

Displaced morphology in German – Evidence for post-syntactic morphology

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Abstract

In this paper I will provide a new argument for post-syntactic morphology. The empirical evidence comes from so-called displaced morphology in German where the non-finite verb form selected by a given governor does not end up on the immediately dependent verb but rather on the last verb of the verb cluster. The placement of the morphology thus depends on linear notions such as adjacency rather than hierarchical relations (c-command, minimality). I will argue that the exponents for non-finite morphology are inserted into separate functional heads which are linearized clause-finally. At a late stage of the PF-derivation, the exponents are associated with their verbal hosts by means of Local Dislocation (Embick and Noyer 2001). As a consequence, the non-finite morphology always comes last in the verb cluster. Displacement arises once the order in the verb cluster deviates from the strictly descending 321 order. The placement operation is thus always the same, displacement emerges just a side-effect of (partially) ascending verb cluster orders.

1. Introduction: morphological selection

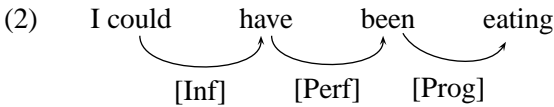
It is a pervasive property of syntax that heads determine the formal properties of their complements. In this paper I will focus on selection of non-finite morphology where several selection relations are involved. Canonically, the morphology selected by a verb V_n is realized on the immediately subordinate verb, viz. V_{n+1} (if the non-finite morphology is selected by a complementizer, the non-finite morphology is realized on the highest verbal element in

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the relevant domain). This is schematically represented in (1), which depicts a sequence of verbs that are in a government relation:¹



The non-finite morphology selected by V1 is thus realized on V2, the morphology selected by V2 on V3 and so forth. The following example from English illustrates the workings of selection:



The modal verb *could* selects an infinitive, which is realized on the perfective auxiliary *have* that immediately depends on the modal. *Have* in turn selects a perfect participle, which is realized on the progressive auxiliary *been*. *Been*, finally, selects the progressive form, which is realized on the lexical verb *eating*.

Ensuring that the selectional properties of a verb/complementizer are satisfied can be done in two ways: Either by means of a checking operation or by Agree between the selector and the dependent element. In the former, both elements are pre-specified for a certain value. If the values co-incide, checking and thus selection is successful. In the latter, first proposed in Adger (2003), the dependent element starts out with an unvalued feature that is valued in the course of the derivation by the selector. The Agree approach is particularly prominent in recent work by Susi Wurmbrand such as Wurmbrand (2012). She assumes that functional clausal heads (such as T, Mod, Asp etc.) have an interpretable T(ense)-feature which is typically valued; the value corresponds to the semantic value of the head, viz., PAST, MODAL, PERFECT etc. Furthermore, all verbal heads have an uninterpretable T-feature, which is typically unvalued. Since it is unvalued, it has to undergo Agree with the closest valued feature. The value of the *u*T-feature is what is realized at PF. A sentence like *He must have left* will then involve the following features and Agree operations (I simplify Wurmbrand's example 7 somewhat):

¹In the traditional German literature, the selection of non-finite verb forms is called 'status-government'; verbs thus govern the 'status' of dependent verbs.

- (3) [ModP Mod_{T:mod} [AuxP Aux_{T:perf;uT:mod} [VP V_{uT:Perf}]]]

The lexical verb thus receives the value [perf] from the auxiliary, while the auxiliary receives the feature [mod] from the modal. At PF, [perf] is realized by the perfect participle while [mod] is realized by the infinitive.

As Wurmbrand points out, in most cases, checking and Agree lead to the same result. She argues that parasitic morphology in Frisian and Norwegian/Swedish provides an argument in favor of the Agree approach because it involves copying of a value from a selector to several dependent verbs. In the following example, the perfect selected by the perfective auxiliary is not only realized on the modal that directly depends on it, but also on the lexical verb that is governed by the modal (Wurmbrand 2012: 132):

- (4) *Jeg hadde₁ villet₂ lest₃ boka.*
 I had want.PART read.PART books
 ‘I would have liked to read the book.’ *Norwegian*

While I find her arguments valid for parasitic morphology, I will argue for a very different position in this paper. The argument will be based on so-called displaced morphology in German where non-finite morphology is realized in a radically different way than in the canonical case depicted above: the morphology selected by V_n is not realized on V_{n+1} but rather on the last verb of the relevant domain, which in our case is the verb cluster. Displacement is schematically represented in (5):

- (5)  *displacement*

The form selected by V1 is not realized on the directly dependent V2 but rather on V3, the last element in the verbal hierarchy. Furthermore, the selectional requirements of V2 seem to be suppressed (a fact to be qualified in sections 4 and 5 below).

I will argue that displaced morphology in German provides an argument for post-syntactic morphology (cf. Arregi and Nevins 2012) and against selection via Agree as in Wurmbrand (2012): First, the placement of non-finite morphology does not depend on the structural conditions that characterize Agree, viz. C-command and Minimality, but rather on linear notions such as adjacency. Second, displacement does not have any semantic effects, which

will be important in the case of participles. I will propose that the non-finite morphology is inserted into separate functional heads and associated with the verb post-syntactically by Local Dislocation (Embick and Noyer 2001). Displacement will be shown to arise from the conflict between the general head-finality of German and head-initial verb clusters. Importantly, there is no displacement operation as such; rather, displacement is just a side-effect of the linearization conflict.

This paper is organized as follows: Section two introduces the empirical phenomenon. In section three, I provide a derivation of displaced morphology. In section four, I address restrictions on displacement. Section five discusses configurations where displacement is exceptionally absent, and section six concludes. The appendix in section seven addresses the IPP-effect.

2. The phenomenon of displacement

One prominent feature of West-Germanic OV-languages like Dutch and German is the clustering of verbal elements at the end of the clause in V-final structures, as in the following example (under verb second, where the finite verb moves to C, only the non-finite verbs occur together):²

- (6) *dass er das Buch lesen₃ können₂ muss₁*
 that he the book read.INF can.INF must.3SG
 ‘that he must be able to read the book’ *Standard German*

Such sequences are referred to as verb clusters (for a detailed overview, cf. Wurmbrand 2005, to appear). In this section, I will describe the placement of non-finite morphology in German verb clusters; I will first discuss the situation in the standard language before addressing German dialects and earlier stages of the language.

