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Unifying prosody and syntax for right- and left-edge coordinate ellipsis

John R. te Velde*

Department of Foreign Languages, College of Arts and Sciences, Oklahoma State University, Stillwater, OK 74078 1054, USA

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Abstract

In this article, two types of ellipsis with apparently quite different properties are accounted for in a derivational grammar model that employs both prosodic and syntactic tools for eliminating many of the surface dissimilarities. A central operation of this model is Copy α via Active Memory, adapted from work by Frazier and Clifton [Syntax 4 (2001) 1], whereby an initial conjunct of a coordinate structure is copied and later matched with the second (and subsequent) conjunct(s). Licensing of the ellipse at the right- and left-edges in the respective constructions occurs in a typical asymmetric c-command relation; in right-edge ellipsis, a syntactic feature, mapped to a focus feature in PF, is the licenser, while in left-edge ellipsis, the coordinating conjunction licenses the ellipse. In the derivation of both forms of ellipsis, cyclic rule application in the syntactic component precedes Copy α, i.e. derivation must precede conjunction, reflecting the surface-based properties of the ellipsis types. However, ''deep'' syntactic operations underlie the surface relations and play a crucial role in establishing the domains in which ellipsis operates. It will be shown that these are best accounted for in a derivational model.

Keywords: Active Memory; Conjunction; Copy α; Ellipsis; Matching; Prosody; Symmetry

* Tel.: +1-405-744-9544; fax: +1-405-744-5733.
E-mail address: forljrv@okstate.edu (J.R. te Velde).

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1. Introduction

Two types of ellipsis in coordinate structures will be considered here in a minimalist framework. These are: (1) ellipsis at the right edge of initial conjuncts, and (2) ellipsis at the left edge of non-initial conjuncts. VP ellipsis and sluicing, because they are also found in non-coordinate constructions, and gapping, because it is ellipsis in the ''middle,'' are not considered.

My overarching objective is to compare these ellipsis types for the purpose of identifying the grammatical principles they require and how these can be unified in a derivational grammar. Unification serves the interests of a minimalist framework, and I will argue that a derivational grammar with precisely defined phases is well-suited for purposes of unification. Out of my comparison will come some specific claims. I will assume, as does Hartmann (2000), that right-edge ellipsis employs prosodic principles that appear to be aloof from the syntax. However, I will show that a derivational grammar in which prosody and syntax are interfaced with each other in precise ways is necessary for right-edge ellipsis. This interface consists primarily of an algorithm which maps a syntactic feature necessary for licensing the ellipse to a focus feature in PF. For left-edge ellipsis, I will claim that the ellipse is licensed by the coordinating conjunction, as it possesses the functional properties of a weak probe. The two edges, not surprisingly, require some different grammatical tools. Despite the contrasts, however, both forms of ellipsis utilize the syntactic component in similar ways and the PF component in the same way. In both, the licensing of the ellipse requires a syntactic c-command relation, and in both, the ellipse is created by non-phonetic realization in PF. Thus, underlying the apparently contrasting ellipsis types is a uniform syntactic relation, c-command, and the same ''deletion'' mechanism. Another form of unification is present in the coordinate symmetry required, defined here in terms of matching features.

The organization of this paper is as follows: Section 2 presents the data and Section 3, the questions and issues that these data raise, as well as my proposal for addressing them. Section 4 outlines the aspects of the minimalist framework that enter into my proposal, including a model of a derivational grammar that is deemed necessary for capturing the data. In Section 5, the focus is directed to unification issues within this derivational grammar; of special interest is the formalization of the symmetry inherent in coordination. Conclusions follow in Section 6.

2. The data

In (1) are given examples of right-edge deletion, commonly called Right Node Raising (RNR), from six diverse languages. RNR appears to be universal, a property that follows from the account given in Section 5:[1]

[1] I have also collected examples from Dutch, German, Spanish, Turkish, Modern Greek and Korean. Some of these will be used below, as space allows.

(1) a. Knud holder af e_i og Kirsten beundrer forskerne$_i$ (Danish)
K. be-fond of and K. admire researchers[2]
'Knud is fond of and Kirsten admires researchers'

b. Pierre a acheté e_i et Paul (a) lu [le livre]$_i$ (French)
P. *AUX* bought and P. *(AUX)* read the book
'Pierre bought and Paul read the book'

c. Bill kupil bol´šuju e_i a Džo (kupil) malen´kuju [knigu po fizike]$_i$ (Russian)
B. bought large but Joe (bought) small book on physics
'Bill bought a large but Joe a small book on physics'

d. Anita hallgatja e_i és Péter pedig olvassa [a híreket]$_i$ (Hungarian)
A. listens-to and P. CONTR reads the news
'Anita listens to and Peter reads the news'

e. John-wa hon-o e_i (soshite) Mary-wa shimbun-o [mai asa yomu]$_i$ (Japanese)
J.TOP book.ACC (and) M.TOP newspaper.ACC every morning reads
'John reads a book and Mary a newspaper every morning'

f. wo zhishi ting shuo guo e_i
I only hear say EXP
dan Akiu kan dao guo, [na ge nianying mingxing]$_i$ (Mandarin Chinese)
but Akiu see reach EXP that CL movie star
'I only heard but Akiu saw the movie star.'

By comparison, left-edge coordinate ellipsis occurs on the left edge of post-initial conjunct(s). Three types of left-edge ellipsis (*n*: number of conjuncts are possible) can be identified: (A) a subject gap at the left edge of TP^n in [TP & TP^n]; (B) an object gap at the left edge of CP^n in [CP & CP^n]; and (C) a finite verb gap at the left edge of CP^n in [CP & CP^n].

Only raised, left-edge subjects are eligible targets for deletion in left-edge ellipsis type A.[3] Furthermore, the Spec,CP of the elided conjunct may not be occupied (by a non-subject, (2e)), and the antecedent subject must be at the left edge of TP (2f, g), unless it is a *wh*-element as in (2c). However, the antecedent subject may be preceded by a fronted element in Spec,CP (2b) (all data from German, except (2g), from Dutch):

[2] Danish has no morphological subject–verb agreement, hence its absence from the gloss.

