lambda x.like(x, cheese)$
c. $like(Fran, cheese) \wedge like(Leo, cheese)$

In sum, Dalrymple et al. assume "a connection between the syntactic and the semantic representation of the source sentence" to guarantee that "solutions produced by higher-order unification satisfy the constraint that parallelism must be maintained by abstracting out of parallel positions" (1991:406-407). In this sense, this proposal acknowledges the syntactic structure in terms of relation formation. However, the authors distance themselves from identity-of-relations analyses that assume that the interpretation of ellipsis " involve[s] copying the interpretation of a constituent in the source" (1991:437); rather, the predicate argument relation is extracted from the source clause. As a consequence, their approach does not need additional syntactic machinery for quantifiers such as *every* and *all*. For example, in (24b) it is shown how the shared property of (24a) would be represented. By contrast, syntactic accounts usually represent quantified phrases at LF yielding extended tree structures. Only after "Quantifier Raising" (QR) – a form of movement – has taken place may the structure be sent off for further interpretation. This implies a burden on mechanisms of movement and/or copying since extra structural information has to be analysed. An LF structure for the first conjunct of (24a) is given in (24c). For the sake of contrast, an LF representation of the utterance in (22) *Fran likes cheese* without a quantified object is shown in (24d).

(24) a. Fran likes every cheese, and Leo too.
b. $\lambda z.every(x, cheese(x), like(z, x))$
c. [$_{IP}$ [$_{DP}$ Fran]$_1$ [$_{VP}$ every cheese]$_2$ [$_{VP}$ t$_1$ loves t$_2$]]]]
d. [$_{IP}$ [$_{DP}$ Fran]$_1$ [$_{VP}$ t$_1$ loves cheese]]]

The lambda term of the utterance containing a quantified phrase is slightly more complicated in (24b) compared to the one in (23b), but no additional

semantic stipulations are required. Note again, however, that (24b) implies a certain syntactic configuration. Matching of the property may apply to resolve the ellipsis. Boone (2014:135-137) explains that QR is problematic for a Minimalistic approach concluding that it is a form of movement that falls outside the computation before Spell-Out (see Figure 1.2). Just as the exceptional movement he promotes to arrive at an appropriate string at PF for the elliptic structure, quantified phrases are subject to an additional exceptional movement to yield the appropriate LF structure at the ellipsis site. In a footnote, Dalrymple et al. emphasise that their analysis concerns:

> its use of an equational framework for declaratively characterizing ellipsis resolution, not its use of particular logics for the representation of meanings. Nonetheless, the use of typed lambda calculus allows us to directly state our analysis with a minimum of extraneous machinery.
>
> [Dalrymple et al. (1991:fn 9)]

In other words, a syntactic representation at LF may be hypothesised but it is not a necessary requirement for the resolution mechanism to work.

While their approach has been very influential, it has also met some criticism as the proposed theory would "overgenerate", which means that it would allow for constructions that are not acceptable. This contrasts with syntax-oriented accounts that generally "undergenerate" if they ignore other levels of representation. In terms of implementation Dalrymple et al.'s advantage is that they put forward a theory-neutral account which can be used in different corners of linguistic theory.

The authors, however, do not show how adjuncts of the kind as shown in (25) should be handled. For this dissertation it will transpire that it is necessary to have a better understanding of adjuncts, given that they will be integral to the design of one of the experiments reported in later chapters.

(25) Fran likes cheese in the morning, and Leo chess.

There are two reasons to assume that a semantic denotation of the first clause in (25) could be expressed by means of a conjunction of two propositions as is represented in (26).

(26) $like(Fran, cheese) \wedge in(the\ morning)$

First of all, the conjunction predicts the proper entailment, since (25) entails that *Fran likes cheese* and that some action happens *in the morning*. If the first proposition is embedded in the adjunct proposition it entails that liking of cheese is dependent on the time of day. This is, however, not the case.

Secondly, adjuncts, especially those denoting time or place, may be "filled in" in elliptical constructions, and in Dutch they usually are, as was demonstrated in (3) above. This would exclude the possibility of embedding the adjunct in the first proposition. However, following Dalrymple et al.'s account, we could assume that the interpreter matches the predicate argument relation

between antecedent and remnant(s) while the interpretative conjunction allows for a choice as to the extent to which an elided adjunct – a proposition that is readily available – should be conjoined to the recovered proposition. Since this operation is semantic in nature, interaction with processes of accommodation to account for optionality is less unexpected than is the case in a structural account. Jackendoff (2007) would agree with such an approach since he suggests that "there is very little syntactic constraint on either the form of the adverbial or its position, and the semantics and pragmatics are doing most of the work."