2.1. Standard German descending verb clusters: well-behaved

Verb clusters in the standard language are mostly descending, viz., the governing verb follows the governed verb. Orders where the governing verb precedes the governed verb are referred to as ascending. Descending orders are

²The number indices on the verbs indicate the hierarchical relations, i.e. 1 stands for the highest verb in the government sequence, 2 for the immediately dependent verb etc.

unsurprising, the non-finite morphology selected by a given verb is faithfully realized on the immediately dependent verb, as illustrated in (7):

- (7) a. *dass er das Buch **gelesen**₃ **zu** haben₂ dachte₁*
 that he the book read.PRT to have.INF think.PST.3SG
 ‘that he thought he had read the book’ 321 *Standard German*
- b. *dass er das Buch **zu** lesen₃ **zu** versuchen₂ versprach₁*
 that he the book to read.INF to try.INF promise.PST.3SG
 ‘that he promised to try to read the book’ 321 *Standard German*

In (7a), V1 selects a so-called *zu*-infinitive (semantically equivalent to English *to*-infinitives), which is realized on V2 (although *zu* is written separately in German orthography, I will show below that it is a prefix). V2 in turn selects a perfect participle, which is realized on V3. In (7b), V1 selects a *zu*-infinitive, which is realized on V2. V2 also selects a *zu*-infinitive, which is realized on V3. The placement in descending orders is schematically represented in (8):

- (8)  *no displacement*

2.2. Standard German (partially) ascending clusters: displaced *zu*

Interestingly, once the cluster order deviates from the strictly descending 321-order, i.e. involves a (partially) ascending order, *zu*-placement is no longer in accordance with the hierarchical relations. Consider the triple in (9) where the complementizer *ohne* ‘without’ selects a *zu*-infinitive (note that while V2 appears as a participle in (9a), it appears as a bare infinitive in (9b/c). This instantiates the so-called IPP-effect, cf. section 7 for discussion):

- (9) a. *ohne das Buch lesen₃ gekonnt₂ **zu** haben₁*
 without the book read.INF can.PRT to have.INF
 ‘without having been able to read the book’ 321
- b. *ohne das Buch haben₁ lesen₃ **zu** können₂*
 without the book have.INF read.INF to can.INF
 ‘without having been able to read the book’ 132
- c. *ohne das Buch lesen₃ haben₁ **zu** können₂*
 without the book read.INF have.INF to can.INF
 ‘without having been able to read the book’ 312

In (9a), which involves a 321-order, the *zu*-infinitive appears on the hierarchically highest verb of the cluster, viz. V1. In (9b/c), however, which involve a 132 and 312 order, respectively, *zu* does not occur on V1 but rather on V2. It thus seems to be displaced. Crucially, if *zu* occurs on V1 in (9b/c), the result is sharply ungrammatical, as (10) shows for (9b):

- (10) **ohne das Buch zu haben₁ lesen₃ können₂*
 without the book to have.INF read.INF can.INF
 ‘without having been able to read the book’ 132

Displaced *zu* has been frowned upon by grammarians ever since Grimm (1837: 949). There seem to be two reasons: First, displacement is considered illogical (as it blatantly violates the canonical rule of morphological selection); second, subjects show a significant degree of uncertainty and variability in empirical tests, see Reis (1979), Haider (2011). As for the first point, German is frequently compared with the ‘logical’ well-behaved Dutch verb clusters, where the equivalent particle *te* always occurs on the hierarchically highest verb:

- (11) *dat hij het boek dacht₁ te hebben₂ gelezen₃*
 that he the book think.PST.3SG to have.INF read.PRF
 ‘that he thought he had read the book’ 123 *Standard Dutch*

Since displacement violates a rule of grammar, it is considered ungrammatical by Merkes (1895) and Haider (2011). Both argue that displacement may be motivated by the fact that *zu* generally occurs at the end of the verb cluster. Displacement may then be an over-generalization. Haider (2011) argues that it is a grammatical illusion: although the construction is acceptable to many speakers, it is nevertheless ungrammatical. Bech (1963) considers the construction grammatical, but argues that it is a hybrid repair construction that results from the fact that two equal rules are in conflict with each other (the details do not matter here); the degradedness of the result may thus be unsurprising. Reis (1979), finally, argues that the grammatical status of the construction is undefined: she proposes that grammatical rules are only defined for the standard cases and may consequently not apply in very specific environments such as the one where displacement is found.

Following Meurers (2000) and Vogel (2009), I assume instead that displacement is a grammatical phenomenon. I will show that the picture

changes drastically once the rule for the placement of non-finite morphology in German is reconsidered. There will be just one placement rule in my system so that no conflicts arise; both lack of displacement in descending orders and displacement in ascending orders will result from the very same rule and both thus arise as the only logical possibility in their respective grammatical environment. The theory-internal arguments against the grammatical status of displacement adduced in the works cited above thus disappear. Nor will there be any reason to consider displacement as either a hybrid construction or as a phenomenon outside the purview of grammatical rules.

Quite apart from the conceptual argument, there are also strong empirical arguments against treating displacement as ungrammatical/paragrammatical/hybrid: First, displacement is attested in careful sources, including poetic and scientific texts as well as in prestigious newspapers as in (12) (for more examples see Merkes 1895: 69f., Meurers 2000: 72, ex. 114):

- (12) *die Ohnmacht, nicht haben₁ helfen₃ zu können₂ ...*
 the powerlessness not have.INF help.INF to can.INF
 ‘the powerlessness not having been able to help’ FAZ, 03. 01. 2005

Second, treating displacement as ungrammatical/as a repair fails to account for the significant contrast between the displaced variant in (9b) and the version without displacement in (10). Third, displaced *zu* is unmarked in German dialects (see section 2.3), and fourth, displaced *zu* is part of a more general displacement phenomenon (see section 2.4). The somewhat reduced acceptability of displacement in the standard language will be addressed in the next subsection.

2.3. Displaced *zu* in German dialects

Displaced *zu* in the standard language is necessarily infrequent because (partially) ascending orders only occur in three-verb clusters, and among those only in one cluster type (Aux/Fut-Mod-V). The situation in dialects is very different because ascending orders are much more prominent. Interestingly, while the phenomenon is well-attested, the literature discussing displacement in dialects does not contain any claims that the construction is marked or ungrammatical. Rather, displaced *zu* is described as the canonical realization of non-finite morphology in (partially) ascending orders. Its grammaticality is thus undisputed. Importantly, this holds for both traditional grammars

(Hodler 1969: 560, Weber 1987: 244 and especially the works cited in Höhle 2006), more descriptive treatments (Comrie and Frauenfelder 1992) as well as formal approaches (Bader 1995: 22 and Cooper 1995: 188f.). Furthermore, displaced *zu* can be heard on the radio (Cooper 1995) and be found on the internet. The following examples are but a small selection. (13a) is from Weber (1987: 244,fn.1), (13c) is from Comrie and Frauenfelder (1992: 1059), and (13d) is from Weise (1900: 154):

- (13) a. *Er schiint₁ nüüt [wele₂ z wüsse₃] dervoo.*
 He seem.3SG nothing want.INF to know.INF about.it
 ‘He does not seem to be interested in it.’ 1 ... 23 *Zurich G.*
- b. *Ich liebe d freiheit, selber de tag [chöne₁ z*
 I love.1SG the freedom self the day can.INF to
bestimme₂].
 determine.INF
 ‘I love the freedom to determine my schedule.’ 12 *Swiss G.*
 cf. <http://badoo.com/de-ch/0279246484/>, found on 11.3.2013
- c. *Ech ha ts Büach kchöifft, fer dam Marco cheni₁*
 I have.1SG the book buy.PRT for the.DAT Marco can.INF
z sägan₂, ...
 to say.GER
 ‘I bought the book to be able to tell Marco ...’ 12 *Bosco Gurin*
- d. *weil er sich nicht von ihm braucht₁ lassen₂*
 because he self not by him need.3SG let.INF
anzuschnauzen₃
 rant.at.INF 123
 ‘because he does not need to be ranted at by him’ *Altenburg*

Note that displacement is also attested with Verb Projection Raising, viz., verb clusters that contain non-verbal material:

- (14) *ohni mi welle₁ uf d bullesite z stelle₂, im gegeteil*
 without me want.INF on the cops.side to put.INF on.the contrary
 ‘without wanting to side with the cops, on the contrary, but ...’

