

# Structure Removal: A Synopsis

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## 1. Introduction

In current Minimalist approaches to syntax, structures are built bottom-up in an incremental fashion. Consequently, syntactic derivations involving cyclic application of Merge at the root are assumed to involve a monotonic increase in hierarchical structure, with little or no modification of already built structure (cf. *No Tampering Condition*; Chomsky 2005:13). This all follows from the assumption that the only structure-building tool available to syntax is Merge (Chomsky 1995 *et seq.*).

That said, there is a long tradition, going back to the earliest transformational work, of assuming that syntactic operations can also remove parts of an existing syntactic representation. This began with early transformational approaches such as S-Pruning in Ross (1967), and has been a recurrent theme ever since. This volume presents a collection of papers exploring the concept of syntactic *Structure Removal* from varying empirical and methodological perspectives. In this introduction, I will trace the historical development of some core concepts of Structure Removal that have been proposed so far.

## 2. Tree Pruning (Ross 1967)

In his dissertation, Ross (1967, 1969) proposed a process of Structure Removal, referred to by him as *Pruning*, that deletes non-branching S nodes in a structure.

(1) *S-Pruning* (Ross 1967:44):

Delete any embedded node S which does not branch (i.e. which does not immediately dominate at least two nodes).

Ross (1967:44) notes that pruning is not an ordinary transformational rule, but instead a ‘condition upon the well-formedness of trees.’ Nevertheless, we will

see that this should be viewed as a grammatical operation, since it interacts with other rules in the grammar.

### 2.1. Ross' arguments for Pruning

An important point to bear in mind when understanding Ross' motivation for S-Pruning is his assumption that adjectives and adnominal modifiers are actually reduced relative clauses. So, the sentence in (2b), for example, would be derived from (2a) by a *Relative Clause Reduction Rule* that deletes the relative pronoun *who* and the copula (a process he later called 'whiz-deletion'; Ross 1972:65).

- (2) a. I met a man who was from Boston  
 b. I met a man from Boston

Ross provided no fewer than eight arguments in favour of S-Pruning. We will restrict ourselves to three of them in what follows.

#### 2.1.1. *Particle movement*

The first argument we will consider comes from particle verbs in English. It is well-known that particles associated with verbs can appear before or after the direct object (3).

- (3) a. The shock touched off the explosion.  
 b. The shock touched the explosion off. (Ross 1967:48)

Ross (1967:47f.) assumes that the sentence in (3b) is derived from (3a) by means of a 'particle movement' rule that re-orders the particle and object so that the NP precedes the particle. A simplified version of this rule is given in (4).

- (4) *Particle movement*:  
 V PRT NP → V NP PRT  
 Condition: blocked if NP is complex (i.e. dominates an S node)

Importantly, this rule has the condition that it is blocked if the NP is complex. Ross (1967:49) assumes that an NP counts as complex if it dominates an S node. This is then supposed to account for the contrasts in (5) and (6).

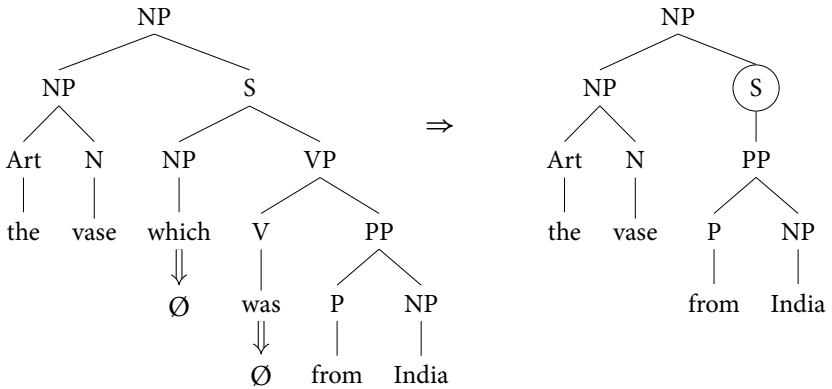
- (5) a. \*I am going to call [<sub>NP</sub> somebody [<sub>S</sub> who is strong ]] up.  
 b. ?I am going to call [<sub>NP</sub> somebody strong ] up.

- (6) a. \*I polished [<sub>NP</sub> the vase [<sub>S</sub> which was from India ]] up.  
 b. ?I polished [<sub>NP</sub> the vase from India ] up.

In each case, the unacceptable (a) examples involve a complex NP that contains a relative clause and therefore cannot undergo the transformation in (4). The more acceptable (b) examples do not count as complex and re-ordering can apply.

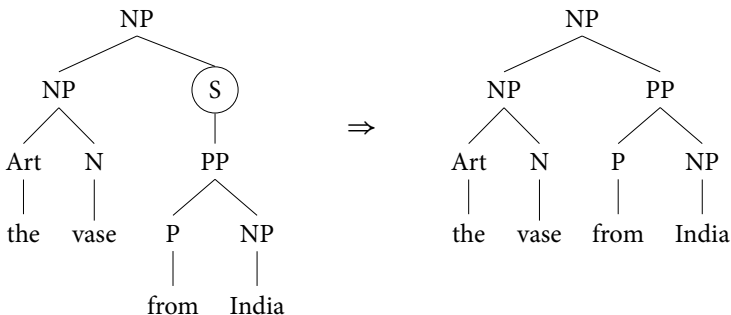
However, recall that Ross assumes that the modifiers here are instances of reduced relative clauses. So, example (6b) is derived from (6a), as shown in (7).

(7) *Relative Clause Deletion Rule:*



Importantly, Relative Clause Deletion in (7) results in a non-branching S node, which is prohibited by (1). Consequently, S-Pruning applies here to delete the S node (8).

(8) *S-Pruning:*



After S has been removed, the NP no longer counts as complex, and the condition on the Particle Movement in (4) is satisfied. Crucially, if the S node in (8) were not removed by S-Pruning then the derived NP *the vase from India* would count as ‘complex’ for the rule in (4) and it could not apply. The rule of Relative Clause Deletion feeds subsequent S-Pruning, since it creates a non-branching S node. This then presupposes a certain extrinsic or ‘parochial’ ordering to these rules (Pullum 1979), namely *Relative Clause Deletion* → *S-Pruning* → *Particle Movement*.

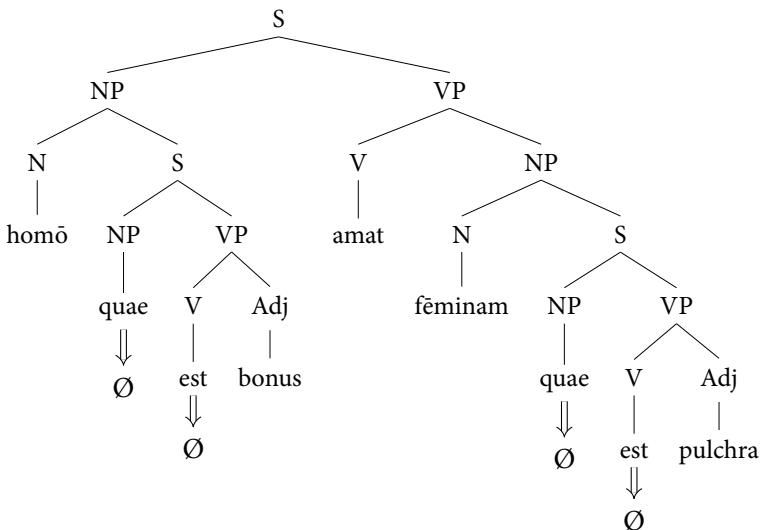
### 2.1.2. Latin adjectives

Another example of S-Pruning comes from adjectives in Latin. Here, Ross is concerned with examples such as (9) where the subject and object are modified by postnominal adjectives.