On a par with Repp (2009), a semantic approach such as Dalrymple et al.'s classifies negation as a special kind of linguistic unit; not as a movable adjunct, however, but as an "operator". Assuming that negation as an operator can take wide scope over the propositions as in (27), this would yield a negative state of the whole proposition. In other words, negation can be sentential.

(27) $\neg[like(Fran, cheese) \wedge in(the\ morning)]$

This may give the impression that an elliptical construction needs reference to a proposition that is true. Possibly, an additional semantic constraint may be that Gapping constructions can only be linked to a state of affairs that exists. I will leave this issue for future research noting that a semantic approach predicts quite naturally that adjunct-hood in general is not exceptional by default, but negation is.

Dalrymple et al. suggest that the semantically represented operator "neg" has a parallel operator "pos" in the right conjunct. They use the VP-ellipsis example in (28a) to show this. The property of the left conjunct is represented in (28b) in which $\lambda S.S$ refers to the underspecified operator that renders the proposition either positive or negative.

(28) a. Dan didn't leave, but George did.
b. $P \mapsto \lambda x.\lambda S.S(left(x))$

In elliptical sentences, Dalrymple et al. assume $\lambda S.S$ to be a property applied to the interpretation of "neg" in the left conjunct since there is a negation. The right conjunct delivers a positive operator which is derived from the affirmative property of *did* (and maybe the contrastive *but* plays a role here too). Therefore, the negation has not been elided but contrasted. If no additional operator is available in the right conjunct, it might be that a parallelism condition on operators holds, meaning that there should be an overt operator of some kind, or else the operator of the left conjunct applies. Gapping constructions with negation in the left clause can be saved by adding an operator in the right clause – regardless of the polarity – as is demonstrated in (29).

(29) De man kocht niet een boek, en de vrouw *(wel/niet) een
the man buy.3SG.PST not a book and the woman (AFF/NEG) a
krant.
newspaper
'The man didn't buy a book, and the woman (did/didn't) a newspaper.'

If no overt operator is available in the right conjunct, it seems that the predicate argument relation that is abstracted from the left clause is assigned the interpretation to the operator that is available, yielding a negative state that can not be interpreted as such. Again, comparable to Repp's account, processes of accommodation may steer the interpretation of the sentential variable $\lambda S.S$ in some cases. The bottom line, still, is that negation seems to be the exception – not adjunct-hood in general. Crucial implication in favour of Dalrymple et al.'s account is that processes of accommodation at the level of CS target semantic representations more easily than they would under Repp's account as these processes would target representations at a different level, that would be impenetrable under minimalistic assumptions. Note though, that Dalrymple et al.'s account may need to be constrained by syntactic information types, for example, to prevent it from overgenerating.

Discourse condition

Hardt (1993:41) proposes a formal process in which meanings are assumed to be stored in a discourse model, while anaphoric expressions are assumed not to have predetermined antecedents. Rather, they are determined at some stage during the derivation. This computational model is apt to resolve VP-ellipsis, while it analyses elided structures as "proform" (also called "null-proform") or "proverb" (on a par with anaphors). Governed by a semantic identity condition, a missing VP is treated as a variable that is semantically interpreted just as other variables such as pronouns.

Together with Dalrymple et al., Hardt's approach falls under the so-called proform theories of ellipsis. Generally, such theories, starting with Wasow (1972) and later developed by proponents such as Fiengo and May (1994) and Lobeck (1995), assume that deep ellipsis forms should be treated as anaphora assuming that the ellipsis site is a null-pronoun (but see Baltin, 2012 for an argument that proforms involve deletion). Proform accounts assume that antecedents are semantic objects, and that ellipsis sites are resolved by replacing them with their antecedent in the semantics. In contrast to syntactic proform theories, Dalrymple et al. and Hardt do not assume syntactic structure at the ellipsis site. Hardt proposes that the interpretation of proforms is accomplished through store and retrieve operations that make reference to a discourse representation. At the same time, neither Gapping nor Stripping have been taken as serious candidates to be accounted for by means of a proform method. Likewise, Hardt (1993:122) argues that Gapping does not "require

access to the discourse model for recovery of missing material." A distinction is made between proforms (VP-ellipsis) and conjunction forms (Gapping, PseudoGapping, Stripping). Both forms are treated by Dalrymple et al. (1991) in the same vein. Hardt (1993:123), however, suggests that their method is too unconstrained ("overgenerates") since the parser would deal with ungrammatical sentences effortlessly. Therefore, Hardt suggests that the focus based mechanism such as proposed by Rooth (1992) is an alternative interpreter for conjunction forms. Following this theory, focus helps to determine the relation between antecedent and remnant(s) at a semantic level of representation. Still, the question remains whether two separate mechanisms are preferred. To some extent, Hardt's approach is a first move towards to a Simpler Syntax approach, which I will discuss after an excursion to HPSG and Categorial Grammar approaches.