1X2 *Swiss German*

As mentioned above, there is no reason to believe that displacement is marked in the dialects. There are arguably two factors that lead to higher acceptability than in the standard language: First, since ascending clusters are much more prominent in dialects, including 2-verb-clusters, displacement is much more frequent than in the standard language where they only occur in one type of 3-verb-cluster. Second, because of the higher frequency of strictly ascending orders in dialects (12, 123), the relative dependencies between the verbs can be determined more easily than in the mixed clusters (132, 312) that prevail in the standard language: In the relevant 13zu2- and 31zu2-clusters, all verbs appear as infinitives so that it is not immediately obvious which verb depends on which. The dialect speaker, however, takes an ascending order for granted and will thus be able to determine the hierarchical relationships quickly despite the lack of morphological clues.

To summarize the empirical situation so far, $z(u)$ always attaches to the last verb of the verb cluster.³ As a consequence, $z(u)$ will appear displaced once the order in the cluster deviates from the strictly descending (3)21.

2.4. Further types of displaced morphology in German (dialects)

Importantly, displaced *zu* is not an isolated phenomenon. Rather, displacement is a systematic property of certain morphological forms in certain German varieties. One example is the so-called Participio Pro Infinitivo (PPI)-construction that was found in earlier stages of the language. In (15), V1 selects a perfect participle, but V2 appears as an infinitive while V3 (which should be an infinitive given the selectional requirements of V2) appears as a participle, see Fleischer and Schallert (2011: 185):⁴

- (15) *dez han₁ wir unser kunichlich Insigel an disen breiff*
 therefore have.1PL we our royal seal to this letter
haissen₂ gehenket₃
 let.INF attach.PART
 ‘Therefore we had our royal seal attached to this letter.’

Middle High German, 1286

³For very rare exceptions, see Schallert 2012: 252.

⁴The PPI-construction is also residually found in some contemporary dialects, see e.g. Steil (1989: 41) and references cited there on Swabian clusters with V2 = ‘help’. See also Höhle (2006: 66, fn. 19) for a PPI-example from Sonneberg.

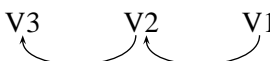

It appears, thus, that a verb in the government chain, V2, has been skipped.

Furthermore, displacement is particularly prominent in East-Middle-German dialects, which have a much richer inventory of non-finite forms (cf. Höhle 2006). In these dialects, various kinds of infinitives and gerunds can be displaced. In (16), V1 selects a so-called *ge*-infinitive, viz. an infinitive with a *ge*-prefix. However, V2 (which selects a bare-infinitive) occurs as a bare infinitive while V3 appears in the *ge*-Inf, see Höhle (2006: 68):

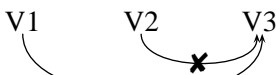
- (16) *kãsd*₁ *mə* *heləf*₂ *gəschri*₃
 can.2SG me.DAT help.INF GE.write.INF
 ‘Can you help me write?’ *dialect of Kleinschmalkalden*

2.5. Summary

We have seen that the order in the German verb cluster has an effect on the placement of non-finite morphology. The distinction between strictly descending (3)21 orders and partially ascending orders, viz., 123, 132 and 312, is crucial. In strictly descending orders, the morphological properties selected by a given verb are always faithfully realized on the immediately dependent verb. Importantly, there is never any displacement in such orders, as the following diagrams show:

- (17)  (18) 
no displacement *displacement*

Things are very different in (partially) ascending orders: The form selected by V1 (or by some higher head like the complementizer *ohne* ‘without’) is not realized on the immediately dependent verbal element but on the last verb of the verb cluster. Furthermore, the selectional properties of verbs that are in the middle of the government sequence (usually V2) appear to be suppressed:

- (19) 
displacement

At first sight, the placement of non-finite morphology may appear rather idiosyncratic given that it can be both faithfully realized or be displaced, de-

pending on the cluster order. A different perspective emerges, though, once it is realized that all cases we have studied so far obey the following very simple descriptive generalization:

- (20) generalization: Placement of non-finite morphology
 The non-finite form selected by the hierarchically highest verb of the verb cluster (or by a *zu*-selector above the verb cluster) is realized on the last verb of the verb cluster

In other words, the placement of non-finite morphology in German follows a very simple and general rule. What is remarkable, though, is the fact that it does not seem to be governed by hierarchical relations (at least not in partially ascending orders) but rather by linear order.

Before concluding this section, I will briefly discuss other cases of displacement in West-Germanic. I will show that they do not fall under the generalizations established above and thus require a different analysis than the one to be proposed in the next section.

The first case is the so-called Skandalkonstruktion ‘scandal construction’, first mentioned in Merkes (1895: 72), rediscovered in Reis (1979) and discussed in detail in Vogel (2009). In this construction, which obtains in 312 (and 1423) orders, the selectional requirements of V1 are displaced to V3. Crucially, displacement thus does not target the last verb of the verb cluster but rather the first one/the one left-adjacent to V1 (note that the *zu* selected by the matrix verb *bedauern* ‘regret’ is displaced to the last verb of the cluster, viz. V2), see Vogel (2009: 308):

- (21) *Er bedauert, es nicht [verhindert₃ haben₁ zu können₂].*
 He regret.3SG it not prevent.PRT have.INF to can.INF
 ‘He regrets not having been able to prevent it.’

Obviously, displacement of participle morphology to the left/the beginning of the cluster in (21) deviates from the general placement rule established above. I will consequently set the scandal construction aside in the rest of the paper. It is not my intention to brush it under the carpet, not the least because Vogel (2009) has convincingly shown that the scandal construction is not just a marginal phenomenon. Rather, I believe that it is fundamentally misguided to attempt to unify the scandal construction with the instances of displacement that target the last verb of the cluster. Consequently, the neces-

sary mechanisms to derive the scandal construction will be rather different, see e.g. Vogel (2009) and Wurmbrand (2012) for explicit proposals. An alternative view is proposed in Meurers (2000: 96ff.), taking up an observation by Merkes (1895: 33f.): he argues that the scandal construction should be considered a residue of a construction that was more prominent in Middle High German; this construction shows a systematic syntax-semantics mismatch: In 3-verb-clusters with the auxiliary semantically as V1 and the modal as V2, the modal appears syntactically as V1 and the auxiliary as V2 (basically as in English *should have left*). The scandal construction can then be re-analyzed as a 321 cluster where morphological selection is regular. I will not pursue this issue any further here.