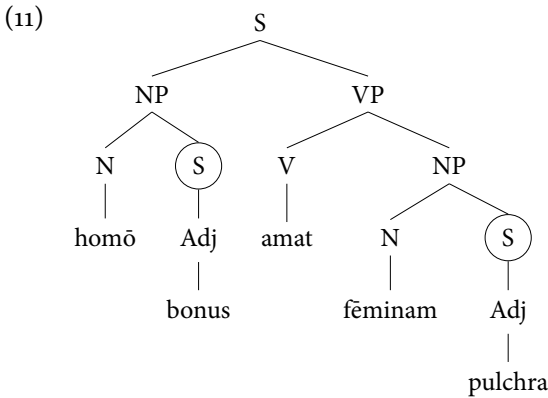
- (9) Homō bonus amat fēminam pulchram  
 man good loves woman beautiful  
 ‘The good man loves the beautiful woman.’ (Ross 1967:75)

Again, Ross assumes that these adjectives are reduced relative clauses, derived by the *Relative Clause Deletion Rule* that we saw in the previous section (10).

#### (10) *Relative Clause Deletion Rule*:



As in the English examples discussed previously, the resulting structure involves non-branching S nodes that should be subject to S-Pruning (11).



Ross (1967:76ff.) provides two arguments for S-Pruning here. First, Latin is a relatively free word order language that allows adjectives to be permuted by a rule of Scrambling (12).

- (12) *Scrambling in Latin* (Ross 1967:75):  
 Pulchram<sub>2</sub> homō —<sub>1</sub> amat fēminam —<sub>2</sub> bonus<sub>1</sub>  
 beautiful man loves woman good  
 ‘The good man loves the beautiful woman.’

Importantly, Scrambling must be sensitive to the presence of an S node. It could not, for example, take place out of a relative clause. For this reason, the S node must be removed to allow for the adjective *pulchram* (‘beautiful’) in (12) to be re-ordered.

Another argument comes from case marking. Ross notes that the unreduced relative clause does not allow for the adjective to receive the same case marking as the head noun (13).

- (13) *No case marking into a relative clause* (Ross 1967:80):  
 homō qui est bonus amat fēmina-m quae est pulchra(\*-m)  
 man who is good loves woman-ACC who is beautiful(\*-ACC)  
 ‘The man who is good loves the woman who is beautiful.’

One interpretation of this is that the rule of case marking (or concord) is

sensitive to the presence of an S node. Postnominal adjectives modifying direct objects do so show accusative, such as *pulchram* in (9), meaning that the structure of such an example must differ from that of (13) in no longer having an S node. S-Pruning therefore feeds this rule of Case Marking or concord.

### 2.1.3. *Serbo-Croatian clitics*

The final of Ross' arguments to be discussed here comes from second position clitics in Serbo-Croatian (see Rivero 1970 for a parallel argument from Spanish). The crucial observation that he attributes to Wayles Browne (published as Browne 1974) is that clitics in Serbo-Croatian must occupy the 'second position' in their clause. Thus, the arguments of the verb *čita* ('read') in (14) appear directly after the complementizer of the embedded clause (14).

- (14) Ivan želi [s da mi je Ivan čita ]  
 Ivan wanted that me it Ivan read  
 'Ivan wanted Ivan to read to it to me.' (Ross 1967:89)

Ross assumes that (14) is derived from the (ungrammatical) underlying structure in (15) by a rule of Clitic Placement that places the clitics in second position of the clause in which they are contained (Ross 1967:90). Importantly, this rule is sensitive to the presence of an S node.

- (15) Ivan želi [s da Ivan čita je mi ]  
 Ivan wanted that Ivan read it me  
 'Ivan wanted Ivan to read to it to me.'

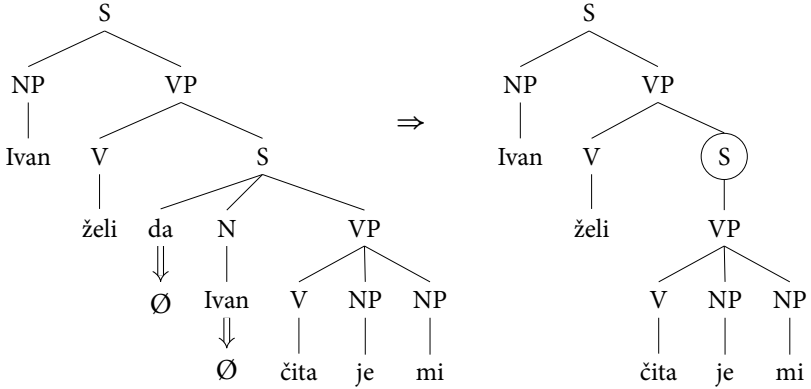
It is also possible to have what we could call a control structure in which the embedded subject and complementizer are absent (16).

- (16) Ivan mi je želi čitati  
 Ivan me it wanted read  
 'Ivan wanted to read it to me.' (Ross 1967:89)

Here, it is striking that the second position clitics *mi* and *je* surface before matrix verb *želi*. Ross (1967:88) proposed that control structures were derived

by a rule of *Equi NP Deletion* that deleted the identical embedded subject as well as the complementizer (17).<sup>1</sup>

(17) *Equi NP Deletion*:



Note that, relative to the output structure in (17), the rule of Clitic Placement would not move the clitics since they are already in the second position of their local S clause. In order to derive clitic climbing, the embedded S node must be absent. Like the Relative Clause Deletion rule in the preceding two sections, *Equi NP Deletion* also creates a non-branching S node. Thus, *S-Pruning* will apply to (17). Subsequently, *Clitic Placement* will move the clitics to the second position of the matrix clause, as in (16).

## 2.2. Perlmutter (1968)

Another example of *Pruning* can be found in Perlmutter (1968). Perlmutter is concerned with the correlation of the two apparently independent properties of pro-drop and *that*-trace effects. He shows that, in languages like English and French, neither pro-drop (18a) nor *that*-trace violations are possible (18b).

- (18) a. \**pro* have worked all day  
 b. \*Who<sub>1</sub> did you say [ that \_\_\_<sub>1</sub> left early ] ?

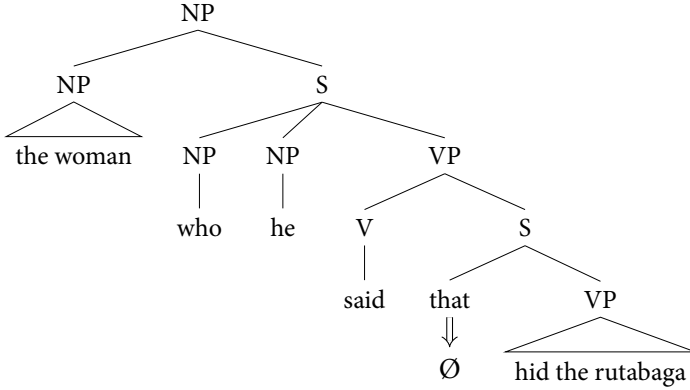
However, there are other languages such as Spanish and Italian which allow

<sup>1</sup>Note that Ross assumed that the embedded clause was dominated by an NP node. I have omitted this here.



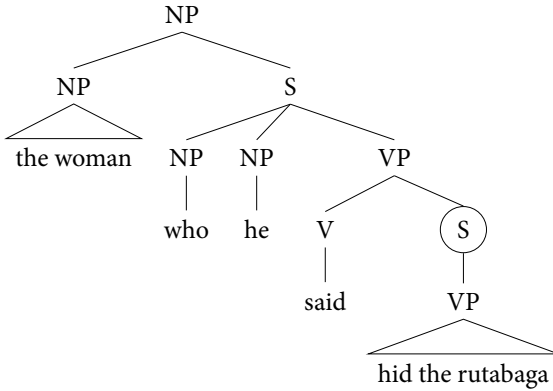


(22) *that-deletion*:



The resulting structure is given in (23). However, the constraint in (20) would still be predicted to rule out this structure as ungrammatical, since the embedded S node does not contain an overt subject.

(23)



Perlmutter (1968:219f.) proposes that Ross' rule of S-Pruning applies here. Note that the rule of *that*-deletion together with relativization of the subject gives rise to precisely the same configuration as in Ross' examples, namely a non-branching S node.

2.3. É. Kiss (2008)

É. Kiss (2008) invokes Tree Pruning in a contemporary setting in her analysis of

non-configurationality in Hungarian. Her observation is that V-to-T movement leads to free word order within the VP, as shown in (24).