A HPSG approach

Head-driven Phrase Structure Grammar (HPSG) is a unification-based non-transformational theory. It is a constraint-based theory, which means that constraints license small pieces of linguistic structure. It utilises multiple inheritance type hierarchies and unification of typed feature structures as central formal mechanisms (see Pollard and Sag, 1994 for an in-depth explanation). An utterance in HPSG is represented as feature structures of type *sign*. For example a sign can be of type *word* which is stored in the lexicon as an entry containing descriptions of (or constraints on) feature structures. Type *phrase* will contain phrase structure rules, construction rules or "immediate dominance schemata". A notable aspect of HPSG is that phonological, syntactic, semantic and contextual features may be obtained at once, fitting the parallel architecture as such as shown in Figure 1.1.

An HPSG account for Sluicing and Fragments, elliptical constructions which are subject to a resolution strategy that is applicable to Gapping (as we have seen in Boone, 2014), has been proposed by Ginzburg and Sag (2000). They propose that Fragments are introduced by the phrasal-type headed fragment-phrase which must dominate the Fragment. The type *phrase* contains the type *local* which specifies the values for CATEGORY and CONTENT.[2] Their solution is to posit that these values are the same as those of the correlate – without assuming any syntactic structure in the ellipsis site. This is not to say that every HPSG account abstains from assuming syntactic structure. For example, Lappin (1999) proposes a mechanism based on syntactic reconstruction.

Ginzburg and Sag 2000:301 take it that prior syntactic structure only functions to determine the appropriateness of the utterance. At the same time, contextual information is available based on the notion "question under discussion" (QUD) – a set consisting of the currently discussable questions among

[2] I follow the convention that values for types in HPSG are written in capitals.

dialogue participants. For example, in (22a), here repeated as (30a), the implicit QUD would be "Who likes what?".

(30) a. Fran likes cheese.
b. Fran likes cheese, and Leo chess.

Ellipsis is licensed when the current QUD is answered by the remnants. This QUD can be overt, as in Fragments that answer overt questions, but the QUD may also be implicit, as is the case in Gapping constructions as in (30b), in which *Leo chess* answers the QUD "Who likes what?". Ginzburg and Sag (2000) suggest that the implicit QUD could be represented as CONTEXT feature containing a parameter that sets the list of open propositions (among other things), which are solved by the remnants. To a certain extent, this reminds us of the underspecified property used by Dalrymple et al. (1991), though Ginzburg and Sag (2000:298) allow for the possibility to incorporate sufficient syntactic sensitivity in their account to overcome overgeneration, that is, to develop a syntactic filter. Further, as we will see in section 2.5, a QUD approach is closely related to the way focus is assigned.

A Categorial Grammar approach

In Combinatory Categorial Grammar (CCG), which is a version of Categorial Grammar, an element like a verb is associated with a syntactic category – comparable to CATEGORY in HPSG mentioned earlier. This category identifies the verb as a function and specifies the type and directionality of the verb's argument(s) (depending on the transitivity) and the type of the result of the function. The effect is that a category can be understood as a combined syntactic-semantic object constituting a transparent interface between surface syntax of a sentence and its underlying semantic representation. Steedman (1990) has become known for his analysis of coordination, including Gapping constructions. Enabled by the flexible notion of constituency which is a core aspect of CCG, it exploits predicate-argument relations rather than syntactic structures. In fact, the only level of representation assumed is the predicate-argument structure. Rather than a module of grammar, "syntax" can be seen in CCG as a history of the algorithm that is used to determine the predicate-argument structure on the basis of a given surface string (during comprehension) – comparable to a "compiler" in certain computational approaches.