Displaced morphology in German should also be set apart from so-called parasitic morphology in Norwegian/Swedish and Frisian, which at first sight seems similar to displacement. In this construction, which is essentially a PPI-construction, the participle morphology selected by V1 is not only realized on V2, but also (optionally) on V3 although V2 selects an infinitive, see Wurmbrand (2012: 132):

- (22) a. *Jeg hadde₁ villet₂ lest₃ boka.*
 I had want.PART read.PART books
 ‘I would have liked to read the book.’ *Norwegian*
- b. *Ik ben tankber dat ik sa folle dien₃ kinnen₂ haw₁.*
 I am thankful that I so much do.PART can.PART have
 ‘I am grateful that I could do so much.’ *Frisian*

Parasitic morphology in these languages differs in significant ways from displacement in German so that a unification is undesirable. First, displacement in German involves various types of non-finite forms while in the other languages it is limited to participles. Second, only German features default forms (infinitives, supines) on V2 (there is no IPP-effect in the other languages). Third, displacement in German is limited to right-branching clusters while parasitic morphology in Frisian occurs in left-branching/descending orders (right-branching/ascending structures are only possible in the 3rd construction in Frisian, see fn. 15 below). Fourth, Frisian also has upward displacement (the requirements of V3 are realized on V2), see Wurmbrand (2012: 139):

- (23) *hy soe₁ it dien₄ ha₃ kinnen₂*
 he would it do.PART have.INF can.PART
 ‘He would have been able to do it.’

Frisian

Finally, unlike German, Frisian and the two Scandinavian languages allow for multiple displacement, i.e. displacement of a selectional requirement to several dependent verbs (to V4 and V5 in (24)), see Den Dikken and Hoekstra (1997: 1068):

- (24) *hy soe₁ it dien₅ kinnen₄ wollen₃ ha₂*
 he would it do.PART can.PART want.PART have.INF
 ‘he would have liked to be able to do it’

Displacement in these languages is thus aptly characterized as ‘parasitic’. It is more akin to spreading in a pre-theoretic sense while in German the non-finite morphology always only occurs once.⁵

3. The derivation of displaced morphology

I will now propose an analysis of the placement of non-finite morphology in German that captures both the well-behaved and the displaced instances. The basic idea is very simple (see Salzmann 2013*b* for an earlier version): the non-finite morphology originates in independent syntactic heads and is associated with its host post-syntactically by means of Local Dislocation, an operation that applies to linear structure and is constrained by adjacency (cf. Embick and Noyer 2001). Concretely, the vocabulary items are inserted into clause-final functional heads and therefore always come last in the verb cluster, thereby deriving the generalization in (20) above. The mechanism that associates the morphology with its host is thus always the same. Crucially, since Local Dislocation applies to linear structure, it can have very different effects, depending on the order in the verb cluster: if the order is strictly descending, the morphology appears to be well-behaved. If, however, the order deviates from the strict (3)21 order, it will appear to be displaced. Crucially,

⁵There are some attested examples of the PPI-construction in German where V2 appears as a participle as well – basically as in Frisian and the Scandinavian languages, see Fleischer and Schallert (2011: 185). At this point, I do not have sufficient information about PPI in German to assess the possible implications.

however, there is thus no displacement operation as such; rather, displacement is only a side-effect. I will first introduce the theory of verb clusters that I presuppose before applying it to displacement.

3.1. Verb cluster formation at PF

In Salzmann (2013*a*) I have proposed a new theory of verb cluster formation. It crucially differs from previous approaches in that complex heads arise after syntax, viz. at PF, via Local Dislocation, i.e. through affixation and reordering under adjacency. Linear order is established post-syntactically. In a first step, specifier, head and complement are ordered relative to another. This step is still sensitive to hierarchical structure. In a second step, verbal elements can be reordered by cluster formation, viz. Local Dislocation. For the initial linearization, I adopt a flexible system as in Abels and Neeleman (2012) that incorporates ordering statements for all sisterhood relations. These ordering statements can refer to properties of the head and the non-head. The latter is particularly important in languages with verb clusters because non-verbal dependents, which are always linearized to the left of the verb, can be treated differently than verbal dependents: I assume that verbal projections in verb cluster/restructuring contexts are linearized to the right of the governing verb. This produces an ascending 123 order. Orders that deviate from 123 arise through verb cluster formation at PF, viz., through complex head formation (= re-bracketing) and inversion at PF and thus represent an instance of local dislocation. This mechanism can derive all six logically possible orders. Next to 123, it can derive 132, which involves complex head formation between V2 and V3, viz., 1[32], 321 (complex head formation V3+V2 followed by complex head formation between V1 and [V3+V2]), viz., [[32]1], 213 (complex head formation between V1 and V2), viz. [21]3. 312 and 231 involve the possibility of string-vacuous cluster formation, viz., rebracketing without inversion: In 312, there is first rebracketing between V1 and V2 followed by complex head formation + inversion with V3: [3[12]]. In 231, finally, V2 and V3 rebracket before the newly formed complex undergoes complex head formation + inversion with V1: [[23]1]. The possible orders in a given variety are determined by linearization parameters. Finally, the coherence/restructuring effects we find with verb clusters are due to the fact that the relevant verbal projections contain less structure (viz., lack a TP/CP-layer), cf. Wurmbrand (2007). In what

follows, I will label all verbal projections as VPs for simplicity's sake even though some may better be classified as functional; for ease of readability, I will also omit the the vP-layer.

In Salzmann (2013a: 100-114) I presented two strong arguments for the PF-perspective: First, cluster formation at PF solves the so-called cluster puzzle: clause-final verbs in descending order form an impenetrable unit, which follows from their forming a complex head. However, in verb-second structures, which are derived from the verb-final order, parts of the cluster can suddenly be moved, viz. entire VPs with modifiers that would not be well-formed clause-finally and the finite V1. This is puzzling if complex head formation takes place in syntax – one seems to be dealing with a movement paradox. The problem disappears once cluster formation takes place post-syntactically: it comes too late to block movement in verb-second structures. Second, the cluster formation mechanism makes cross-linguistically correct predictions about the (im)penetrability of the various cluster orders.