[3] I do not include adverbials among those elements that are elided at the left edge, for two reasons: (1) an adverbial gap in (i) would violate the V-2 rule, cf. (i). (2) Unlike fronted DPs/NPs, adverbials have scopal properties which enable them to extend their domain to a second conjunct without having a presence in the form of a coindexed gap:

(i) Gestern$_i$ hat Peter$_j$ den Aufsatz fertig geschrieben und (*e_i) e_j wollte sofort eine Flasche Wein trinken
yesterday has P. the essay finished written and wanted immediately a bottle (of) Wein (to) drink
'Yesterday Peter finished the essay and immediately wanted to drink a bottle of wine.'

(2) a. [$_{TP}$ Paul$_i$ hat den Salat gemacht und [$_{TP}$ e_i ist dann auswärts essen gegangen]]
P. has the salad made and is then outwards (to) eat gone
'Paul made the salad and then went out to eat'

b. [$_{CP}$ Den Salat hat [$_{TP}$ Paul$_i$ gemacht und e_i ist dann auswärts essen gegangen]]
the salad has P. made and is then … (see (2a) for gloss)

c. [$_{CP}$ Wer$_i$ hat den Salat gemacht und [$_{CP}$ e_i ist dann auswärts essen gegangen]]?
Who has the salad made and is then … (see (2a) for gloss)

d. [$_{TP}$ Paul$_i$ hat den Salat gemacht und [$_{TP}$ e_i wollte danach Pizza bestellen]]
P. has the salad made and wanted thereafter pizza (to) order

e. *[$_{TP}$ Paul$_i$ hat den Salat gemacht und [$_{CP}$ danach wollte e_i Pizza bestellen]]

f. *[$_{CP}$ Beim Vortrag ist ihm [$_{VP}$ ein Fehler$_i$ unterlaufen und
at-the lecture is him a mistake underrun and
[$_{TP}$ e_i brachte ihn zum Stillstand]]
brought him to-the standstill
'During the lecture he made a mistake and came to a standstill' (intended reading)

g. *[$_{CP}$ Tijdens de lezing is hem [$_{VP}$ [iets raars]$_i$ overkomen en
during the lecture is him s.thing strange overcome and
[$_{TP}$ e_i bracht hem helemaal uit zijn evenwicht]]]
brought him completely out-of his balance
'During the lecture something strange came over him and threw him off balance'
(intended reading)

The ellipsis types in (2) must be defined in terms of syntactic domains. In this analysis the domains CP, TP and vP will figure prominently. I will assume that a CP domain is required in German for any declarative main clause which has some fronted element, such as (2b), or for any interrogative clause, such as (2c). A TP domain is required in German for subject-initial main clauses.[4] The vP domain occurs in any construction with a transitive verb. Using these basic assumptions, we note that a subject gap is distinct from the others in that in declaratives it requires conjoined TPs, both of which have a lexically-filled T°. Interrogative subject gaps (cf. (2c)), like object and verb gaps, require the CP domain. When a conjunct is ''smaller'' than TP or CP as in (3a), then no left-edge ellipsis occurs:

(3)
a. [$_{TP}$ Paul [$_{vP}$ made the salad and [$_{vP}$ then bought a pizza]]] (no gap: [vP & vP])
b. [$_{TP}$ Paul$_i$ often makes a salad and [$_{TP}$ e_i will then go out to eat]] (subject gap: [TP & TP])

In (3b) *will* in T° must agree with the element in its Spec,TP. Long-distance agreement with Spec,TP of the first conjunct is out (agreement is only local). This theory-internal assumption leads to the conclusion that a subject gap exists in the second conjunct of constructions like (3b). Empirical support for this assumption will be given in Section 5.2.1.

[4] The assumption about subject-initial main clauses in German is based on Travis (1984).

In contrast to subjects, only left-edge objects in Spec,CP are eligible targets for deletion:[5]

(4) a. [$_{CP}$ Diesen Aufsatz$_i$ hat Peter an einem Tag t_i geschrieben
this essay has P. on a (single) day written
und [$_{CP}$ e_i wollte er nie wieder t_i lesen]]
and wanted he never again (to) read
'This essay Peter wrote in one day and never wanted to read again'

b. *[$_{CP}$ Diesen Aufsatz$_i$ hat Peter an einem Tag t_i geschrieben
und [$_{IP}$ er wollte [$_{vP}$ e_i [$_{VP}$ nie wieder t_i lesen]]]] (see (4a) for gloss)

In addition, the preceding conjunct must have the matching object in Spec,CP, which in the languages investigated here is always at the left edge (no adjunction to CP allowed, cf. (4a)):

(5) a. *[$_{TP}$ Peter hat diesen Aufsatz$_i$ an einem Tag geschrieben
und [$_{CP}$ e_i wollte er nie wieder t_i lesen]] (see (4a) for gloss)

b. *[$_{CP}$ An einem Tag hat Peter diesen Aufsatz$_i$ geschrieben
und [$_{CP}$ e_i wollte er nie wieder t_i lesen]] (see (4a) for gloss)

In English, lacking the V-2 requirement in declaratives, the subject and object gaps may occur together in one construction:[6]

(6) This wine$_i$ a New Yorker$_j$ loves t_i and e_i e_j will usually buy t_i in large volume

An object gap is ungrammatical in English if not combined with a subject gap, unless the finite verb can be fronted to C, as in (7b):

(7)
a. *That book$_i$ Peter hasn't read t_i and e_i he has been avoiding t_i for some time
b. That book$_i$ Peter would never read t_i nor [$_{CP}$ e_i would$_j$ [$_{TP}$ he t_j recommend t_i to anyone]]

[5] If the conjuncts are highly symmetric and the morphology perfectly unambiguous, then a dative DP can be marginally elided from a second conjunct in German:

(i) ?Dem Fremden$_i$ antwortete der Beamte nicht und e_i glaubte er auch nicht
the foreigner.DAT answered the official.NOM not and believed he also not
'The foreigner the official didn't answer, nor did he believe him'

(ii) ?Dem Sohn$_i$ gab die Mutter gar nichts und e_i bereitete sie sogar Probleme
the son.DAT gave the mother.NOM at all nothing and prepared she even problems
'To her son the mother gave nothing at all and even created problems for him'

[6] Note that the equivalent of this construction would never be generated in German—with two gaps at the left edge—because the fronting of any VP element to Spec,CP always requires V-to-C, in which case the subject remains in Spec,TP and cannot elide because it is no longer at the edge:

(i) Diesen Wein$_i$ mag ein Mainzer$_j$ t_i und e_i kauft *e_j/er$_j$ gewöhnlich t_i in großen Mengen
This wine.ACC likes a Mainzer.NOM and buys he usually in great volumes

Note also that the good version of (i) provides independent evidence that the left-edge gap exists: Without the (syntactically real) object gap, a V-2 violation would occur.