Steedman (1990:234) proposes that "Gapping requires the recovery of the arguments from the left conjunct, rather than the recovery of the verb". Treating Gapping as constituent coordination, he assumes that categories of the left conjunct can be decomposed. The 'remnant constituent' retrieves the arguments of the left conjunct upon which interpretation proceeds. Steedman (1990:255) states that Gapping resolution is "purely syntactic, and not to be mediated by anaphora of any kind, pragmatically specialized though it is". Note though, that CCG exploits logical form rather than the surface structure. The left conjunct decomposition operation resembles to some extent the

higher-order unification method that we encountered in 2.4.2 (as is noted in Dalrymple et al., 1991:fn 3) and further compares with an interpretational method such as proposed by Cremers (1983). A common aspect of accounts that denote ellipses as sets of functions with propositional values is that they can account for the apparent lack of proper syntactic constituency in elliptical structures. Interestingly, such interpretational accounts are relatively easy to transpose to computational methods as we will see in section 2.6.

A Simpler Syntax approach

In the Simpler Syntax enterprise proposed by Culicover and Jackendoff (2005:273-282), Gapping constructions are assumed to be resolved in the syntax-semantics interface. Their theory pictures a situation in which a non-derivational syntax does not employ hidden levels of representation. Not surprisingly, it compares with constraint-based lexicalist theories such as HPSG and is compatible with the tripartite architecture in Figure 1.1. Just as Ginzburg and Sag (2000), Culicover and Jackendoff (2005) assume that language users interpret Gapping constructions without reconstructing a derivation from an underlying structure. In a sentence such as (31a), Culicover and Jackendoff treat remnants *Leo* and *cheese* as so called "orphans" – paired fragments that make up a constituent of no specific category and that are represented in the syntax. Again, we see flexibility in terms of syntactic constituency. In the semantics, the function $\mathcal{F}$ connects the orphans as arguments, a procedure the authors refer to as "Indirect Licensing"(IL) – a discourse-based mechanism. The missing material is recovered from the non-focused part of the source clause. This way, the interpretation and licensing of Gapping depend mainly on a Conceptual Structure function (see Figure 1.1) which "amounts to the presupposition of the antecedent, constructed by substituting variables for the two foci in the CS of the antecedent" (Culicover & Jackendoff, 2005:276). They reason that the remnants' contrastive focus hinges on the presupposition of the antecedent taking a position that is also apparent in semantics-based approaches. They are, however, less detailed as to the extent of the autonomy of and interaction with prosodic rules, as focus hinges entirely on CS. Presumably though, the phonological structure of the left conjunct should easily be employed considering the parallel nature of the framework. The syntax and semantics of the elliptical conjunct of (31a) are represented in (31b).

(31) a. Fran likes cheese, and [$_{XP}$ Leo] [$_{YP}$ cheese].
b. Syntax of the right conjunct: [$\text{XP}_i^{ORPH_1}$ $\text{YP}_j^{ORPH_2}$]
CS of the right conjunct: $\mathcal{F}$([X_i C-FOCUS] , [Y_j C-FOCUS])

While the contrastive foci of the orphans (i.e. [X_i C-FOCUS] and [Y_j C-FOCUS]) are used to match the contrasting foci of the antecedent structure, the function $\mathcal{F}$ in (31b) can be utilised to replace the corresponding foci of the first conjunct by variables which would yield a reduced lambda denotation such as was introduced earlier in this section: like(X, Y). Culicover and

Jackendoff subsequently assume that the contrastive foci of the right conjunct (as represented above) can be substituted giving the interpretation of this clause: [like(Leo, chess)]. The connection with propositional abstraction accounts like Dalrymple et al. (1991) is apparent. In a talk, Merchant (2007) suggested that Indirect Licensing can be seen as an updated version of Hardt (1993) and Dalrymple et al., but he remains critical as to the importance of structural issues. A recurring example is that of "connectivity effects". For example, in (32) it is shown that a Fragment Answer must carry the underlying voice of the question.

(32) a. Q: Who is ordering pizza? A: Pizza is being ordered by Fran.
b. Q: Who is ordering pizza? A: *By Fran.
c. Q: Who is ordering pizza? A: Fran.

Since the answer in (32b) cannot be uttered in passive voice – which is possible in principle as shown in (32a) – it is argued that an underlying syntactic structure should be assumed. (32c) is grammatical as the Fragment Answer follows the voice of the question. Culicover and Jackendoff (2005:539) suggest, however, that connectivity effects can be accounted for within their theory since IL transmits syntactic properties from the discourse antecedent to the Fragment. In conclusion, IL does not only exploit CS but capitalises on the parallel nature of the framework that this mechanism is embedded in. In addition, IL overcomes the criticism related to overgeneration of ungrammatical utterances in a purely semantic account; also it allows for an extension to account for other ellipsis types, resolving the disparity between deep and surface ellipsis types and the accompanying mechanisms to interpret them.