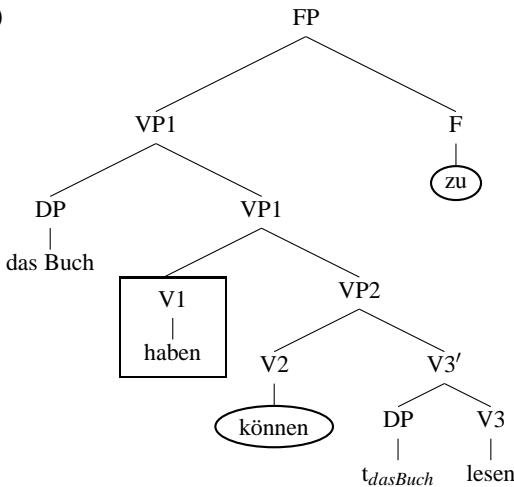
3.2. The placement of non-finite morphology

We need one further ingredient for our analysis: I assume that there are separate functional heads for the various non-finite verb forms, viz., there is a head *F* for *zu*, and different heads for participles, *ge*-infinitives and gerunds (cf. also Den Dikken and Hoekstra 1997: 1062). They occur above VP. Morphological selection is thus checked in syntax: A V1 that takes a *zu*-infinitive is syntactically combined with an FP hosting the relevant syntactic features (given a post-syntactic approach to morphology, cf. Halle and Marantz 1993, the morphological exponents are inserted late). These functional heads have another crucial property: they are linearized head-finally, i.e., they take their VP-complement to the left. This will have the consequence, that the non-finite morphology always comes last in the cluster. We are now ready to tackle *zu*-displacement. In a first step, we want to derive both well-behaved 321 cases like (9a) as well as examples with displacement such as (9b) and (9c). I repeat the first two for convenience:

- (25) *ohne das Buch {lesen₃ gekonnt₂ zu haben₁/ haben₁*
 without the book read.INF can.PRT to have.INF have.INF
lesen₃ zu können₂ }
 read.INF to can.INF

‘without having been able to read the book’ 321/132 *St. German*

After the initial linearization, we obtain a right-branching cluster with strictly ascending 123 order; the hierarchically highest verb is boxed, the verb that *zu* will end up on is circled (non-verbal material has been scrambled out of the lexical VP; this is optional in varieties that allow verb projection raising; I omit the functional projection for the participle, see section 7 on the IPP-effect):⁶



At vocabulary insertion, the hierarchical structure is gradually converted into a linear structure. Now verb cluster formation comes into play. To derive the examples in (25), we generate 1[32] and [[32]1]. *Zu*-placement is next: Since by assumption *zu* takes its VP-complement to the left, it has been linearized after the verb cluster. As it is a dependent element with selectional properties, it needs a host; furthermore, it is specified to attach to the left of the verb. By local dislocation, it is affixed onto and inverted with the closest, i.e. linearly adjacent verbal element:

$$(27) \quad \text{a.} \quad 1[32] \text{ zu} \Rightarrow 1[3+\text{zu}+2]$$

$\uparrow \text{LD}$

⁶Importantly, displacement is only found in transparent/coherent contexts but not with (finite and non-finite) CP-arguments in postverbal position. This follows if the transparent VPs in verb clusters and restructuring contexts are complements while CP-arguments are extraposed and thus end up outside the domain of the non-finite morphology. The same goes for the 3rd construction. See Salzmann (2013b: 91-100) for detailed discussion.

$$\text{b. } [[32]1] \text{ zu} \Rightarrow [[32]+ \text{zu}+1] \\ \quad \quad \quad \uparrow \text{LD} \downarrow$$

Note that the order of operations follows from cyclicity, assuming that the PF-derivation proceeds bottom-up/inside-out, cf. Embick and Noyer (2001: 576, 580).⁷ Displacement with 312 orders as in (9c) proceeds similarly: First, a 312 order is formed: [3[12]]. Then, *zu* is affixed onto and inverted with V2:⁸

$$(28) \quad [3[12]] \text{ zu} \Rightarrow [3[1+\text{zu}+2]] \\ \quad \quad \quad \uparrow \text{LD} \downarrow$$

Finally, in a variety that allows a 12(3) order like (13b), (13c) and (14), things are particularly simple: the ascending 123 order arises through the initial linearization. *Z(u)* is linearized after the verb cluster and then targets the last verb of the cluster:

$$(29) \quad 1 \ 2 \ 3 \text{ zu} \Rightarrow 1 \ 2 \ \text{zu}+3 \\ \quad \quad \quad \uparrow \text{LD} \downarrow$$

Note that since the functional heads for non-finite morphology are always linearized after the verb cluster, they will always attach to the last verbal element of the cluster. This affects both functional heads outside the verb

⁷Although the full hierarchical structure is no longer available, it is generally assumed that the PF-derivation still involves a certain amount of bracketing.

⁸In all the derivations so far, *zu* is inverted with the last verbal terminal of the cluster. This might seem to be in conflict with the generalizations in Embick and Noyer (2001: 577f.) about what type of element can adjoin where. They distinguish between Morphological Words (MWd), which refers to independent heads as well as complex heads, and Subwords (SWd), which refers to terminal nodes of complex heads. Crucially, they argue that MWds can only adjoin to MWds while SWds can only adjoin to SWds. In the case at hand, however, *zu*, an independent head and thus a MWd, adjoins not to the entire complex head but rather only to a segment of the complex head, viz. V2. One possibility to avoid a conflict may be to assume a default rule that adjoins stray affixes to the verbal complex so that they become subwords and can subsequently rebracket and invert with one of the cluster's segments. Alternatively, and this is the solution I will adopt, it may be possible to derive the placement possibilities of elements like *zu* from their selectional properties: unlike clitics such as the Latin coordinator *-que* 'and' which is category-insensitive, the vocabulary items for non-finite verbal features not only select a category but also specific versions of the category, e.g. a stem. This automatically precludes affixation to more complex elements. To avoid infixation of *zu* into prefix verbs, I will assume that they are combined in syntax and that their internal structure is no longer accessible at PF (cf. *zu verlassen* 'to leave' vs. **ver-zu-lassen*); on this see also fn. 12.

cluster as in the examples just discussed as well as functional heads selected by V1 as in (13a), (13d), (15), (16). Note that the placement of the non-finite morphology does not necessarily involve inversion; if it is a pure suffix like the gerund, it only rebrackets with the last verb of the cluster. Inversion is thus triggered by the selectional requirements of the vocabulary items.

To summarize, non-finite morphology in German is inserted into functional heads that are linearized after the verb cluster. The morphology is placed by local dislocation, an operation that is sensitive to linear precedence and adjacency. Consequently, the morphology is always associated with the last verb of the cluster. The morphology appears well-behaved in (3)21 orders because in these orders, the hierarchically highest verb ends up cluster-final. Displacement, on the other hand, is just a side-effect of cluster orders that deviate from the strict 321 order; there is no displacement rule as such. Rather, there is just a single rule that associates the non-finite morphology with its host. Put more generally, displacement arises from a conflict between the general head-finality of the language (as expressed by the head-final linearization of the functional heads) and (partially) ascending verb clusters. The facts thus all fall out from independently motivated principles: the head-finality of the language motivates the head-final linearization of functional heads. The selectional properties of the vocabulary items for the non-finite morphology (i.e. their affixal nature) determine their exact position; contrary to what was stated above, we thus do not need an explicit rule for their placement. And the various cluster formation options are simply independent properties of a given variety.⁹

One of the major advantages of the PF-approach is that no problems arise for semantic interpretation. This is particularly crucial in the case of participle displacement as the participle arguably contributes to the interpretation of the perfect. In the PPI-construction (15), it must consequently not be interpreted on V3 but rather on V2. Since the morphology is inserted and placed post-syntactically, no problems arise in the present approach: at LF, which interprets the hierarchical structure produced by narrow syntax, the relevant features are located in the correct position; concretely, in the PPI-case, there

⁹Displaced morphology may also be compatible with other theories of verb cluster formation; see Salzmann (2013b) for essentially the same approach where the verb cluster is first linearized as left-branching and ascending orders arise via VP-inversion at PF. See also the next subsection.

would be an FP above VP2 for the participle so that the perfective interpretation correctly applies to VP2 and not to VP3.