(24) *Free order in Hungarian VP with V-to-T movement* (É. Kiss 2008:443):

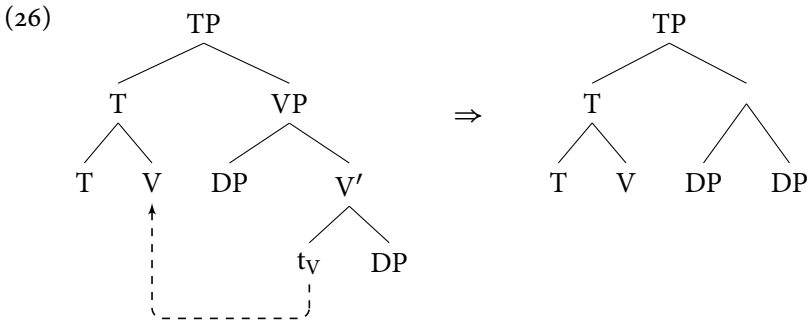
- a. [TP Össze [T' veztek<sub>i</sub> [VP t<sub>i</sub> a fiúk egymással ]]]  
 out fell the boys each.other.with
- b. [TP Össze [T' veztek<sub>i</sub> [VP t<sub>i</sub> egymással a fiúk ]]]  
 out fell each.other.with the boys  
 'The boys fell out with each other.'
- c. [TP Könyvet [T' vett<sub>i</sub> [VP t<sub>i</sub> Péter Éván-ak ]]]  
 book.ACC bought Peter Eva-for
- d. [TP Könyvet [T' vett<sub>i</sub> [VP t<sub>i</sub> Éván-ak Péter ]]]  
 book.ACC bought Eva-for Peter  
 'Peter bought some book(s) for Eva.'

Her proposal is that a pruning-like process, which she calls *domain flattening*, applies to phrases whose heads have been moved (25).

(25) *Domain flattening* (É. Kiss 2008:462):

When the head of a phase is moved into the head position of the next higher phase, the silent copies of the moved head and their projections are pruned.

As represented in (26), this leads to a flat structure within the VP.



This result of this is that, in the absence of asymmetric c-command between VP-internal arguments, linearization of the VP becomes free. Similar to Müller

(2015, 2017), É. Kiss (2008) uses the concept of Structure Removal in the syntax to deal with conflicting evidence for flat and hierarchical VP structures.

#### 2.4. Stepanov (2012)

Stepanov (2012) extends É Kiss' idea to a broader range of cases in which a phrase headed by a trace results in it being 'pruned'. One such case involves what Stepanov (2012:687) calls the 'gate opening' effect of head movement in removing barriers. This generalization can be stated in (27).

(27) *Trace-Barrier Generalization* (Bošković 2005:35; Bošković 2011:16):

A phrase that is normally a barrier to movement ceases to be a barrier if headed by a trace.

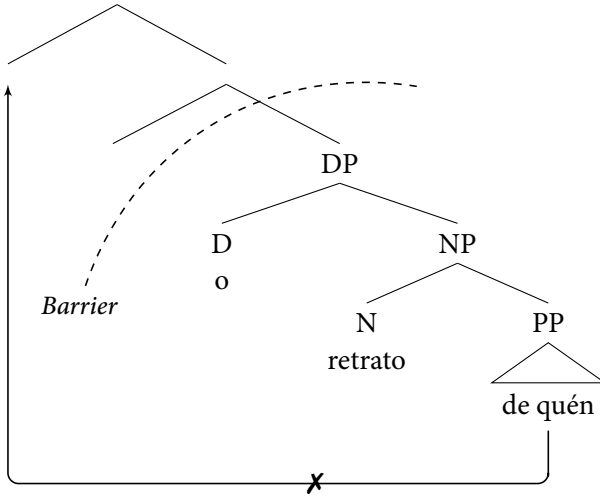
A good example of this comes from Galician. DPs with a free-stranding determiner are to be islands for extraction of PP complements (28a,b). However, if the determiner cliticizes to the verb as in (28c,d), extraction becomes possible.

(28) *Incorporation feeds extraction in Galician* (Uriagereka 1988:81):

- a. \*[<sub>PP</sub> De quén ] viche [<sub>DP</sub> o retrato t<sub>PP</sub> ] ?  
     of whom saw.2SG DET portrait  
     'Who have you seen the portrait of?'
- b. \*[<sub>PP</sub> De cal ] liche [<sub>DP</sub> a reseña t<sub>PP</sub> ] ?  
     of which read.2SG DET review  
     'Which one have you read the review of?'
- c. [<sub>PP</sub> De quén ] viche-lo<sub>1</sub> [<sub>DP</sub> t<sub>1</sub> retrato t<sub>PP</sub> ] ?  
     of whom saw.2SG-DET portrait  
     'Who have you seen the portrait of?'
- d. [<sub>PP</sub> De cal ] liche-la [<sub>DP</sub> t<sub>1</sub> reseña t<sub>PP</sub> ] ?  
     of which read.2SG-DET review  
     'Which one have you read the review of?'

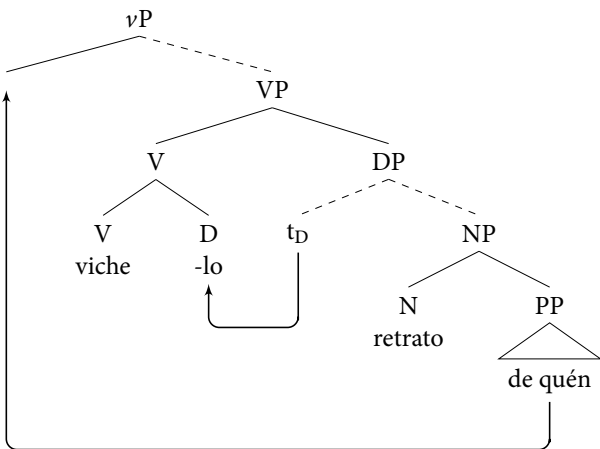
The intuition here is that DP constitutes a barrier for extraction (29) (see Bošković 2005 for an analysis of how this follows from the PIC and Anti-Locality).

(29)



If cliticization of the determiner is analyzed as head movement (30), then the generalization in (27) would mean that the DP ceases to be a barrier and extraction becomes possible.

(30)



This can be unified with Kiss' proposal if we assume that projections whose heads undergo movement are subsequently pruned. Importantly, this must take place in the syntax directly in order to be able to feed subsequent movement processes.

Stepanov (2012:690) argues that pruning as an additional operation is not necessary. Instead, he suggests that head movement does not leave a trace and that this, coupled with Bare Phrase Structure assumptions, causes a phrase whose head has moved to ‘collapse’ (Stepanov 2012:686). It is, however, not entirely clear how this works and what happens to specifiers/adjuncts, etc. Furthermore, it seems to predict that headless phrases cannot move (since they do not exist). While this has been claimed (Funakoshi 2012), it faces a challenge from multiple fronting constructions in German, (for example (see S. Müller 2005; G. Müller 2018*b* and section 5 for discussion).

## 2.5. Fitzpatrick (2006)

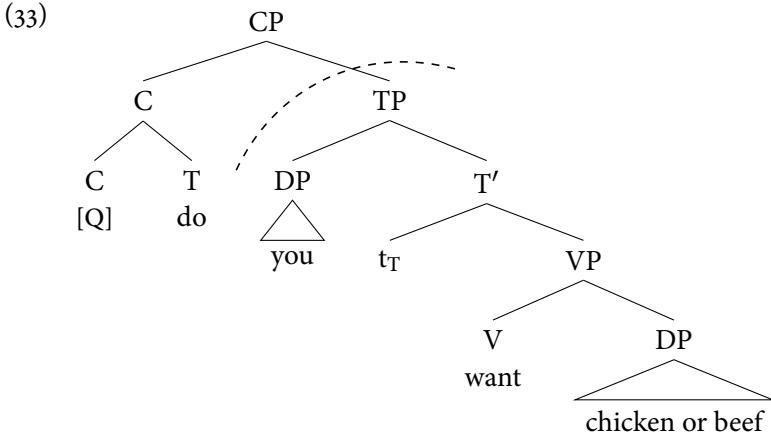
Another approach to pruning can be found in Fitzpatrick (2006), who discusses auxiliary drop in English (31).