Finally, only left-edge finite verbs in interrogative V-2 clauses can elide (on this in Dutch, see Hoekstra, 1994). I will assume in Section 4 that these verbs occupy the C of CP position; hence, a finite verb gap always requires the CP domain:

(8)
a.	Läuft$_i$	Paul t_i	nach	Hause	und e_i	Peter t_i	zur	Schule?	(German)
b.	Loopt$_i$	Paul t_i	naar	huis	en e_i	Piet t_i	naar	school?	(Dutch)
	walks	P.	to(ward)	house	and	P.	to(ward)	school	

English equivalents of (8) are also acceptable; they can occur with or without Gapping. I assume that since *do* may elide alone without ellipsis of the verb (Gapping), we have evidence that a finite verb gap is also possible in English, as it is in German and Dutch, i.e. it is not a form of, nor a part of, Gapping:

(9)
a. Does$_i$ Paul walk$_j$ home and e_i Peter walk/e_j to school?
b. Does$_i$ Paul walk home and e_i Peter ride with his mother?

We turn now to syntactic issues of coordinate ellipsis that arise from these data.

3. Issues, questions and my proposal

The issues that the data in (1)–(9) raise are many and varied. I will focus on those that appear most relevant to finding the common ground shared by the two types of ellipsis.

3.1. Right- and left-edge asymmetries

The right- and left-edge asymmetries in the data above give rise to the question of what corollaries might exist between them and the asymmetries of the right versus the left conjunct. More specifically, we should ask: How are the edges (versus the ''middle'') different as targets of ellipsis? In the case of RNR, we note that the gap precedes the lexical counterparts (pendant), a configuration that raises related questions: What licenses the gap? How is the gap recovered for interpretation in LF? If we assume that rightward raising is out, following minimalist assumptions about movement (leftward only), we must rule out the possibility of a c-command relation between the pendant and gap.

There is another option for licensing. Hartmann (2000) proposes that licensing in RNR is accomplished with prosody. RNR has the following prosodic requirements: (1) rising or steady intonation at the end of the initial conjunct (before the gap), and (2) a (slight) pause before the pendant of the gap at the right edge of the second conjunct. If we assume Hartmann's prosody-based theory of licensing, we must ask: What does licensing have to do with the prosodic requirements of RNR? And: How does prosody interact with the right edge of conjuncts?

The data on left-edge ellipsis indicate that the gap follows the antecedent in each case, and that a CP (a ''barrier'' to anaphor-antecedent relations in non-coordinate structures)

may intervene between the two. Questions arising here include: Are licensing and recovery syntactically based (as suggested by the asymmetric relation between antecedent and gap)? If so, what defines the domain of licensing and recovery? And finally: Why doesn't prosody matter in left-edge ellipsis?

In the remaining subsections of Section 3, I will address these questions in somewhat more detail and indicate my answers to some of them, thus providing a starting point for the analysis in the remaining sections. An assumption that space limitations will not allow us to consider extensively is the issue of the symmetry and asymmetry of coordinate structures. Hartmann addresses this in some detail and comes to the conclusion that an asymmetric relation exists between conjuncts. It is also discussed at great length in Johannessen (1998) and is a topic of investigation in Camacho (1997) and te Velde (in preparation). Central to the analysis in this paper is the claim that many coordinate symmetries exist independently of the asymmetric phrase-structural relations between conjuncts. In Section 5 we will see that the interface with Active Memory where Copy and Match occur is the basis for these symmetries.

3.2. A basic comparison of RNR and left-edge deletion

My general working assumption will be that phonetic identity and prosodic parallels between the conjuncts are required in RNR.[7] However, RNR requires more than phonetic and prosodic rules. On this point, my proposal differs from Hartmann's (2000: 53) who states: "The RNR dependency . . . cannot be syntactic." I will argue that the "dependency" between the gap and the pendant must be "set up" in the syntactic component, for the simple reason that unless licensing of the gap and feature matching occur as final steps in cyclic rule application, no RNR ellipsis can occur in PF.

The fact that syntactic non-constituents can be targets of ellipsis in RNR points to the related fact that prosody plays a role in the syntactic licensing and in the recovery of the gap in the perceptual stage. Prosody at the right edge of clausal conjuncts normally serves to signal the status of the clauses as indicative or interrogative. In the case of RNR, it signals that the clause is incomplete. RNR prosody is able to establish a dependency necessary for licensing and recovery between an ellipse and a matching pendant because of the symmetries in the RNR construction, to be outlined in detail in Section 5.1. However, these symmetries are established by the syntactic derivation of the construction and the syntactic relations that result. For instance, not just any combination of two right-edge

[7] Note that in Gapping phonetic identity is not an absolute requirement when only [±pl] is asymmetric:

(i) Paul has$_i$ five brothers, and he and his brothers e_i six sisters

It appears in (ii) that phonetic identity is also not a requirement of RNR (from Postal, 1998: 173; his judgment):

(ii) The pilot claimed that the first nurse *e* and the sailor proved that the second nurse *was a spy / were spies

The plural verb can be explained if we assume that the verb is assigned [pl] as if it agreed with conjoined DP subjects, and, most importantly, that this agreement rule is not affected by the ellipsis operation which targets **only** phonetic features and not formal features like [±pl], i.e. [-pl] on the gap is not deleted, but rather combines with [-pl] on the second verb to form a plural set ([-pl] + [-pl] = [+pl]), which is then phonetically realized as *were*.

constituents can be targeted, once RNR prosody has been applied:[8]

(10) a. *Bill wrote e_i e_j and Sue read [a paper]$_i$ [in the afternoon]$_j$
b. Bill wrote e_i e_j and Paul read [his sister]$_i$ [a letter]$_j$

The matter of when and how RNR targets multiple syntactic constituents will be left to further research. What can be ascertained on the basis of (10) is that syntactic relations constrain the choice of target and that RNR prosody is not autonomous of the syntax (see footnote 8 also).