2.5 Parallelism, identity and focus

While reviewing the various accounts in the previous sections it has become clear that parallelism plays a considerable role. Syntax-oriented approaches emphasise the requirement of parallel syntactic structure between two conjuncts, and semantics-oriented accounts generally emphasise identity of relations. Some authors refer to "matching" rather than identity, which seems, following the definition in (33), more useful.

(33) To match: corresponding in some essential respect with something previously mentioned or chosen: a new coat and a hat to match.

[McKean (2005)]

Matching allows for using just enough information – for example, just enough syntactic information – to overcome connectivity effects. This contrasts with "isomorphism" which is also used for identity. In derivational theories, syntactic isomorphism extends to the lexical item and not so much to the inflection, which is assumed to be regulated by a higher node. Therefore, the ellipsis

in (34a) is understood as in (34b) while being licensed under syntactic identity.

(34) a. These men are more clever than Mary.
b. These men **are** more clever than Mary **is** clever.

[Vicente (2008)]

Some structural accounts that speak of matching of 'just enough syntactic information' (see for example Kobele, 2015) and matching of truth conditions (which has been quite common since Sag, 1976), are comparable to semantics-oriented accounts in that they take pieces of semantic information of the antecedent into account. In general, semantic parallelism seems stronger than syntactic isomorphism as is pointed out in the following excerpt from Vicente (2008).

> [...] while both semantic parallelism and syntactic isomorphism play a role in the licensing of ellipsis, their relative importance is different. Semantic parallelism appears to be a truly inviolable condition; on the other hand syntactic isomorphism can be violated under certain specific conditions. The fact that these two conditions have different rules of application entails that they constitute separate conditions, neither one being reducible to the other.
>
> [Vicente (2008:21)]

In other words, semantic and syntactic constraints may apply in parallel, which entails that both semantic and syntactic representations are relevant levels in order to resolve ellipsis. Especially derivational accounts may encounter problems as long as they do not assume an interaction between semantic and syntactic representations. Crucial in Vicente (2008)'s analysis is the role of focus structure that can violate syntactic isomorphism. This brings us to the issue of prosodic parallelism.

Kuno (1976) precipitated a line of research with respect to prosodic parallelism – which one could call a syntax-discourse interface tradition – implementing focus to account for ellipsis phenomena. Kuno notes that the acceptability of Gapping is dependent on discourse context.

> [...] Gapping is a pattern that is used for presenting contrastive pairs of information segments, and [that], because of this semantic function, the constituents left over after Gapping must represent new, unpredictable information [...]
>
> [Kuno (1976:309)]

Kuno proposes that focus is driven by semantics and that in Gapping, the deleted elements must be given, which results in an unpronounced antecedent, a contrastive topic constituted by the first remnant and a contrastive focus on the second remnant.

Although Kuno's approach is "functional" at heart, which means that its starting point is language as a communicative tool (and that this determines

linguistic form), his insights fed into transformational accounts and their successors – extending the theory that prosody can be accommodated in derivational syntactic accounts. In general, this results in extending syntax with focus projections that are contingent on the semantics or discourse; but note that the T-model as presented in 1.2 only allows for a unidirectional flow of derivations. In fact, "externalization (hence a fortiori communication) is an ancillary aspect of language, peripheral to its core nature" (Chomsky, 2015:101). As a consequence, a Chomskyan theory should abide by the notion that meaning of focus depends on a certain syntactic derivation. Though not everyone agrees and many Generativists have adopted Rooth (1992)'s non-syntactic "Alternative Semantics" approach to accommodate focus. Examples of syntactic (deletion) accounts that factor in prosody have been developed by Hartmann (2000) and Winkler (2005), who are in turn indebted to Kuno. Hartmann concludes that a verb can only be deleted if the antecedent is deaccented, while remnants should find a corresponding accented correlate. Note that this resembles Culicover and Jackendoff (2005)'s IL formalisation. Winkler makes a distinction between two different types of ellipsis:

- Sentence-Bound Ellipsis (SBE): The information-structural function of sentence-bound ellipsis is the isolation of contrastive foci or topics. Examples are Gapping, Stripping, PseudoGapping.
- Discourse-Bound Ellipsis (DBE): The information-structural function of discourse-bound ellipsis is to mark the elliptical material as anaphoric or given. Examples are VP-ellipsis, Sluicing, NP-ellipsis.