- (31) a. Has Anyone seen John today?  
 b.  $\emptyset$  You want chicken or beef? (Fitzpatrick 2006:400)

He provides various arguments that these are not inherently reduced clauses and must include a full CP. One of the more straightforward arguments involves the NPI subject in (31a). Since these NPIs are licensed in downward-entailing contexts such as polar questions, the relevant features in C must be present to license it. This can be seen by comparing it to declaratives with raising intonation. In (32), the inflection on the verb shows that we do not have subject-auxiliary inversion here, and consequently the NPI is not licensed.

- (32) \*Anyone wants a hot dog? (Fitzpatrick 2006:409)

Fitzpatrick argues that subject-auxiliary inversion allows for deletion of the verb by simply not spelling-out the final root CP phase. As (33) shows, there is to T-to-C movement resulting in *do*-support. When the CP phase is complete, its complement TP is sent to the interfaces for interpretation. The standard assumption is normally that the final CP edge undergoes the final process of Transfer, but Fitzpatrick (2006:419) suggests that this ‘need not apply in all cases, and aux-drop is one case where it fails to apply’. If the root CP edge is not interpreted, then we simply have the TP structure without the moved auxiliary – this gives the impression of deletion of the auxiliary (subject to semantic recoverability).



Fitzpatrick (2006:429) notes that this is, in essence, a Structure Removal analysis, however ‘the small amount of tree pruning at the root is done not through an *ad hoc* truncation operation, but rather finds a more natural place in a theory of cyclic spell-out’. Thus, like Stepanov (2012), he seeks to derive the effect of syntactic deletion without appealing to a dedicated operation for it. That said, some of the details of the implementation are vague. For example, the optionality of suspending the final Transfer operation is not made explicit, nor is its restriction to the root CP. Regarding the latter, there are proposals, such as S-Pruning and  $\bar{S}$ -deletion (to be discussed in the following section), that identify a similar process applying at the embedded CP edge.

### 3. S-bar Deletion (Chomsky 1981)

An early example of Structure Removal is the operation of  $\bar{S}$ -Deletion discussed in Chomsky (1981). In proposing  $\bar{S}$ -deletion, Chomsky (1981:66f.) was concerned with cases of so-called Exceptional Case-Marking (ECM), where the subject of an embedded clause is case-marked by the matrix verb (34).

(34) I believe him to be smart

At this time, a finite embedded clause was an  $\bar{S}$  constituent, which is analogous to CP in more modern parlance. The C-head and its specifier correspond to a single COMP domain, and the equivalent of TP or IP was S. The structure of the standard embedded finite clause is given in (35).

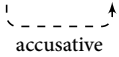
(35) I believe [<sub>S</sub> [<sub>COMP</sub> that ] [<sub>S</sub> he is smart ]]

The topmost node of an embedded clause,  $\bar{S}$ , was assumed to constitute a barrier to government, and concomitantly Case assignment, from the matrix verb. This effectively means that, in the presence of  $\bar{S}$ , accusative case can not be assigned to the subject of the embedded clause by the matrix verb in (35).

In order for accusative case to be assigned in ECM examples such as (34), Chomsky (1981:66) proposed what he called a ‘marked rule of  $\bar{S}$ -deletion’ that would be available to ECM-verbs such as *believe*.<sup>4</sup> This transformational rule would remove the  $\bar{S}$  node on an embedded clause, and therefore allow for the verb to assign Case to the embedded subject under government (36).

(36)  $\bar{S}$ -deletion:

I believe [<sub>S</sub> [<sub>S</sub> him to be smart ]] → I believe [<sub>S</sub> him to be smart ]



From a modern perspective, it might seem strange to posit a deletion operation for this purpose – why not simply assume that ECM complements are inherently S, rather than  $\bar{S}$ , constituents? There was good reason for this, however. Assuming ECM complements to be S-constituents was incompatible with the prevailing theory of locality at the time, *Subjacency*.

To see this, consider the definition of Subjacency in (37).

(37) *Subjacency* (Chomsky 1977:73):

A phrase cannot move from position Y to position X in

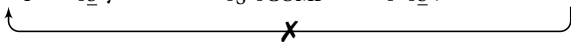
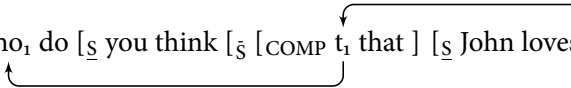
... X ... [ <sub>$\alpha$</sub>  ... [ <sub>$\beta$</sub>  ... Y ... ] ... ] ... X ...,

where  $\alpha$  and  $\beta$  are cyclic nodes [= S, NP].

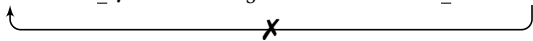
This has the effect that a movement step cannot cross more than one cyclic, or ‘bounding’, node, which we will assume are S and NP in our present terminology. This could derive various island effects, but had the effect that long-distance movement had to apply in a successive-cyclic fashion, as is now widely accepted. Movement in ‘one fell swoop’ (38a) would cross two bounding nodes, namely the matrix and embedded S, which is precluded by (37). Instead, movement could stop off, leaving a trace in the intermediate COMP domain (38b). Each

<sup>4</sup>Later in Chomsky (1981), he considers an alternative in which  $\bar{S}$  is transformed into S (Chomsky 1981:303ff.).

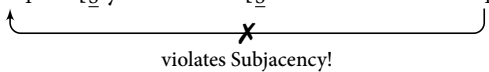
of the movement steps now only crosses a single bounding node, in compliance with Subjacency.

- (38) a. \*Who<sub>1</sub> do [<sub>S</sub> you think [<sub>S̄</sub> [<sub>COMP</sub> that ] [<sub>S</sub> John loves t<sub>1</sub> ]]] ?  
  
 b. Who<sub>1</sub> do [<sub>S</sub> you think [<sub>S̄</sub> [<sub>COMP</sub> t<sub>1</sub> that ] [<sub>S</sub> John loves t<sub>1</sub> ]]] ?  


Subjacency also offered an explanation for why English shows wh-island effects. In (39), the subject wh-phrase *who* blocks movement from stopping at the edge of the embedded clause.<sup>5</sup> As a result, movement must apply in one fell swoop in (39), crossing two S-nodes as in (38a) and therefore violating the Subjacency Condition.

- (39) \*What<sub>2</sub> do [<sub>S</sub> you think [<sub>S̄</sub> [<sub>COMP</sub> who<sub>1</sub> ] [<sub>S</sub> t<sub>1</sub> ate t<sub>2</sub> ]]] ?  


With this in mind, let us return to our ECM example. If we did adopt the alternative approach in which ECM complements were simply S, rather  $\bar{S}$ -constituents, then wh-movement from the complement of an ECM verb would violate Subjacency in crossing two S nodes (40).

- (40) \*Who<sub>1</sub> do [<sub>S</sub> you believe [<sub>S</sub> him to have seen t<sub>1</sub> ]]] ?  


Thus, such extraction is predicted to be ungrammatical, as noted by Chomsky (1981:172): ‘Rizzi points out that we could not assume that the structures in question are base-generated with S rather than  $\bar{S}$  complements, or it would follow that such sentences as [(41)] would be on a par with wh-island violations.’

Consequently, it seems that we need ECM complements to contain an  $\bar{S}$  layer to facilitate successive-cyclic movement, with later  $\bar{S}$ -deletion removing the barrier to Case government from the matrix verb (41).

<sup>5</sup>Since the COMP domain could, in principle, host multiple elements, the inability for a trace to co-occur with the wh-phrase in COMP would have to be more or less stipulated. This problem is less acute in a CP analysis where the trace and wh-phrase would compete for a single Spec-CP position (see Rudin 1988).