3.3. Against previous accounts

Previous accounts can be divided into syntactic/derivational accounts where *zu* is an independent syntactic element (Sternefeld 1990, von Stechow 1990, Hinterhölzl 2009) and declarative/realizational approaches where *zu* is just a feature of the non-finite complement (Bader 1995, Meurers 2000, Vogel 2009). I will discuss the two types of approaches in turn.

The idea the position of *zu* depends on the surface order of the verbal complex can be found in previous work as well. For instance, von Stechow (1990: 159) argues that *zu* is generated in INFL and incorporated into the verbal complex after reanalysis (which is taken to be the mechanism that generates complex heads and ascending orders, cf. Haegeman and van Riemsdijk 1986). The account seems to involve lowering/affix hopping of *zu*. It is explicitly assumed that this takes place before PF, which means it should be subject to syntactic locality conditions; as a consequence, one would expect *zu* to end up on the hierarchically highest verb of the cluster and not on the last one. It seems that lowering is sensitive to adjacency in this account, but that seems implausible for a syntactic operation (quite apart from the fact that it violates the c-command constraint on incorporation). Perhaps the underlying intuition was similar to the Local Dislocation approach proposed here, but given the framework of that time, a solution by means of a PF-operation was apparently not obvious.

A somewhat different proposal is found in Sternefeld (1990: 251), who first argues that it is the rightmost verb that moves to INFL, where *zu* is base-generated. Since movement to INFL follows cluster formation, *zu* ends up on the correct verb (viz. V₂). But it remains mysterious why it is not the head of the verb cluster V₁ that moves to INFL as would be expected under a syntactic account where locality constraints apply (e.g. minimality). Sternefeld also considers an incorporation solution as in von Stechow (1990) but points out that this raises problems for *te*-placement in Dutch as in (11) where incorporation would have to precede cluster formation/reordering. The issue is eventually left open, and it remains unclear to what extent the placement of the infinitival particle can be handled in a systematic way both within German and cross-linguistically.

Sternefeld (2006) posits a silent functional head *F* hosting the features for *zu* and assumes that it takes *VP1* as its complement. The feature for *zu* can then migrate, i.e. become a selectional feature of *V1*. Once *V1* combines with *VP2*, the selectional requirements of *V1* can be satisfied by *zu* on *V2* (which is the head of *V1*'s complement). However, this only seems to work for 132 clusters. In 123 clusters, *zu* would end up on *V2* instead of on *V3*. Clearly, the percolation mechanism does not quite work as it still targets the heads of verb clusters. It would have to be iterated in 123 orders to derive the correct result, but this arguably shows that the approach is on the wrong track. Furthermore, it remains unclear how migration can be limited to ascending orders.

The solution that comes closest to the current proposal is the one by Hinterhölzl (2009: 208), who argues that *zu* is a phrasal affix and fuses with the adjacent infinitive at Morphological Form (i.e. at PF). He adopts a theory of verb clusters based on massive (remnant) XP-movement. These movements are triggered by the need for temporal linking and subcategorization checking and target aspect phrases. In the case of *zu*-displacement as in (9b), *zu* is a phrasal affix in the extended projection of *V1*. A projection including *VP2* (with *VP3* in the specifier of a head in the extended projection of *V2*) then moves to *SpecAsp2* of *V1* while *V1* moves from *V* to *Asp1* (Hinterhölzl 2009: 208):

- (30) [_{Asp1P} *V1*₁+*Asp1* [_{Asp2P} [_{XP} *VP3* *V2*] *Asp2*+**zu** [_{VP1} ____]]]

In cases where requirements by *V1* are displaced as in (15), the phrasal affix, viz, the participial morphology, is in *Asp2* of *V2*. To obtain the correct result, one has to assume that *VP3* moves to *SpecAsp2* of *V2* while *VP2* moves to *SpecAsp1* in its own extended domain. Finally, the entire *Asp1P* of *V2* is moved into *SpecAsp2P* of *V1*, leading to (31) (Hinterhölzl 2009: 208):

- (31) [_{Asp1P} *V1*₁+*Asp1* [_{Asp2P} [_{Asp1P} *VP2*₃ *Asp1* [_{Asp2P} *VP3* *Asp2*+**prt** ____]]]₁ *Asp2* [_{VP1} ____] ____]]]

Instead of listing the general objections that can be raised against this type of approach (such as the effort needed to ensure that everything moves into the right specifier), I will only focus on one aspect of the analysis that in my view is highly unattractive: in (31), the participle is in *Asp2* and is affixed onto *V3* under adjacency. It is assumed that the participle expresses [+past]; however,

given the semantics of the construction, it must not apply to VP3 but rather to VP2. To achieve this, Hinterhölzl (2009: 210) proposes a repair strategy that copies the semantic features on Asp2 onto Asp1 and deletes them on Asp2. It is not quite clear to me how this operation is supposed to work, not the least since it seems to apply after vocabulary insertion (for unclear reasons, the author assumes that the participle – rather than the syntactic head – supplies interpretable features like [+past]). We are thus dealing with a copying operation from one head to another that is more reminiscent of narrow syntax than PF. At any rate, the need for a semantic repair operation clearly shows the drawback of an syntactic XP-movement approach to verb cluster formation and displacement.¹⁰ Next to the repair operation, many other issues remain unclear in Hinterhölzl's approach. The nature of the operation that places the phrasal affixes seems similar to local dislocation, but its precise workings are not spelled out so that it is not clear to what extent it can be applied to other cases of (dis)placement. For instance, only 123 and 132 clusters are discussed, how 312 clusters as in (9c) are to be derived remains an open question.