[after Winkler (2005:37)]

Winkler proposes the "Hybrid Focus Hypothesis of Ellipsis" in which phonological deletion is invoked for SBE while a proform account should be in charge of DBE. Prosodic marking of contrastive focus and topic in SBE is understood as relying on syntactic movement operations (which are by definition sentence-bound). The derivation of a sentence proceeds in two cycles. The first is concerned with the derivation, in which two movement operations take place, which is followed by deletion at the level of PF. The second operation interacts with the first derivation in order to update the appropriate information-structural configuration, assuming a bilateral relation between PF and syntactic formation rules.

Winkler's proposal drops us back into the surface-versus-deep discussion. In the meantime, we have seen that for successful resolution of Gapping-like constructions to happen, discourse representations can be used (see for example Boone, 2014; Culicover & Jackendoff, 2005; Ginzburg & Sag, 2000). Oddly, Winkler implements her ideas in a parallel Jackendoff style (see Figure 1.1) – something she herself acknowledges (see footnote 8 Winkler, 2005:231) – while still taking derivational principles of the Minimalist Program (see Figure 1.2) as her starting point. In her view, LF representations are directly accessible at the level of PF – a position that cannot be accepted if one complies with

Minimalist assumptions. Whatever the validity of her account is with respect to a Minimalist paradigm, it has become clear that a feasible account of ellipsis resolution integrates different – maybe autonomous – levels of representation that are allowed to interact. In that sense, a multi-dimensional sign-based framework such as HPSG may be a more adequate architecture to accommodate multiple levels of representation. Even if a proposed technique does not involve reconstruction of syntactic structure, sensitivity to syntactic parallelism may be included as is argued by Ginzburg and Sag (2000:298). Note though, that the authors are not specific with respect to the relation between focus phenomena (or prosody for that matter) and QUDs, which seems odd since a QUD refers to focused phrases. As noted earlier, Culicover and Jackendoff (2005:539) include a focus constraint in their IL method while further arguing that sufficient syntactic information is available ("matches") during the resolution process.

Recall that we have seen in Chapter 1.3.1 that syntactic constituents do not always coincide with prosodic constituents. Trying to account for this fact and incorporating intonation in a CCG approach, Steedman (1991) makes explicit the integration of prosodic structures with syntactic-semantic structures. The rules of the Combinatory Categorial Grammar are sensitive to intonation for establishing constituency, which would otherwise be rather haphazard. As noted earlier, CCG produces different "trees" for one string. A parser would have to be able to handle such ambiguities all the time. For example, in (35) Steedman shows that different bracketing options are possible in a CCG approach. However, crucially, they all correspond to a distinct intonation contour that in turn corresponds to a certain question that may provide some given information. The question that leaves open the requested phrase, a variable, is referred to by Steedman as "open proposition". Note that this compares with a possible QUD in which the *wh*-phrase represents the variable. A sequence of ") (" marks an intonation and – in CCG terms – constituent break.

(35) a. (They are a good source of) (vitamins).
QUD: What are legumes a good source of?
b. (They are) (a good source of vitamins).
QUD: What are legumes?
c. (They) (are a good source of vitamins).
QUD: What about legumes?

[after Steedman (1991:37)]

The idea is that in order to limit the possible constituent configurations, at least in spoken language, prosodic information should be integrated in the grammar. Steedman proposes that the combination of two syntactic categories via a syntactic "combinatory" rule is added with a restriction that the prosodic categories should also be properly combined. The prosodic categories are subject to prosodic combinatory rules. Similar to the syntactic combina-

tion, the assignment of prosody is a matter of functional composition. However, phonological categories are defined as an autonomous (in phonological terms "autosegmental") level of intonational structure. Steedman's proposal offers the possibility to consolidate intonation as structure building rules, pairing phonological and logical form without an intermediate level of representation. Furthermore, speech processing and parsing could be merged into a single process. Steedman uses intonational categories that are based on the autosegmental notation as proposed by Pierrehumbert (1980). A transcription of Dutch intonation (ToDI) has been proposed by Gussenhoven (1988) and is the subject of an ongoing project which can be found on the website todi.let.kun.nl. Converging elements are abstract tonal segments that refer to the relative pitch measured as a function of the fundamental frequency against time. For example, there are two phrasal tones, H and L, denoting high or low 'simple' tones; two boundary tones, written H% and L%, denoting an intonational phrase-final rise or fall; and two target tones written H* and L* denoting a high or low pitch target. Utterances such as (2a) and (2b) repeated here would be transcribed as in (36) (though different pronunciations are possible as reported by Dimitrova, 2012:167).