With respect to left-edge deletion, we cannot automatically conclude that multiple constituents may not be targeted, just because prosody does not play any role in the licensing of subject, object and finite verb gaps. In fact, we saw in (6) that multiple syntactic targets CAN be targeted. My assumption will be that two factors constrain what may be targeted: (1) the nature of licensing at the left edge of non-initial conjuncts: the ellipse is c-commanded by a syntactic licenser; and (2) the fact that these ellipsis types occur in Spec positions of the functional domain (with the exception of left-edge finite verb gaps, cf. Section 5.4), which are goals (landing sites) of movement. Because of the syntactic c-command relation at the center of licensing in left-edge deletion, prosody plays no role. Of course, the necessary prosody may not be available at the left edge in the languages under investigation (see discussion in Section 5.1).

One striking property common to both right- and left-edge ellipsis and all coordinate structures is the symmetry required. Much has been written about this property, often with proposals for symmetric phrase structures to capture it (cf. Goodall, 1987; Grootveld, 1994; Wesche, 1995). I will propose that the property of coordinate symmetry should be defined in terms of feature sets: the fact that certain sets occur in all conjuncts, and that they have the same grammatical relations in all conjuncts with other feature sets. These ''redundancies'' form the basis of coordinate symmetries that are captured in a matching operation that occurs via an interface with Active Memory which provides copies for setting up matching in Goodall's parallel structures, or Grootveld's 3-D structures. Active Memory is itself not part of syntactic phrase structure or derivation in the model I will propose; it is only a ''storage facility.''

3.3. My proposal: an overview

In my proposal to be outlined in more detail in the next section, I will make the following assumptions:

[8] An anonymous reviewer pointed out that (i), which is very similar to (10a), is acceptable:

(i) Bill wrote and Sue read two reviews in just under one hour

The only difference between the two is that *in just under one hour* is a manner adverbial and therefore most likely occupies a different position than the temporal adverbial in (10a) which does not as readily form a constituent with the verb for deletion purposes. Note that the indirect and direct objects in (10b) are both dominated by the vP and can therefore be targeted and licensed together under the assumptions made here about RNR.

(1) The symmetry of an RNR structure combines with its prosody for recovery of the RNR gap.
(2) Symmetry is determined on the basis of shared syntactic, semantic and prosodic features.
(3) A syntactic feature mapped to a focus feature in PF must be present in the derivation prior to Spell-Out.
(4) This feature must enter the derivation for licensing the ellipse in the syntactic component.
(5) The left edge of a non-initial conjunct can be targeted for deletion because of its local relation to the coordinating conjunction [&] which has functional features for licensing and probing to the right.
(6) The symmetry of structures with subject, object or finite verb gaps combines with the syntactic (functional) properties of [&] and the conjuncts themselves for the identification of the antecedent.
(7) In all forms of edge-ellipsis, the symmetry of coordinate constructions facilitates matching, without which the recovery of gaps would not be possible.

We move on now to consider how this proposal can be couched in a minimalist framework.

4. Coordinate ellipsis and the minimalist program (MP; Chomsky, 1995, 1998, 1999)

A general assumption made here about coordinate ellipsis is that it manifests an economy principle; avoiding PF realization of phonetic features is a desirable short-cut. Additionally, coordinate symmetry supports economy because it lessens the computational burden. Furthermore, I assume for reasons of unification that the syntactic derivation operates within an asymmetric phrase structure (all phrases are constructed as Spec-head-complement structures), but this asymmetry does nothing to neutralize the symmetries of coordinate structures, simply because these symmetries can be captured in the feature sets and relations between these sets common to all conjuncts.

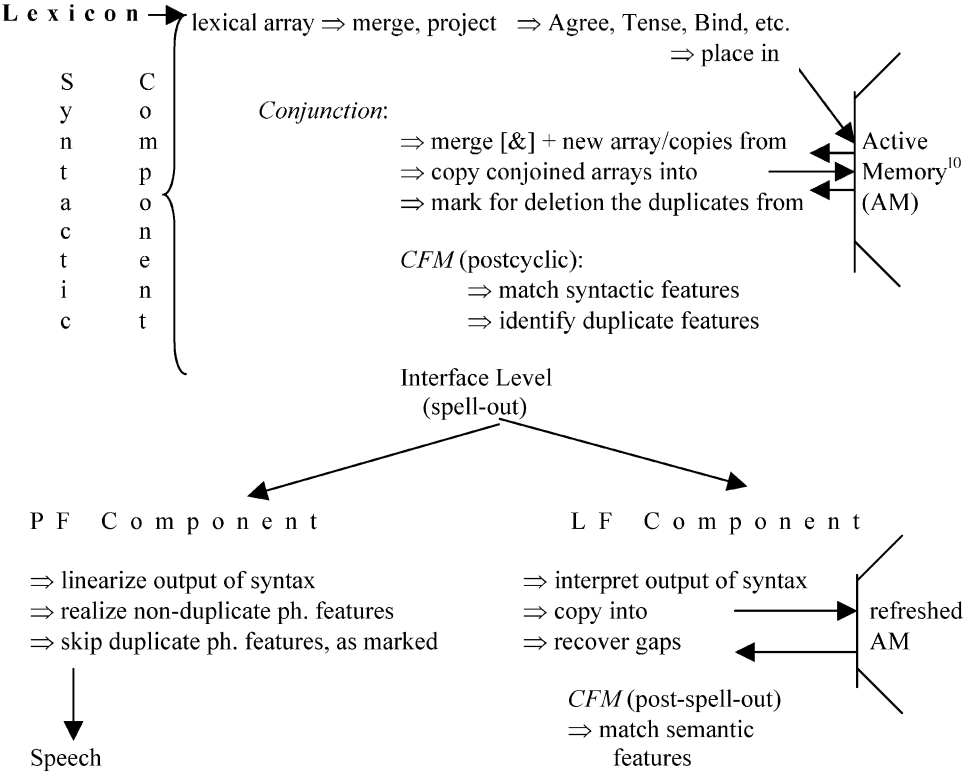
4.1. Derivation by phase and the interface with Active Memory