(41) Who<sub>1</sub> do [<sub>S</sub> you believe [<sub>S̄</sub> [<sub>COMP</sub> t<sub>1</sub> ] [<sub>S</sub> him to have seen t<sub>1</sub> ]]] ?

Thus, the motivation for  $\bar{S}$ -deletion as a syntactic operation stems from the conflicting evidence for the presence vs. absence of  $\bar{S}$ . While the  $\bar{S}$  node is required for successive-cyclic movement, it must be absent for the purposes of Case assignment to the embedded subject. This seemingly paradoxical situation is resolved by first having the  $\bar{S}$  layer present in the structure and then later deleting it.<sup>6</sup>

#### 4. C-deletion (Chomsky 2013)

The concept of Structure Removal has re-surfaced in recent work by Noam Chomsky. It can be found in published form in Chomsky (2015), as well as in a series lectures given by Chomsky in 2014 at MIT (19th May 2014) and in Olomouc, Czech Republic (*Problems of Projection: Extensions*, 5th June 2014), which were made available online.

I will not recount all the details here, but the relevant proposal of C-deletion pertains to the explanation of *that*-trace effects in the PoP+ (=Problems of Projection) framework (Chomsky 2013). An important background assumption from Chomsky (2013) is that labels on constituents created by Merge are required for the interfaces. Furthermore, T in English is ‘too weak’ to provide a label (42a) (unlike pro-drop languages such as Italian). The consequence here is that a DP must move to Spec-TP in order to provide a label for what would normally be the ‘TP’ constituent.<sup>7</sup> Simplifying notation somewhat, the  $\varphi$ -features of the subject can provide a label for the  $\alpha$  (=traditional TP) constituent (42b).

- (42) a. \* [<sub>δ</sub> C [<sub>α</sub> T [<sub>σ</sub> EA<sub>φ</sub> ν\* ... ]]]  
 b. [ <sub>δ</sub> C [<sub>φP</sub> EA<sub>φ</sub> T [<sub>σ</sub> ν\* ... ]]]

<sup>6</sup>Note that this view entails that Subjacency must be a restriction on movement rules themselves, rather than an output condition as in Freidin (1978) (also see Chomsky 1981:303 for discussion). This is because, in the final output, the intermediate trace will have been removed by  $\bar{S}$ -deletion, meaning that Subjacency appears to be violated in the output (an instance of counterbleeding opacity).

<sup>7</sup>This is designed to derive well-known correlation between pro-drop and the EPP, going back to Rizzi (1982).

In prohibited *that*-trace configurations such as (43), the subject of the embedded clauses moves away, possibly to Spec-CP first for PIC-based reasons.

- (43) [<sub>y</sub> who do you *v*\* [<sub>ε</sub> think [<sub>δ</sub> C [<sub>α</sub> T β ]]]]  
 = (\*‘who do you think that read the book’)  
 (Chomsky 2015:10)

What seems to go wrong here is that the subject is no longer in the canonical subject position (Spec-TP) and thus no label can be provided to the  $\alpha$  constituent in (44). The PIC forces the subject to move from Spec-TP, however doing so means that  $\alpha$  remains unlabelled (note that copies/traces cannot provide labels). This paradox results in ungrammaticality.

- (44)\*[<sub>δ</sub> who C [<sub>α</sub> T β ]]

However, this analysis faces the familiar problem of why the null complementizer voids this effect. The structure suggested by Chomsky (2015) for these cases is given in (45).

- (45) [<sub>y</sub> who do you *v*\* [<sub>ε</sub> think  $\emptyset$  [<sub>α</sub> T β ]]]]  
 = (‘who do you think read the book’) (Chomsky 2015:10)

Here, the C head and its associated constituent  $\delta$  has been ‘eliminated’ by an operation that Chomsky (2015:12) refers to as *C-deletion*. Concretely, Chomsky (2015:11) proposes the order of operations in (46). First, T inherits the features of C including its phase property (46a). Next, the subject moves to the specifier of T, forming  $\alpha$  (46b).  $\alpha$  can subsequently be labeled by the EA (46c). Then, the operation of C-deletion deletes the C head and the constituent formed by its merger with  $\alpha$  (46d). Finally, Transfer of the lower phase (*v*P) takes place. However, since the original phase head has ‘disappeared’, the ‘natural assumption is that phasehood is inherited by T’ (Chomsky 2015:11). Importantly, this means that the specifier of T will be accessible for movement in the next phase, thereby avoiding the previous movement paradox we had.

- (46) a. Inheritance  
 b. IM of *who* in  $\alpha$  (EPP)  
 c. Labeling of  $\alpha$   $\langle \phi, \phi \rangle$   
 d.  $C \rightarrow \emptyset$ , so that *who* can remain in situ and still be accessible to IM in the next phase  
 e. Transfer.

However, one might wonder what kind of operation this ‘C-deletion’ is. As Norbert Hornstein noted on his blog, Chomsky’s approach requires that this is a genuine deletion operation in syntax proper (Hornstein 2014):

This story requires that that is deleted rather than not present at all. Were it never present, C could not transfer its features to T, and T has not features of its own (more below). Thus, to make this work, we need deletion operations in the syntax. A question that arises is how similar the operation deleting that is to more run of the mill ellipsis operations. The latter are generally treated as simply dephonicization processes. This will not suffice here. [...] At any rate, it’s worth observing that C deletion is not simply quieting the phonetics.

This point was also clarified in the Q&A session after a lecture given by Chomsky in 2014 at the Olomouc Linguistics Colloquium. The question posed to him was ‘what kind of deletion operation do we have that can rid of something from the structure? That’s not the sort of thing you can get from Merge’.<sup>8</sup> Chomsky’s response was printed in the proceedings volume of that conference:

No, that is a deletion operation. It is probably an idiosyncratic operation, which says to take away something. The C has intrinsic properties like Force, like ‘I am a clause’, ‘I am an imperative’, or something, and there has got to be some operation that says ‘lose this property’. I mean it is the kind of operation that we see all the time in phonology. And the question is: can you have an idiosyncratic counterpart to it in syntax? Probably so. I think it is not the only deletion operation, but yes, that is kind of like copy deletion, except in the syntax.

(Chomsky 2014:24)

So, it becomes very clear that what Chomsky has in mind here is something equivalent to Structure Removal in syntax. Again, it is motivated by conflicting structural requirements: The *wh*-phrase has to be in Spec-TP for the purposes of labeling, but in Spec-CP for PIC reasons. This conflict, which proves fatal for

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<sup>8</sup>From memory, I recall that this question was asked by Thomas McFadden.

*that*-trace configurations, is alleviated by removing one source of the problem: the CP projection itself.

## 5. Structure Removal (Müller 2017, et seq)

More recently, a revival of classic syntactic deletion approaches has been pursued by Müller (2017, 2018*a,b*, to appear) (also see Murphy 2016, Zyman 2018). He argues for an operation parallel to Merge, *Remove*, that triggers deletion of a designated element of a syntactic representation. Müller (2017:28) suggests that Remove mirrors Merge in being feature-driven, able to apply to both heads and phrases, obeying the Strict Cycle Condition, and also having both an internal and external mode of application.

Technically, Remove is assumed to be triggered by a feature [-F-] on a given head that specifies the category of the item to be removed. Müller (2017) also suggests that a diacritic can distinguish between Removal of heads (0) and phrases (2). For example, if a head X bears [-Y<sub>0</sub>], it will remove the YP shell of its complement (47a). This is similar to S-Pruning and  $\bar{S}$ -deletion that we reviewed in preceding sections. The alternative is that the entire phrase is removed, as in (47b). This seems to be analogous to ellipsis operations that apply to constituents, i.e. VP ellipsis and sluicing (see Murphy & Müller 2019).

- (47) a.  $[XP X_{[-Y_{-0}]} [YP Y [ZP Z \dots ]]] \Rightarrow [XP X_{[H\bar{X}+H_d]} [ZP Z \dots ]]$   
 b.  $[XP X_{[-Y_{-2}]} [YP Y [ZP Z \dots ]]] \Rightarrow [XP X_{[H\bar{X}+H_d]} ]$

The major motivation for Structure Removal comes from evidence for conflicting representations. In other words, a construction has two possible, mutually incompatible analyses, A and B, and there are arguments in favour of each of them. In this situation, Müller (2017) argues that both structures can be accommodated derivationally, by first having A in the derivation and transforming it into B via Structure Removal.