(36) a. De MAN kocht een boek in LONDEN, en de VROUW in LEIDEN.
H*L LH% LH* H*L%
'The man bought a book in London, and the woman in Leiden.'

b. De MAN kocht een BOEK in LONDEN, en de VROUW een KRANT
H*L H*L LH% LH* LH*
in LEIDEN.
H*L%
'The man bought a book in London, and the woman a newspaper in Leiden.'

Despite the differences in prosodic "contours", the prosodic parallelism in terms of focus is evident. The parallelism reflects intonation contours that are related to the respective QUDs.

(37) a. WIE kocht een boek WAAR?
L*H H*LH%
'Who bought a book where?'

b. WIE kocht een BOEK WAAR?
L*H L*H H*LH%
'Who bought a book where?'

Boone (2014:67) concludes that the fact that the ellipsis clause often seems to answer the QUD is just a reflex of the way focus is assigned. Since he assumes that remnants must be focused independently of the focus structure in

the antecedent, he is able to sustain his movement-of-remnants account ("escaping the ellipsis"). Indeed, it appears that neatly aligning focus assignment such as seen between (36) and (37) only holds for structurally parallel cases. The bottom line is that focus assignment is determined by information structure (in the tripartite architecture represented at Conceptual Structure); Boone (2014) would agree with this since he exploits the alternative semantics account by Rooth (1992). What he finds more useful is the notion put forward by Griffiths and Lipták (2014) that contrastive remnants can only be felicitous if their correlate is contrastively focused. This would mean that (38) is not felicitous since *boek* and *Londen* are not contrastively focused – not because the QUD is not properly answered in the right conjunct.

(38) ??De MAN kocht een boek in LONDEN, en de VROUW een KRANT in
H*L LH% LH* LH*
LEIDEN.
H*L%
'The man bought a book in London, and the woman a newspaper in Leiden.'

It is an empirical question to what extent (38) is ungrammatical. To me (being a native speaker), at least, it seems that a felicity condition may be violated. Note that Steedman (1991) would predict (38) to be ungrammatical just as the felicity condition does, only if one (incompatible) QUD is available. Provided that the mechanism is dynamic, though, a prosodic structure may be overruled, giving the opportunity to a secondary QUD – which is in principle possible under Steedman's account. IL as proposed by Culicover and Jackendoff (2005), would set the mechanism to search for an unfocused phrase (here: *kocht een boek*) which can not be properly integrated with the orphan structure. Alternative readings may be guided by the discourse level (c.f. accommodation) – the framework would allow for this – but the authors have no detailed account as to how this would work.

Intonation may help to organise utterances into appropriate constituent configurations, but also into manageable units in order to be perceived and memorised more easily. In cognitive psychology this is known as "chunking" (Crystal, 2010:179) and to get a better understanding of the functional level of description of prosody in ellipsis resolution, we need experimental data. This calls for a theory that can be related to processing, an issue that I will turn to now.

2.6 Mapping to processing

Since the 1970s, theoretical research on Gapping has boomed. Couched in a Chomskyan framework and characterised by derivational levels of representation, the first theories proposed a deletion approach, which is an intuitive

choice from a theory-internal perspective. This way, structural parallelism is easily established as the ellipsis site is fully represented, albeit hidden. Therefore, in Minimalism and its predecessors, the operation of deletion and its relative, copying are still applied, with or without some form of phrasal movement. However intricate and admirable in terms of syntactic argumentation, such theories do not have so much to offer a processing account. A representation of a fully-fledged structure may be the ultimate notion that can be used as a starting point for a processing model, but derivational steps cannot easily be mapped to parsing procedures.

Being among the pioneers, Hankamer and Sag (1976) proposed that anaphoric relations cannot be accounted for in mere syntactic terms. Taking the notion of "process" seriously, they further emphasised the importance of discourse. Sag ended up in a constraint-based environment (see for example Pollard & Sag, 1994; Sag & Wasow, 2015) in which the mapping from grammar to procedure is rather straightforward, while different levels of analysis are understood as constituting one dynamic system. An advantage of constraint-based techniques is that we might eventually end up with a theory of ellipsis resolution without needing to resort to the application of different methods for different types of ellipsis.