An operation essential to the derivation of coordinate structures, regardless of syntactic model, is the matching of lexical items. Given the minimalist assumption that all lexical items consist of feature clusters, I will assume that matching in coordinate ellipsis occurs on a feature-by-feature basis. I will refer to this matching as Coordinate Feature Matching. In the model presented here, I propose that Active Memory, located outside of the syntactic component, temporarily stores phases and subarrays that are to be matched (cf. Chomsky, 1999: 9).[9] Active Memory is bounded up to the next phase (i.e. up to the CP phase, cf. Chomsky, 1999: 11). This means that one vP phase must be spelled out and erased from Active Memory before another phase can be placed in it. A vP phase occurs when the VP

[9] Coordinate Feature Matching differs from feature matching in simplex structures in that it never eliminates any features but rather determines what features, whether syntactic or semantic, are duplicates. Duplicates can, in the case of syntactic features mapped to phonetic features, be marked for non-realization (a type of elimination), but only for reasons of economy.

projected from the lexical array that was selected from the lexicon undergoes cyclic rule application. Coordinate symmetry, I will argue, acts as an aid to Active Memory so that two or more CONJOINED vP or CP phases can be stored at one time, if symmetry is high. For ellipsis to occur, syntactic features mapped to phonetic features in PF must be matched with identical features in another conjunct. This matching operation identifies which features are redundant and can be marked accordingly within the cyclic computation, resulting in the non-realization of the corresponding PF features. In (11) is a sketch of a grammar model in which Active Memory, located outside of the grammar model, interfaces with the syntactic component:[10]

(11) **Derivational Grammar Model for Conjunction with Coordinate Feature Matching (CFM)**



[10] Frazier and Clifton's (2001) theory is designed to account for differences in reading speed when subjects encountered coordinate versus non-coordinate structures. It is, therefore, intended for the perceptual side of language, whereas my theory addresses the conceptual side. They argue that Copy α is a cost-free structure building operation in certain coordinate structures (cf. left arrow). Copying must, however, be followed by a matching operation in a derivational model like (11) to determine whether the copy is what is wanted. Such matching can take place in AM. Matching is also presumably required in the LF component for recovery and interpretation, but not in PF, if syntactic features mapped to PF features are matched earlier in the syntactic component.

In the derivation of coordinate structures, one conjunct, if a phase, enters Active Memory before the second one is syntactically derived. The second (and subsequent) conjuncts are syntactically derived while the first is maintained in Active Memory; this allows copying from it whenever possible. Because the entire foregoing conjunct is never copied in its entirety, but rather new feature clusters are added, the first and subsequent conjuncts must be matched with a copy from Active Memory to determine what features and structures are duplicates. If syntactic features mapped to PF are duplicated in positions that can be licensed, then these can be marked for non-realization in PF. At this point, the derivation reaches the interface level. Both/all conjuncts are placed in PF together, where non-realization of features results in ellipsis.[11]

4.2. Matching and symmetry in coordination: properties and independent evidence

For a coordinate structure to have properties of symmetry, a minimum number of features (syntactic, semantic, phonetic) must match. Matching is triggered by the merging of [&]. The scope of syntactic matching is based on what precedes [&], but it is never larger than a phase for the types of ellipsis considered here. The structural configurations and syntactic relations must also match (evident most obviously in the edgeness requirement). In (11) are listed the elements of symmetry necessary for RNR to occur:

(11) Symmetry in RNR: Elements of symmetry include:
- a. location of gap and pendant: right edge of each conjunct
- b. the category that immediately dominates the gap also immediately dominates the pendant
- c. the category that dominates each conjunct is the same
- d. the category of the sister of the gap and its pendant is the same in each conjunct

Independent evidence that matching and symmetry are necessary in coordinate ellipsis comes from the elliptical constructions in (12):[12]

(12)
a. Bill wrote$_i$ a letter and Barb *e_i/wrote on the computer
b. Sue always orders e_i but Sam usually declines / #dislikes [buttered popcorn]$_i$
c. Jill enjoys visiting relatives, but Jim doesn't (enjoy it/them)[12]
either: Jill enjoys going to visit relatives, but Jim doesn't enjoy going to visit relatives
or: Jill enjoys relatives who come for a visit, but Jim doesn't enjoy relatives …

[11] It should be noted that the only operations of AM are Copy and Match. No syntactic operations are possible in AM because it is not part of the syntactic or LF components. These components simply exploit AM for economizing the derivation. In coordinate structures, economy is evident primarily in duplicate structures and gaps; these create the often-noted parallelisms of coordinate structures.

[12] This construction is based on one in Lang (1984: 52).

In (12a), the ellipse (by Gapping) is ruled out because the selectional properties of the two *writes* don't match. In (12b), *dislikes* is ill-formed because *order* and *dislike* aren't semantically symmetric. In (12c), the VP ellipse must be interpreted by matching with the antecedent VP.

Psycholinguistic experiments (see Levelt, 1989; Dubinsky et al., 2000; Frazier and Clifton, 2001) support the assumption that Active Memory stores structures for copying and matching purposes. Highly symmetric/identical conjuncts require less processing time. I assume that in derivation, both form and features are matched, using a structure and its elements (in the form of feature sets) as a template.[13,14] Matching determines not only form, but also content identity. In RNR, prosody provides the licensing by signaling phonetic non-completion. In left-edge deletion, a syntactic head-complement relation between [&] and the following conjunct is the necessary relation for licensing the ellipse. We will see below that in both, licensing requires a c-command relation.

5. Applying the model to right- and left-edge ellipsis

In this section, we turn to the detailed application of the model described in Section 4 for the derivation of the ellipsis types described in Sections 2 and 3. We will see that for each type, a sequencing within derivation by phase in the syntactic component is necessary to get the correct output, and that this type of derivation achieves the desired level of economy.

5.1. RNR

In RNR, prosody and derivation by phase combine for greater economy through ellipsis. The matching of features in opposite conjuncts makes possible the recovery of the ellipse.

We note first that an intonational feature at the right edge of any clause marks its status as declarative or interrogative:

[13] Cf. Wilder's (1997) two conditions for ellipsis: (1) form identity, and (2) licensing.