To see a concrete example of this, consider the case of the complex prefield construction in German discussed by Müller (2018*b*). As a verb-second language, German typically only allows a single constituent to occupy the position preceding a verb in second position. However, there are examples such as (48) which seem to violate this requirement.

(48) *Complex prefield V3 construction* (Fanselow 1993:70):

[<sub>DP</sub> Einen Brief ] [<sub>PP</sub> nach Hamburg ] hat er Anette öfter geschickt  
 a letter to Hamburg has he Anette often sent  
 'He has often sent a letter to Anette in Hamburg'

As Müller (2018*b*) shows, there is evidence for both a single constituency analysis in which the complex prefield forms a single constituent with a VP whose head is silent (49a), and for multiple constituency approach where they fronted elements are independent constituents (49b).

(49) a. *Single constituency:*

[<sub>CP</sub> [<sub>VP</sub> XP [<sub>V'</sub> e YP ] ] [<sub>C'</sub> C ... ]]

b. *Multiple constituency:*

[<sub>CP</sub> [<sub>C'</sub> XP [<sub>C'</sub> YP [<sub>C'</sub> C ... ]]]]

Müller (2018*b*) shows that there is conflicting evidence in favour of each of these analyses. I will confine myself to briefly summarizing two arguments for each in what follows.

In favour of the single constituency analysis, Müller (2018*b*:222f.) cites the observation that each of the elements in a complex prefield must come from the same clause (50). If what is fronted is actually a VP with a silent head (49a), then the clausemate restriction follows.

(50) *Clausemate condition on complex prefields* (Fanselow 1993:66):

a. Ich glaube dem Linguisten nicht [ einen Nobelpreis gewonnen  
 I believe the.DAT linguist not a.ACC nobel.prize won  
 zu haben ]  
 to have

b. \*[<sub>CP</sub> Dem Linguisten<sub>1</sub> einen Nobelpreis<sub>2</sub> [<sub>C'</sub> glaube ich \_\_\_\_<sub>1</sub>  
 the.DAT linguist a-ACC nobel.prize believe I  
 nicht [ \_\_\_\_<sub>2</sub> gewonnen zu haben ]]]  
 not won to have  
 'I don't believe the linguist to have won a nobel prize.'

Furthermore, Müller (2018*b*) points out that the same ordering restrictions that pertain in the base position hold for the complex prefield. In other words, deviations from default, assumed to be derived by scrambling, are equally

dispreferred in a complex prefield (51b). The preference for base generated argument orders makes sense on the view that what is fronted is a VP constituent.

(51) *Ordering restriction in complex prefields* (Müller 2018b:224):

- a. [CP [DP den Fahrer ] [PP zur Dopingkontrolle ] [C'  
     the.ACC rider           to.the doping.test  
 begleitete ein Chaperon t<sub>DP</sub> t<sub>PP</sub> ]  
 accompanied a chaperon
- b. ?\*[CP [PP zur Dopingkontrolle ] [DP den Fahrer ] [C'  
     to.the doping.test                   the.ACC rider  
 begleitete ein Chaperon t<sub>DP</sub> t<sub>PP</sub> ]]  
 accompanied a chaperon  
 'A chaperon accompanied the rider to the doping test.'

There is, however, also evidence that the phrases in a complex prefield do not form a constituent. For example, Müller (2018b) notes an asymmetry in licensing of the NPI *auch nur irgendein X* by a fronted negative indefinite such as *keinen Berg* ('no mountain'). When such a negated expression is fronted as part of a VP, it cannot license an NPI subject (52a). However, as part of a complex prefield, it can (52b). This fact is puzzling if the examples in (52) have the same underlying structure and differ only with regard to the overtness of the verb in the fronted constituent.

(52) *NPI licensing from complex prefield* (Müller 2018b:236):

- a. ??[CP [VP Keinen Berg im Sitzen bewältigt ] [C' hat auch nur  
     no hill in sitting managed has also only  
 irgendein Fahrer ]]  
 some rider
- b. [CP [DP Keinen Berg ] [PP im Sitzen ] [C' hat auch nur irgendein  
     no hill in sitting has also only some  
 Fahrer bewältigt ]]  
 rider managed  
 'No hill was conquered by a rider without getting out of the saddle.'

A similar example comes from the loss of idiomatic interpretation. Fronting of an incomplete idiomatic VP leads to loss of the non-literal interpretation (53a). Heck & Assmann (2014) identify this as part of a more general anti-

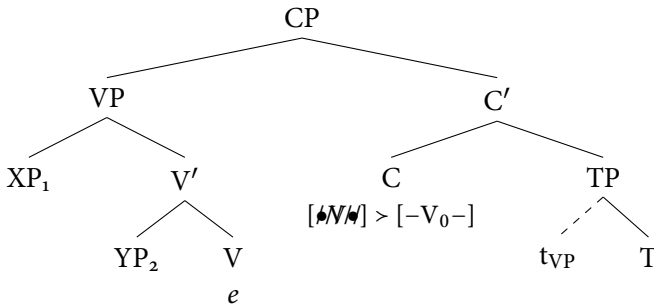
reconstruction effect found with remnant movement (i.e. *Barss' Generalization*; Barss 1986). In complex prefields, however, idiom reconstruction is possible (53b). Again, this asymmetry is unaccounted for if (53b) also involves fronting of a (remnant) VP.

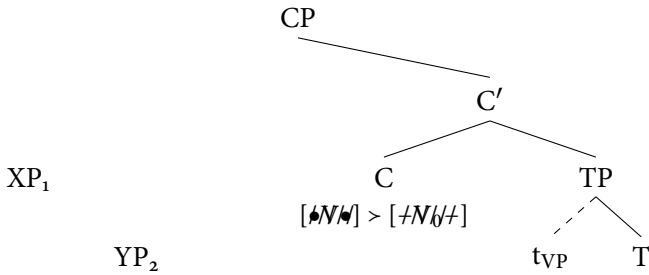
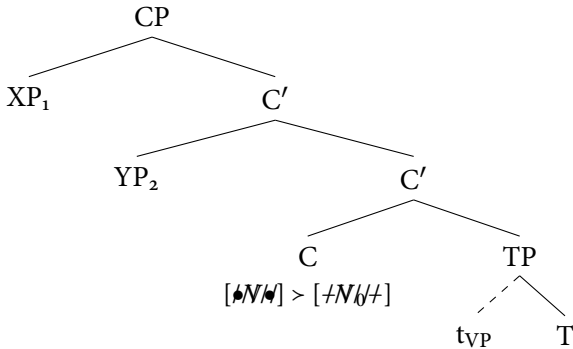
(53) *Idiom reconstruction in complex prefield* (Müller 2018b:237f.):

- a. #<sub>[CP [VP t<sub>DP</sub> Auf den Kopf getroffen ] [C' hat er [DP den Nagel ]  
on the head hit has er the nail  
erneut ]]</sub>  
again
- b. [<sub>CP [DP Den Nagel ] [PP auf den Kopf ] [C' traf er damit ]]</sub>  
the nail on the head hit er there.with  
'Again, he hit the nail on the head.'

Müller (2018b) argues that conflicting evidence of this kind can be reconciled under an analysis in which we first have single constituency, and later multiple constituency. The analysis first assumes that the VP together with the fronted arguments is moved to Spec-CP to check the [ $\bullet V \bullet$ ] feature (54a). We can assume that the verb has moved out prior to this to some functional head position. Subsequently, the Remove feature [ $-V_0-$ ] on the C head is checked by deleting the head of the VP in its specifier, and the associated projection (54b). Finally, the former complement and specifier are 'reassociated' into the structure as specifiers of the C head, in both an order preserving fashion and in accordance with the Strict Cycle Condition (54c).