It seems that theories that assume the lexicon to be the main locus of language-specific grammatical information – proposals of the HPSG, CCG and Simpler Syntax kind – may be the ones that best integrate syntax, semantics, and phonology (including the autosegmental representation of intonation). According to Steedman (1999), such lexicalist models are not only easily paired with computational approaches, but may also be used to show that "there might be a closer relation between the connectionist and symbolist theories than is usually assumed". In other words, such models may be used to relate symbolic representations to lower level neural networks, providing a crucial link to brain activity. Not surprisingly then, such models may be used to better understand the relation between theory and psycholinguistic data using computational methods as a mediating level. Still, CCG proposals have usually been considered to have weak psychological reality. Because of its flexible notion of constituency, a CCG parser would have to deal with (sometimes) numerous possible parse trees of individual sentences. Steedman notes that in principle the CCG approach deals with competence without stipulating how a parser should handle different surface structures (see footnote 4, Steedman, 1996:93). Already in 1991, he stipulates that a parser equipped with instructions related to a functional description of intonation and referential context may be adequate. In other words, intonation contours may guide the interpretation of a certain constituent structure. If one adopted a CCG approach to develop a parser, one should include instructions for handling prosody.

Still, CCG has been used by computational linguists to design semantic parsers; in psycholinguistics they are barely implemented. For example, a computational approach is advanced by Cremers (1993) who argues that the interpretation of coordinate structures – including the ellipsis type Gapping

– is in part "extra-grammatical". In addition to a well-defined description of an expressive grammar formalism, a processing component is included. It is remarkable that in lexicalist accounts on ellipsis such as Cremers (1993), a procedural (computational) implementation may be provided straightforwardly (see for another example Lappin, 1999), while computational accounts embedded in a Minimalist framework need additional stipulations. For example, Kim, Kobele, Runner, and Hale (2011) try to implement the copying account as proposed by Kobele (2015) incorporating "heuristics" that define how a grammar should be applied. This may be contingent on performance factors, and, as a consequence, the authors suggest that heuristics need not be part of grammar *per se*. However, it hardly aligns with the Minimalist T-model which is shielded from interaction with other aspects of cognition. Regardless of the computational theory, typically it deals with meaning representations that may go beyond a structural representation at LF. In general, it may be fruitful for computational research to link theory with practical implementation, possibly opening the door to real-time processing in the brain.

2.7 Summary and conclusions

Theoretical accounts of ellipsis resolution can be broadly summarised by the following quote from Kehler (2000:546) "Syntactic theories recover semantics by copying syntactic material, and semantic theories recover it through a form of anaphora resolution." When it comes to the details of specific approaches, we have seen that each approach works as long as one conforms to specific assumptions of the framework in which the approach is proposed. For example, a movement account (with or without deletion) can only be proposed in one corner of syntactic theory, complying with the presuppositions therein. Consequently, it will be very difficult to link such an account to processing theories since derivational steps such as "first move then delete" have no clear analogue in processing terms. Such theories may be elegant within their framework; at the same time they stand in relative isolation.

Or do they? For example, Boone (2014) can be partly seen as a derivational translation of Indirect Licensing proposed by Culicover and Jackendoff (2005). His reference to the non-hierarchical semantic relation that needs to be in place in order to license Gapping (and thereby Stripping) and Fragments aligns with the idea of semantic parallelism at the level of CS. He then uses syntactic trees to represent such a relation, but in fact he is invoking an independent level of representation – discourse. Within his syntax-oriented framework it is common use to invoke something like D-linking to incorporate such a level. However, the effect is that syntactic theory is augmented with an autonomous dimension that, crucially, may not hinge on syntax *per se*. If one would comply with the model as is depicted in Figure 1.2 on page 6, there is nothing syntactic about discourse – or one should at least have a very lenient view of LF's scope. In other words, Boone presents his account as syntactic but in essence it

can be understood as consisting of (at least) two dimensions. The same holds for Winkler (2005) who argues for an interdisciplinary parallel model trying to implement discourse representations within a Minimalist approach. Once again, it is shown that structural approaches try to find ways to discharge Minimalist assumptions.

Finally, the distinction between ellipsis types may only be relevant for theories that involve movement and/or deletion, as it seems redundant for accounts that put less burden on syntactic structure. Theories that involve meaning representations tend to account for Gapping just as they do for other ellipsis types. Given their emphasis on semantic representations, it is relatively easy to link them to computational settings that are typically occupied with meaning representations. Furthermore, accounts that acknowledge autonomous levels are more flexible to incorporate functional levels, which seems essential if one intends to integrate prosody properly.

The simple differentiation between syntactic and semantic accounts has been the driving force behind the current project. The initial idea was to link this differentiation to electrophysiological data. We have only arrived at the end of the second chapter and it already appears that Gapping, and thereby Stripping, cannot be entirely captured in either syntactic or semantic terms as the most promising accounts (will need to) integrate different levels of representations. The next step is to see how these accounts can be connected to existing processing accounts.