[14] Note that Coordinate Feature Matching is not simply an operation which matches phonetically identical strings:

(i) *Paul had ~~a wreck because he was driving~~ asleep, and Peter caused a wreck because he was driving drunk

What prevents (i) is the inability of prosody to license the gap, which is not at the right edge. In cases like (ii) (see also Postal, 1998: 173 for another example) RNR targets an element within an embedded clause that is not a phonetic match. This is possible also in Hungarian (iii, from Miklós Gáspár, p.c.):

(ii) Peter believed$_i$ that Sally e_j and Paul e_i that Sue [??has/?have enrolled in ROTC]$_j$

(iii) Péter tegnap ~~vásárolt~~ én pedig tegnapelõtt vásároltam
P. yesterday shopped.3SG I CONTR yesterday-before shopped.1SG

The grammaticality is somewhat degraded in (ii), and the construction is grammatical with *have*, if at all, for these reasons: (1) the feature [±plural] is a formal feature and is therefore not included in the target of deletion (see footnote 7); (2) the symmetry is very high; (3) the complementizer *that* has no semantic content; and (4) the embedded clause has been elided all the way up to the subject; thus the computational burden is reduced.

(13) a. All the by-standers saw the accident↘
b. Did all the by-standers really see the accident↗

In RNR, this intonational feature is manipulated to mark an ellipse: rising (↗) or steady (→) intonation signals "incompletion" of PF spell-out (presence of null phonetic features):[15]

(14) a. Paula writes ↗ and Paul reads long novels
b. Peter makes coffee →/↗ and Petra brews tea on the old black stove

A pause (□) in the second conjunct, used to signal the location of the pendant, provides a symmetric counterpart to the rising or steady intonation in the first conjunct. These prosodic features immediately precede another parallel: a gap in the first, and its pendant in the second conjunct:

(15) a. [$_{C1}$ The by-standers related ↗/→[*e*]$_i$ and [$_{C2}$ the police recorded □ (C = conjunct)
[the details of the accident]$_i$↘]]
b. [$_{C1}$ Die Beistehenden erzählten ↗/→[*e*]$_i$ und [$_{C2}$ die Polizei dokumentierte □
[die Einzelheiten des Unfalls]$_i$ ↘]] (translation/gloss of (15a))

The assumption that each conjunct of an RNR construction is a phase is supported by the prosodic properties of (16a, b, c, d), which are not cases of RNR, and, therefore, do not require the prosodic features of an RNR construction just described:

(16) a. I know both over- and underinsured motorists
b. Wir haben alle Türen auf- und wieder zugeschlossen (German)
we have all doors up and again to-closed
'We opened and closed all the doors'
c. Bill is writing and editing many books on climate change
d. Erik kender og holder af Karen. (Danish)
E. know and be-fond of K.

I will, therefore, assume that RNR conjuncts are always minimally TPs, requiring at least the vP phase.

5.1.1. Matching, symmetry and deletion

Neither PF Focus features nor their syntactic counterparts mapped to them can identify the suitability of a target, only the location of where the gap is to be/has been

[15] Whether focus accent, accompanied by rising intonation, is always required in RNR, as claimed in Hartmann (2000), can be debated. It doesn't appear to be a requirement of every RNR construction in English, cf. (14b).

generated, and where the pendant is located. Feature matching, triggered by [&], is required to identify a suitable target. Neither RNR prosody nor feature matching can occur in a [matrix [$_{CP}$ embedded]] construction lacking a coordinating conjunction:[16]

(17) a. [$_{C1}$ Harry has written ↗ [*e*]$_i$ [$_{C2}$ and Hanna has read □ [many stories about the Aztecs]$_i$]]
b. *[$_{TP}$ Harry has written ↗ [*e*]$_i$ [$_{CP}$ because Hanna likes □ [stories about the Aztecs]$_i$]]

However, syntactic asymmetry and coordinate symmetry combine to create the unique properties of RNR: Syntactic asymmetry rules out right-to-left c-command for licensing the gap as well as a rightward raising operation, while coordinate symmetry, in the form of feature matching, ensures that licensing and recovery of the ellipse are possible.[17]

5.1.2. Sequencing in the derivation

Essential to a prosodic approach to RNR are the prosodic features (↗ and →); I will call both the Non-Final Intonation feature. This feature, as a type of focus feature, is realized in PF and is therefore not part of narrow syntax, following work of Rooth (1992), Selkirk (1995) and Schwarzschild (1999). Rather, a syntactic feature, represented here with upward and straight arrows, is mapped by an independent algorithm to the focus feature in PF. The focus feature as audible output of PF is functional for licensing the gap only in the PERCEPTUAL STAGE after realization in speech. It is crucial for the model presented here that this focus feature have a syntactic corollary, for it is this corollary which licenses the ellipse in the CONCEPTUAL stage, i.e. in the derivation of an RNR construction. For simplicity's sake, I will refer to both this syntactic corollary and the focus feature it is mapped to as the Non-Final Intonation feature.

In the syntactic component, the merging of the Non-Final Intonation feature must occur after movement operations are complete. Merging this feature prior to Move produces ungrammatical derivations:[18]

[16] The only exceptions tolerated by some speakers are with complementizers like *while* and *that* (see footnote 14) which are rather neutral w.r.t. their subordinating properties. I assume they do not establish their own syntactic domains:

(i) ?Bill read while Sue wrote the long letter to their family

[17] See Cheng and Rooryck (2000) for an account of *wh*-in situ in Chinese which utilizes prosodic licensing.

[18] I am using the term 'merge' here in a broad sense, aware of the fact that prosodic features are not lexemes for which 'merge' is intended. The operation might be a case of encliticization.

(18) Ellipsis prior to fronting to Spec,CP in German (NFI = Non-Final-Intonation):

Lexical array1:	*Ilse viele Aufsätze schreiben*
	I. many essays write
Agree and Tense:	*Ilse schreibt viele Aufsätze*
Lexical array2:	*und Erika viele Aufsätze lesen*
Agree and Tense:	*und Erika liest viele Aufsätze*
match duplicates:	*Ilse schreibt* [*viele Aufsätze*] *und Erika liest* [*viele Aufsätze*]
merge NFI-feature:[18]	*Ilse schreibt* ↗[*viele Aufsätze*] *und Erika liest* → [*viele Aufsätze*]
license duplicates:	*Ilse schreibt* ↗[~~*viele Aufsätze*~~] *und Erika liest* → [*viele Aufsätze*]
Front to Spec,CP:	~~*Viele Aufsätze*~~ *schreibt Ilse und Erika liest viele Aufsätze*
PF realization:	**Schreibt Ilse und Erika liest viele Aufsätze*

The derivation in (18) crashes because an ellipse at the left edge of the first conjunct cannot be recovered. A crash can be prevented if further syntactic derivation is blocked after the Non-Final Intonation feature is merged, resulting in the grammatical *Ilse schreibt* e_i *und Erika liest* [*viele Aufsätze*]$_i$. Whether the merger of a syntactic feature like the Non-Final Intonation feature that is mapped to a focus feature in PF can, by some independent principle of the grammar, preempt further syntactic derivation is a question that I will leave to further research.