(54) a. *VP fronting*:



b. *Remove:*c. *Reassociation:*

The evidence for single constituency, i.e. the clausemate and ordering restrictions, follow from the fact that the phrases in the complex prefield must be moved as part of a single VP constituent. After Removal and Reassociation as multiple specifiers, the phrases in the complex prefield act as separate constituents, with different c-command relations. Since constraints on NPI licensing and reconstruction access the final output representation, their sensitivity to multiple constituency is accounted for.

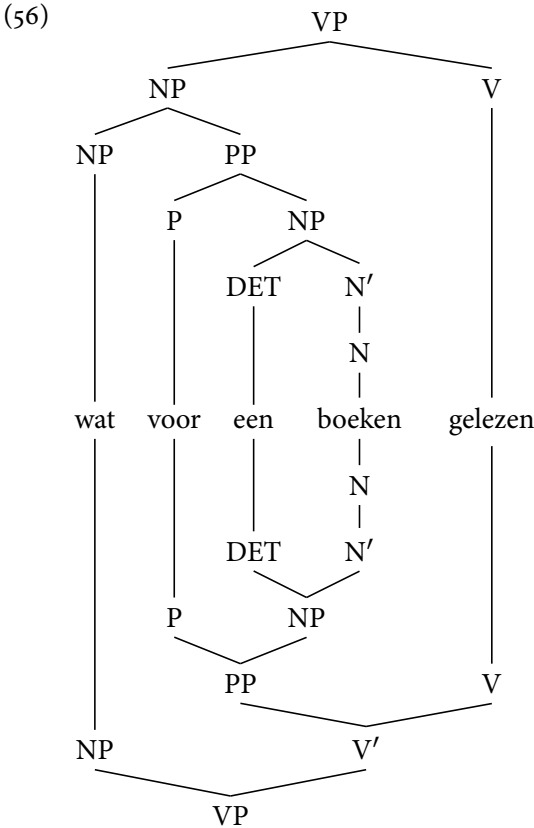
Müller's account provides a solution to the conflicting evidence for single vs. multiple constituency since both representations are available in the derivation, albeit not at the same time. The classic, and arguably only alternative, approach to conflicting representations is the idea that both syntactic structures are present simultaneously, i.e. what is sometimes called *co-analysis* (Haegeman & van Riemsdijk 1986, Di Sciullo & Williams 1987, Saddock 1991, Pesetsky 1995).

To see an example of this, consider *wat voor*-splits in Dutch. In this construction either the full wh-phrase (55a) or just the NP-internal determiner *wat* can be extracted (55b).



- (55) *wat voor-split in Dutch* (Corver 1990, 2017):
- a. [<sub>NP</sub> Wat voor een boeken ]<sub>i</sub> heb je t<sub>i</sub> gelezen ?  
 what for a books have you read
  - b. Wat<sub>i</sub> heb je [<sub>NP</sub> t<sub>i</sub> voor een boeken ] gelezen ?  
 what have you for a books read  
 ‘What kind of books have you read?’

The puzzle here is why this particular construction allows for a certain type of movement (i.e. Left-Branch Extraction) that other NPs do not. A classic approach to this by Bennis (1983) involves parallel representations. Bennis proposes the structure in (56).

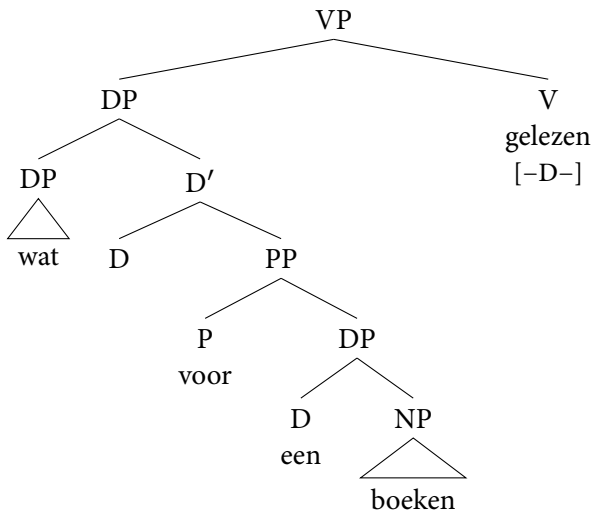


The upper representation is the one in which *wat* is the left-branch of the noun

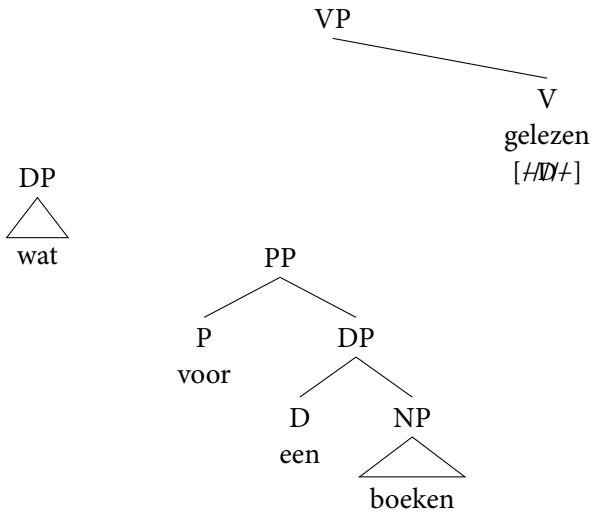
phrase. The idea is that the lower representation can be generated by a process of restructuring. In this structure, *wat* is reanalyzed as the specifier of V. In deriving ordinary wh-movement of whole NP (55a), the upper representation can be accessed, whereas the split construction in (55b) would require the lower representation. This approach therefore accounts for why an apparent violation of the Left-Branch Condition is possible, since *wat* is not NP-internal in the lower representation and therefore freely extractable.

This case of conflicting representations could be equally well captured in a Structure Removal approach in which the two representations are present sequentially, i.e. derived by Remove. Updating our structures somewhat, we could assume that V in Dutch can optionally bear a [-D-] feature that can remove the DP shell on its complement (57a). This feature can be checked by removing the DP shell on its complement (57b). Following Müller (2018b), after the former specifier and complement of D, *wat* and *voor een boeken* respectively, are reassociated into the structure in a way that preserves the original c-command relations. Thus, the PP becomes the complement of V and *wat* becomes the specifier (57c).

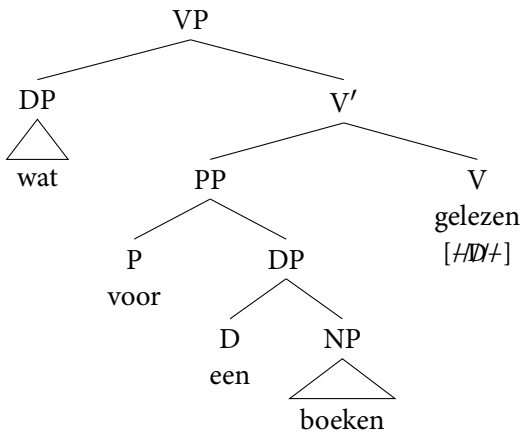
(57) a.



b.



c.



This derives the same result as Bennis' analysis second structure, as *wat* can now be extracted without violating the Left-Branch Condition. We can assume that the feature responsible for removing the DP shell is optional, which would also allow for extraction of the full DP. Thus, Structure Removal provides a strictly derivational alternative to co-analysis approaches with parallel representations.

## 6. Exfoliation (Pesetsky 2019)

A similar concept of Structure Removal that emerged at the same time as Müller's is *Exfoliation* (Pesetsky 2019). Exfoliation is a derivational process triggered when an element in a higher clause tries to establish a movement-triggering Agree dependency with another element across a phase boundary. The full definition is given in (58).