As for the declarative approaches, Meurers (2000: 189–194, 214f.) argues that verbs in the upper-field, i.e. verbs in ascending order, are not regular verbs but functional elements. Not being proper verbs, they cannot be governed nor can they govern themselves. As a consequence, they cannot determine the status of verbs that depend on it, e.g. V1 cannot govern V2 in the 132 order. This not only accounts for the IPP-effect (see the appendix in section 7) but also for *zu*-displacement in 132 orders: the complementizer *ohne* 'without' selects a complement specified for the *zu*-infinitive. Since V1 is not a verb, it is consequently not the head of the verbal projection *ohne* combines with. Instead, the head-final V2 is the head and thus correctly occurs as a *zu*-infinitive; verbs in ascending order are thus ignored in the government chain. The approach is very attractive in that it unifies the IPP-effect and *zu*-displacement; furthermore, no displacement as such has to be assumed. However, the approach fails in one fundamental respect: it is

¹⁰The semantic problem may also obtain in von Stechow (1990) and Sternefeld (1990), depending on where the participle is interpreted. Since incorporation/verb movement takes place in syntax in these approaches, the participle is arguably interpreted in its displaced position, which would lead to the wrong result. Under such assumptions, one is arguably forced to assume that the participle does not contribute to the perfective/past interpretation of the perfect.

simply not correct that verbs in the upper-field, viz., in ascending order, do not govern: Next to the potential counter-examples Meurers discusses himself on p. 221, there is ample evidence for government by verbs in ascending order, recall the examples with displacement of forms selected by V1: the *zu*-infinitive in (13a) and (13d), the participle in (15), the *ge*-infinitive in (16) and the displaced gerund in (47) below. Therefore, the treatment of verbs in ascending order as functional elements cannot be correct.

While Meurers (2000) handles displacement by categorizing verbs in ascending order differently, Bader (1995) and Vogel (2009) instead propose that the feature for the *zu*-infinitive is special. In both cases, it is a feature that is assigned to entire infinitival complement/the entire phrase and is crucially not borne by the head of the verb phrase (in Bader's HPSG-approach it is a so-called EDGE-feature otherwise used for the placement of clitics). Crucially, the morphological realization of the feature is the result of special realizational rules (Bader) or an alignment constraint (Vogel). (32) is a modified version of Vogel's realizational rule¹¹ and is arguably equivalent to Bader's EDGE-feature realization rule:

- (32) *zu* is realized on the right-most verbal element *within* the XP bearing the *zu*-feature

This works for both well-behaved *zu* in descending orders as well as for displacement in ascending orders: the feature is realized on the right-most terminal of the relevant phrase. It thus captures the intuition that the placement of *zu* (and displaced morphology more generally) depends on the surface order within the verbal complex and not the hierarchical relations. As far as I can tell, it can also be extended to the interactions discussed in the following sections. The major difficulties arise with CP-complements and the 3rd construction, as discussed in Salzmann (2013*b*: 102-106), because the approaches fail to adequately limit downward 'percolation' of the feature. There are two additional drawbacks: First, although such special features that are only present on the maximal projection of a head but not on the head itself avoid the postulation of several functional heads (as my derivational

¹¹His original formulation on p. 329, which defines *zu*-placement w.r.t. the extended projection of the phrase bearing the *zu*-feature, derives the wrong result in a number of cases, see Haider (2011: 250) and Salzmann (2013*b*: 103ff.) for discussion.

approach is forced to), they also come at a cost: they proliferate the number of feature types (one will need different features for finite morphology, see section 5.1), quite apart from the fact that such features are incompatible with current Minimalist assumptions such as Bare Phrase Structure (Chomsky 1995). Second, the rule essentially incorporates the descriptive generalization; it would thus be just as plausible as the converse rule and therefore misses a crucial property of displacement: it is related to the head-finality of the language, an intuition that falls out directly in the approach proposed above. I will consequently adhere to the derivational perspective, although it should be borne in mind that the realizational approaches by Bader and Vogel can probably receive the same degree of descriptive adequacy if worked out in sufficient detail.¹²

¹²The realizational approaches including Meurers (2000) may have certain advantages w.r.t. coordination: Since *zu/z* is a separate head, one might expect it to be able to have scope over a coordination, contrary to fact: both verbs have to bear *zu/z* (unlike English *to*), cf. also Cooper (1995: 191) and Haider (2011: 237):

- (i) *Er hät versproche, *(z) schriibe und *(z) telefoniere*
 he has promise.PRT to write.INF and to phone.INF
 'He promised to write and phone.'

Swiss German

This property can perhaps be derived under the realizational approaches if the *zu*-feature is assigned to the &P so that it has to be realized on both conjuncts. Under the derivational approach here, this does not yet follow. However, it should be stressed that the obligatory repetition in coordination is a frequent feature of phonologically/morphologically dependent elements. In other words, typologically, occupying an independent syntactic head does not imply scope over the coordination, see e.g. Romance function words or the Bulgarian definite article in Spencer and Luis (2012: 197, 203).

In V+V-coordination, one finds examples with just one *zu*, but puzzlingly before the entire coordination, cf. e.g. Müller (1999: 156) for an example. The same goes for Dutch *te*, cf. Zwart (1993: 104f.); for evidence from older stages of Dutch, see Hoeksema (1995). Under the current approach, this seems to require the assumption that X^o-coordination can form impenetrable units just like prefix verbs (cf. *zu verlassen* vs. **verzulassen* 'to leave'). Alternatively, this construction may involve *te*-deletion in the second conjunct as proposed in Zwart (1993).

The separability of particle verbs (cf. *aufmachen* 'open' → *aufzumachen* 'to open') can be accounted for if they do not form a complex head in syntax (but only at PF, see Salzmann 2013a: 123, fn. 28), an assumption that is generally advantageous since the particles are obligatorily stranded under verb second. The only problem for this view constitute prefix verbs that contain a particle verb. They are inseparable in syntax (they resist verb second) but can take affixes like *zu*, cf. *uraufführen* 'premiere' → *uraufzuführen* 'to premiere'. I am thus

4. Restrictions on displacement

Displacement is not always possible. The descriptive generalization in (33) provides a good initial approximation:

- (33) Restrictions on displacement:
 Displacement is only possible if the non-final verb(s) selects a bare infinitive

By non-final verb(s) I mean those verbs of the cluster that do not select the displaced morphology. This can be the highest verb of the cluster as in (13b), (13c), (14) or the middle verb V2 in (13a), (13d), (15), (16) (I will come back to the IPP-cases in (9b), (9c) in the appendix in section 7 below).¹³

In the rest of this section, I will first introduce a case where displacement fails. This will motivate my treatment of the infinitive as being syntactically absent. In the last part, I will discuss cases where displacement is felicitous even though the non-final verb(s) does not select a bare infinitive. Importantly, the restrictions to be observed follow from the independently established selectional properties of the exponents.

4.1. Selectiveness

At first sight, the free positioning of *zu* is reminiscent of that of clitics: it occurs at the edge of the verb cluster, viz., in second to last position. However, *zu* (as well as the other displaced morphemes) crucially differs from regular clitics in that it has selectional properties. It only attaches to verbs in the bare infinitive. Because of this property, it is sometimes referred to as a phrasal affix, see Vogel (2009), Hinterhölzl (2009). Given the many problems with the clitic-affix dichotomy (see Bickel et al. 2007), I will refrain from using the terms in the remainder of this paper. What is crucial is that the morphological elements under discussion are dependent and selective but do not (necessarily) attach to the head of the complement of the head they are inserted into.