5.1.3. Summarizing RNR and a final observation

I have shown that a derivational grammar model, with proper sequencing and an interface with the accessory AM outside of the syntactic component, is capable of accounting for the properties of RNR. A prosodically-mapped feature must be selected in the syntactic component, and the entire coordinate structure must be checked by feature matching in Active Memory before PF realization of any features. Matching of a copy from Active Memory with a derived structure is required for the recovery of the RNR gap.

The amount of linguistic information that must be maintained in Active Memory represents the well-known PROCESSING CHALLENGE that RNR constructions pose. COORDINATE SYMMETRY is essential to meeting this processing challenge.

We consider next how left-edge ellipsis can be accounted for in the derivational model we have used for RNR.

5.2. Left-edge subject gaps

Left-edge ellipsis differs markedly from right-edge ellipsis in terms of configuration; for this reason, the way the gap is licensed differs. In RNR, a prosodically-mapped feature c-commands the gap; in left-edge deletion, a lexeme, the coordinating conjunction, licenses the gap.

We begin with a related issue: Does a left-edge subject gap actually exist? In Section 2, I presented theory-internal evidence for this assumption and with it suggested a way to unify the derivation of left-edge subject and object gaps: each occurs in a distinct domain, but both utilize the same syntactic mechanisms for deriving these domains. The main differences between the two are: (1) the subject gap occurs in the TP domain (unless the subject is a *wh*-element, cf. (2c)) and the object gap in the CP domain; (2) a subject gap

does not head a syntactic chain; the object gap does. Despite these differences, they behave the same in left-edge ellipsis.

5.2.1. Evidence of the gap

One form of independent evidence that the left-edge subject gap actually exists is available from the fact that the antecedent and gap do not necessarily have the same referent:[19]

(19)
a. [A woman] is currently mayor and [*e*] has occasionally been the head of state in England
b. [Eine Frau] ist Außenministerin in Amerika und [*e*] wird bald Präsidentin in Deutschland
a woman is foreign-minister in A. and becomes soon president in Germany

This kind of disjoint reference, in which the subject gap and the lexical element in the parallel position of the first conjunct have a different referent, is obtainable, despite symmetric (identical) phonetic, semantic, structural and Case features; binding symmetry, necessary for a mutual referent, is exempted for the disjoint interpretation. Although disjoint reference of this sort is uncommon in coordinate structures, its availability is evidence that the subject gap actually exists in constructions like these.[20]

5.2.2. Licensing the ellipse

My assumption about the licensing of the subject gap is that [&] has a functional property for licensing such an ellipse. As part of its function set, [&] can probe and license to its right (only). This is supported by the fact that [&] forms a constituent with the conjunct on its right, but not with the conjunct on its left.[21]

Related to these properties of [&] is the fact that [&] and the subject gap must be adjacent:

(20) a. *[$_{TP}$ Paul$_i$ hat den Salat gemacht und [$_{CP}$ danach wollte e_i Pizza bestellen]]
b. [$_{TP}$ Paul$_i$ hat den Salat gemacht und [$_{CP}$ e_i wollte danach Pizza bestellen]]
P. has the salad made and wanted thereafter pizza (to) order

For these reasons, I will assume that [&] can license to its immediate right, but not its left. Therefore, it plays no role in the licensing of an RNR gap, but it does license left-edge gaps.

The properties that I attribute to [&] as a licenser of left-edge gaps and the properties of the gaps themselves are summarized in (21):

[19] See arguments in Büring and Hartmann (1998) for the existence of the subject gap. For evidence of the object gap, see footnote 6.

[20] Assuming that the ellipse exists only in constructions like (20) would run counter to general principles of generative grammar.

[21] A complementizer (C) also forms a constituent with the embedded clause that it introduces. A [C] and a [&], however, differ in significant ways. In very general terms, a [C] creates subordination, while a [&] creates coordination. One indicator of the syntactic difference between the two can be seen in the fact that [C + TP] can move in a derivation (*Paul knows* [*that he did well*] ⇒ [*That he did well*] *Paul knows*), but [& + TP] cannot move (*Paul knows the answer* [*but Peter is stumped*] ⇒ *[*But Peter is stumped*] *Paul knows the answer*).

(21) [&] as a licenser of subject and object gaps

a. [&] is a defective probe for two reasons: (1) it is not ϕ-complete, and (2) it does not induce movement; rather, it induces a search to the right in the form of feature matching. A full probe seeks a matching goal and induces Move or Merge to satisfy Agree for the elimination of uninterpretable features, cf. Chomsky (1998: 37; 1999: 4–5).

b. The left edge of a conjunct often contains a lexically redundant position, i.e. a lexical item does not need to occur there, if coordinate symmetry provides for its recovery.

c. A lexically redundant position could be a Spec,TP or Spec,CP position, or two adjoined Spec,TPs (as in English), or the head of C position.

d. These positions are lexically redundant because they simply offer goals (''landing sites'') for fronted lexical items already present in the numeration: objects and finite verbs are heads of chains whose feet are copies. Subjects in Spec,TP do not head a chain, but they are displaced; furthermore, the Spec,TP position, because of the Extended Projection Principle feature, does not have to be lexically filled, if agreement morphology is sufficiently rich (as in *pro*-drop languages like Spanish and Italian).

e. Subjects, objects and finite verbs on the left edge of TP or CP conjuncts occupy lexically redundant positions and are, therefore, easy targets of deletion, if they have antecedents in the previous conjunct with the same features and in the same positions.