(58) *Exfoliation* (Pesetsky 2019:11):

a. *Structural Description*:

...  $\beta$  ... [YP (phase) ... [ $\gamma$ P (non-phase) ...  $\alpha$  ... ]], where

(i) YP is the phase that dominates  $\alpha$  but not  $\beta$ ,

(ii)  $\alpha$  occupies the edge of  $\gamma$ P, and

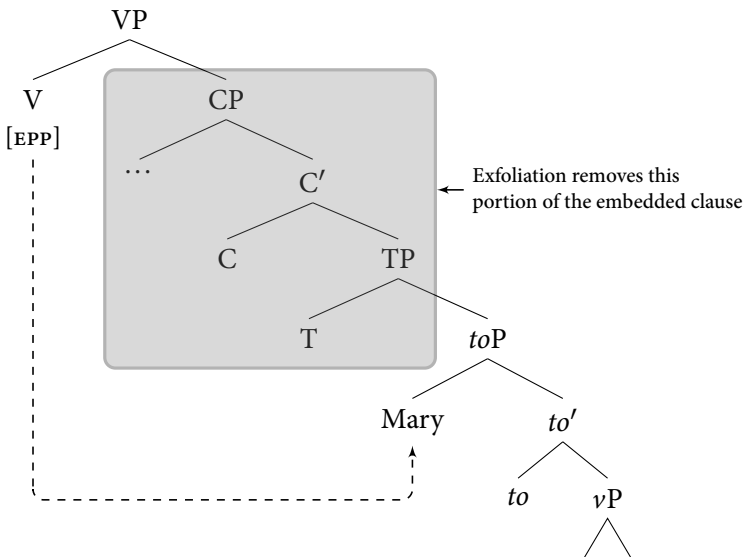
(iii) a movement-triggering probe on  $\beta$  has located  $\alpha$  on its goal.

b. *Structural Change*:

Replace YP with  $\gamma$ P, which takes the phasal property of its predecessor.

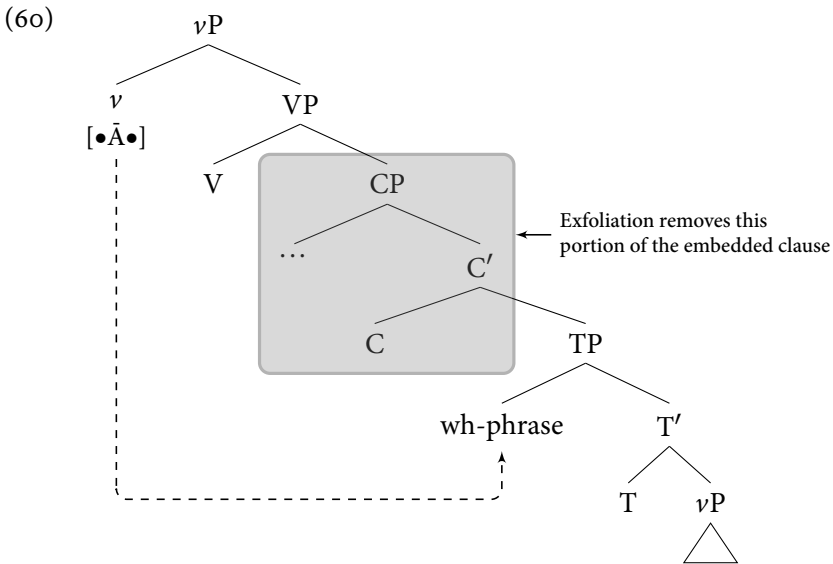
Pesetsky (2019) focuses in particular on developing Exfoliation analyses of ECM constructions and complementizer-trace effects. For canonical cases of Raising-to-Object (RtO) such as *Sue believes Mary to have solved the problem*, Pesetsky proposes the (here somewhat simplified) analysis in (59).

(59)



He assumes that all embedded clauses originate as CPs (what he calls the *Full CP Hypothesis*; Pesetsky 2019:9) and that infinitival clauses are derived by means of Exfoliation. In the case of RtO, the matrix V has a movement triggering feature that finds the embedded subject under Agree, however movement is constrained by the PIC. As a response, Exfoliation applies to facilitate movement by deleting the CP and TP projection of the embedded clause (59). This causes the *to*P projection to become the phase and the abstract *to* head to be realized overtly. Pesetsky (2019:Ch.4) discusses a number of interesting facts that follow from this analysis.

Pesetsky (2019:36ff.) also proposes Exfoliation of just the CP layer as an explanation for well-known complementizer-trace effects (see section 2.2). Leaving some details aside, the general idea is that movement of the subject to the edge of the Spec-CP phase is ruled out by Anti-Locality or something similar (see Erlewine 2017). Thus, when the probe on matrix *v* triggering  $\bar{A}$ -movement finds the embedded subject in Spec-TP, movement cannot apply due to the PIC. As with RtO, the conditions for Exfoliation are met and the CP phase is removed (60). Due to the absence of the CP projection, the impossibility of an overt complementizer is accounted for.



Thus, both Pesetsky and Müller's proposals constitute contemporary revivals of

the old idea of deletion operations in syntax. However, they also differ in some crucial respects (see Pesetsky 2019:12 for discussion). The main one involves the trigger for deletion. While Müller assumes that, like Merge and Agree, Remove is an operation driven by features on heads, Pesetsky's Exfoliation has more of a Last Resort/repair character, applying when movement would otherwise fail. Furthermore, Müller envisages a much wider application of deletion, for both heads and full projections, as well as in complement and specifier position. In its current form, Exfoliation is primarily triggered by subject movement from an embedded clause.

What both of these approaches have in common, however, is their demonstration of the utility of genuine deletion operations in contemporary syntactic frameworks. Thus, what may seem a rather idiosyncratic, antiquated idea can still provide insightful solutions to long-standing problems such as conflicting representations and variation in clause size. This volume contains a collection of papers that provide new arguments in support of this position.

## 7. Contributions to this volume

As we have seen, syntactic theories involving some concept of Structure Removal have a long pedigree. However, this idea has manifested itself in different guises. In the present volume, we also see different implementations and conceptions of Structure Removal that shown to have applications in new empirical domains.

The first set of papers discuss feature-driven approaches to Structure Removal in German. The contribution by **Johanna Benz** explores the phenomenon of 'status government' in German. She argues that Structure Removal stands in a counterfeeding relation to status government, accounting for the presence of the second status (*zu*-infinitive) in restructuring contexts. **Gereon Müller** contributes two papers developing a Structure Removal analysis of passivization in German. The first, 'The Short Life Cycle of the External Argument in German Passive Derivations', argues that there is conflicting evidence for the presence/absence of the external argument in the German passive. This is reconciled by first projecting the external argument and then later removing it from the structure, giving rise to what he calls 'short life-cycle effects'. The second paper, 'Long-Distance Passives by Structure Removal', extends the analysis in the first paper to long-distance passives by additionally adopting a Structure Removal approach to restructuring. **Marie-Luise Schwarzer**

presents a Structure Removal account of the *tough*-construction in German. Crucially, she argues that the movement step out of the infinitival clause is not A-movement, as is often assumed, but instead displacement that results from Remove. This avoids the problem of improper movement, for example.

The next group of papers pursue feature-driven Structure Removal approaches from a cross-linguistic perspective. The paper by **Imke Driemel** and **Sören E. Tebay** discusses how a Structure Removal approach can derive certain restrictions on subjects in the Balinese object voice construction. **Sampson Korsah** and **Andrew Murphy** provide a Structure Removal analysis of clausal determiners in two Kwa languages Akan and Gã that derives their complex distribution. Further cross-linguistic evidence for Structure Removal comes from the paper by **Philipp Weisser**, who investigates the complementarity effect in Breton, accounting for it with the operation Remove.

The remaining papers all provide different perspectives on Structure Removal. **Johannes Englisch** presents a computational implementation of a fragment of German grammar that incorporates the core operation of Structure Removal. The paper by **Jelena Stojković** discusses the intricacies Left-Branch Extraction in Bulgarian and Macedonian (two languages with articles) and provides an analysis based on Pesetsky's Exfoliation. Furthermore, **Anke Himmelreich** proposes Structure Removal on the level of features in her account of agreement asymmetries in Modern Standard Arabic. Finally, **Gereon Müller** provides a unique perspective on Structure Removal as the reduction of syntactic 'activity'. Couched in the framework of Harmonic Grammar, he argues that Structure Removal can result in Gradient Symbolic Representations, which give rise to weaker violations of grammatical constraints.

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