SYMMETRY is essential to ellipsis and plays an important role in [&] licensing a gap. Note that in (22) the conjuncts of each construction must have the same configuration in the sense that both the antecedent and the gap must be at the edge of the conjunct, and both conjuncts must have the same projection (22a), with an antecedent subject in VP, does not meet these requirements, but the equivalent with a raised subject, (22b), does:

(22)

a. *[$_{CP}$ Beim Vortrag unterlief [$_{TP}$ ihm [$_{VP}$ ein Fehler$_i$
at-the lecture underran him a mistake
und [$_{TP}$ e_i war besonders gravierend]]]]
and was especially serious
'At the lecture he made a mistake, and it was especially serious' (intended reading)

b. [$_{TP}$ Der Fehler$_i$ unterlief ihm beim Vortrag und [$_{TP}$ e_i war besonders gravierend]]
the mistake underran him at-the lecture and was especially serious
'He made the mistake at the lecture and (it) was especially serious'

5.3. *Left-edge object gaps*

Earlier I stated that the object gap is syntactically very similar to the subject gap, with the main difference that it occurs in the CP domain and heads a syntactic chain. There is one interesting exception to the CP domain requirement. In English, which lacks the V-2

requirement and allows fronting to an adjoined TP, the object gap must ''piggy-back'' on the subject gap. Otherwise it is ungrammatical, unless V-to-C occurs and the object gap is fronted to the Spec,CP position:

(23)
a. [$_{TP}$ This wine$_i$ a New Yorker$_j$ loves t_i [and [$_{TP}$ e_i [$_{TP}$ e_j will often buy t_i in large volume]]]]
b. [$_{TP}$ *That book$_i$ Peter hasn't read t_i [and [$_{TP}$ e_i he has been avoiding t_i for some time]]]
c. [$_{TP}$ That book$_i$ Peter would never read t_i [nor [$_{CP}$ e_i would he recommend t_i to anyone]]]

In languages like German which have a V-2 requirement, the object gap cannot piggy-back on the subject gap:

(24) a. *[$_{CP}$ Diesen Wein$_i$ mag [$_{TP}$ ein Mainzer$_j$ t_i
This wine.ACC likes a Mainzerian.NOM
[und [$_{TP}$ e_i [$_{TP}$ e_j kauft gewöhnlich t_i in großen Mengen]]]]
and buys usually in large volumes
b. [$_{CP}$ Diesen Wein$_i$ mag [$_{TP}$ ein Mainzer$_j$ t_i
[$_{CP}$ und [$_{CP}$ e_i kauft [$_{TP}$ er$_j$ gewöhnlich t_i in großen Mengen
… he …

A comparison of (23) and (24) indicates that the object gap requires a distinct syntactic domain, the CP, to occur autonomously, i.e. without ''piggy-backing'' on the subject gap.

5.4. *Left-edge finite verb gaps*

In (25) (repeats (8)) are given two examples of left-edge finite verb gaps:[22]

(25)	a.	Läuft$_i$	Paul t_i	nach	Hause	und e_i	Peter t_i	zur	Schule?	(German)
	b.	Loopt$_i$	Paul t_i	naar	huis	en e_i	Piet t_i	naar	school?	(Dutch)
		walks	P.	to(ward)	house	and	P.	to(ward)	school	

Gapping of a left-edge finite verb is the only type of left-edge ellipsis that doesn't target a Spec position; instead, it targets [C], a head position. For this reason my comments here are not intended as a thorough analysis but must remain more speculative.[23]

[22] Constructions in English similar to those in (25) are:

(i) a. [$_{CP}$Has [$_{TP}$Peter finally [$_{vP}$ read this book and [$_{vP}$ written a review of it]]] ?
b. [$_{CP}$ Were [$_{TP}$ Peter to [$_{vP}$ write the review and [$_{vP}$ publish it ...]]]]

A significant difference between these and those in (25) is the lack of any element in Spec,TP of the second conjunct. For this reason I see no need for the TP and CP projections in the second conjunct (cf. discussion of (3)). The derivation of (i) thus does not require more than one phase and starts out with a lexical array that projects into conjoined VPs with just one subject in a single Spec,VP. For more discussion see te Velde (2002).

[23] It should be pointed out that because a finite verb gap is possible only in the CP domain, V^T-to-C must occur before the derivation is copied in AM and serves as a ''template'' for the second conjunct. In other words, the copying is post-cyclic, cf. discussion of (18).

The fact that a verbal head can be targeted suggests that, if [&] licenses left-edge ellipsis, then its licensing properties are not restricted to a specific category. This non-category-specific licensing could suggest that symmetry and matching play a large role in licensing, as well as in recovery. This would be an interesting topic for further research.

6. Conclusions

I have proposed that a grammar for RNR requires the unification of prosodic and syntactic features in the syntactic component for proper derivation. RNR capitalizes on the fact that the right edge of a clause is a prime area for prosodic manipulation, since intonational features at that point in PF realization signal the status of the foregoing structure. This prosody occurs independently of coordination. In RNR, prosodic manipulation combines with the symmetry (parallels) of coordination for the recovery of an ellipse. The prosody is subject to syntactic domains in that prosody as a licensing mechanism for ellipsis depends on the symmetry of conjuncts, defined in terms of domains. Furthermore, a c-command relation underlies the licensing, and syntactic operations and parameters provide the tools and framework for the derivation.

In the case of subject, object and finite verb gaps, the left edge of a clause becomes a prime area for syntactic manipulation because of its redundancy and adjacency to [&]. Because movement is leftward in a minimalist model, movement exists inter alia to create functional syntactic domains. Spec positions in these domains do not need to be lexically filled in coordinate structures (they are ''lexically redundant'') if coordinate symmetries are able to recover whatever lexical features are required for interpretation. The gaps assure the functionality of these positions. Left-edge elements are hierarchically superior by the Linear Correspondence Axiom (Kayne, 1994) vis-à-vis the rest of the clause. However, the left edge of a conjoined clause is hierarchically inferior to, and within the local domain of, [&], a weak probe, used in left-edge ellipsis for licensing.

The left edge, in contrast to the right edge, is unsuitable for prosodic manipulation. However, left-edge ellipsis, like RNR, is highly symmetry-sensitive. In addition, left-edge ellipsis is domain-sensitive because of syntactic movement (in RNR no movement is required). For this reason, each type of left-edge ellipsis investigated here can be clearly identified with a particular syntactic domain. RNR is also defined in terms of domains and phases: any domain ''less'' than TP does not produce RNR. These domains require precisely sequenced derivational steps in the syntactic component. These properties suggest that a derivational grammar similar to the one outlined here is desirable for an account of right- and left-edge ellipsis.

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