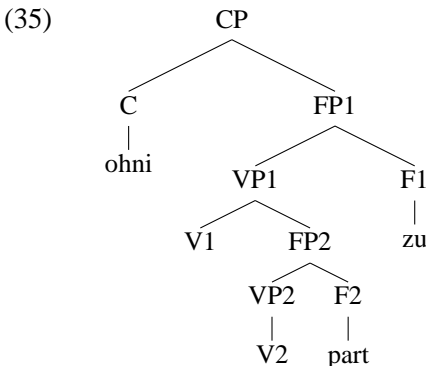
forced to assume that they do not form complex elements in syntax and that their immobility is due to different reasons.

¹³Of course, in more complex clusters, there can be several non-final verbs in the relevant sense.

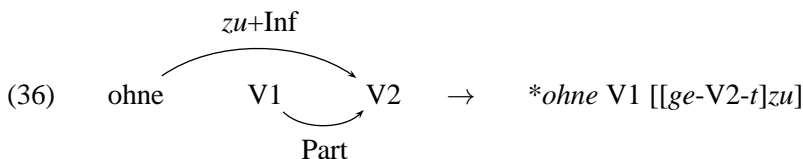
The selectiveness of *zu* can be illustrated as follows: In some Western Swiss German dialects (e.g. Bernese German), 2-verb clusters with V1 = perfective auxiliary and V2 = participle allow for both a 12 and a 21 order when V1 is finite, see (34a). However, if V1 is non-finite, e.g. when selected by the complementizer *ohni* ‘without’, only the descending order is possible, see (34d). The ascending order is ungrammatical, irrespective of whether *zu* is placed on V1 (i.e. not displaced), see (34b) or whether it undergoes displacement to V2, see (34c) (Raffaella Baechler, p.c.):

- (34) a. *das er s Buech hä₁ gläse₂/ gläse₂ hä₁*
 that he the book have.3SG read.PRT read.PRT have.3SG
 ‘that he read the book’ 12/21; *Swiss German*
- b. **ohni s Buech z ha₁ gläse₂*
 without the book to have.INF read.PRT
 ‘without having read the book’ 12; *Swiss German*
- c. **ohni s Buech ha₁ z gläse₂*
 without the book have.INF to read.PRT
 ‘without having read the book’ 12; *Swiss German*
- d. *ohni s Buech gläse₂ z ha₁*
 without the book read.PRT to have.INF
 ‘without having read the book’ 21; *Swiss German*

The reason is the following: In the syntax, there will be a functional projection above the verb cluster for *z*, selected by *ohni* ‘without’. In addition, there will be another functional projection for the participle selected by V1 between V1 and VP2:



At linearization, the exponents for *part* and *zu* have to be attached cyclically, viz., bottom-up/inside-out, cf. Embick and Noyer (2001). Consequently, in a first step, the participle exponent is attached to the verb (I will treat it as a circumfix for present purposes, but nothing really hinges on this). Since the participle selects a stem, this will be felicitous. However, in the next step, *z* has to be attached. Since *z* is a prefix and selects a bare infinitive (more precisely, the stem, see below), a clash obtains: it cannot be affixed onto the participle. In other words, the derivation crashes at linearization of the complex head derived by Local Dislocation, viz. [[[V]Part]*zu*]. The failed displacement is schematically represented in (36):



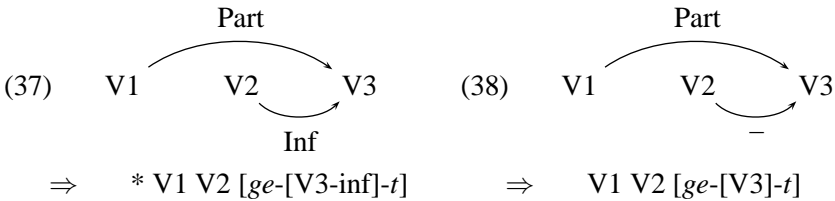
This problem will obtain more generally whenever there is more than one governor with a right-hand FP-complement so that as a consequence there will be more than one clause-final exponent on the final verb of the cluster. Since the selectional restrictions of the morphemes often conflict with each other, this will consequently lead to a clash and a crash of the derivation. Therefore, displacement is necessarily quite restricted. Configurations with more than one element selecting to the right will only be grammatical if the requirements of the non-finite forms are compatible. I will discuss the types where this is systematically possible in 4.3 below. Before doing so, I will address the special status of the infinitive.

4.2. The infinitive as the default

As mentioned above, displacement is facilitated if the non-final verb(s) select a bare infinitive. In fact, displacement is generally possible in this configuration – apart from the standard German IPP-cases as in (9b) and (9c) where the participial morphology selected by V1 goes missing, see section 7 below.

To account for the effect of the infinitive, I propose that infinitival features are not present syntactically, i.e., there is no separate functional projection for them. As a consequence, in ascending orders, verbs selecting a bare infinitive will not contribute an additional clause-final exponent so that a clash at linearization is prevented. Importantly, this assumption is independently

necessary to allow for PPI in German as in (15): If there were a functional projection for the infinitive, the infinitive marker would first attach to V3. The displaced participle, selected by V1 could then not be affixed as it selects a verbal stem and not an infinitive, see (37). If, instead, V2 effectively selects nothing, there will only be one clause-final exponent, the participle, which can then felicitously be affixed onto the verbal stem, see (38):



It remains to be explained how infinitive morphology is introduced. This is particularly pressing for morphemes which themselves select an infinitive, viz., *z(u)* as well as the gerund and the *ge*-infinitive, which both morphologically contain an infinitive. I will assume that the vocabulary item for these items have an additional feature triggering insertion of an infinitive morpheme (cf. Halle and Marantz 1993 for other cases of inflectional morphology where this is necessary). Additionally, the infinitive feature is assigned by default to verbs that are not associated with any functional morphemes during the PF derivation. Apart from verbs in descending order as in (6), the default rule is also important for non-final verbs in ascending order (cf. those mentioned at the beginning of this section) because they fail to receive functional morphemes due to displacement of the morphology selected by higher heads. This directly accounts for the generalization that these non-final verbs (in the relevant sense) generally occur in a default form, usually in the infinitive or, especially in the dialects described by Höhle (2006), as supines (for exceptions, see section 5.3 below).

4.3. Combinatorial possibilities

While displacement often fails if there is more than one governor that selects a non-infinitival form in ascending order, it is sometimes possible if the selectional restrictions of the exponents are compatible with each other. So far there seem to be three basic types:

4.3.1. *V1 and V2 select the same form: haplology*

In the first type, the two governors select the same form. In the so-called missing-*z* construction described for Bernese German (cf. Bader 1995: 22,26), there are two *z*-selectors in ascending order, but we find only one *z*, on the last element of the cluster (while V2 appears in the bare infinitive):¹⁴

- (39) *wüu dr Hans sine Fründe schiint_{1[zu]} probiere_{2[zu]} z*
 because the John his.DAT friends seem.3SG try.INF to
häuiffe₃
 help.INF
 ‘because John seems to try to help his friends’ *Bernese German*

The missing-*z* construction can be accounted for as follows: After the initial linearization, we obtain an ascending verb cluster with two cluster-final functional heads into which *z* will be inserted:

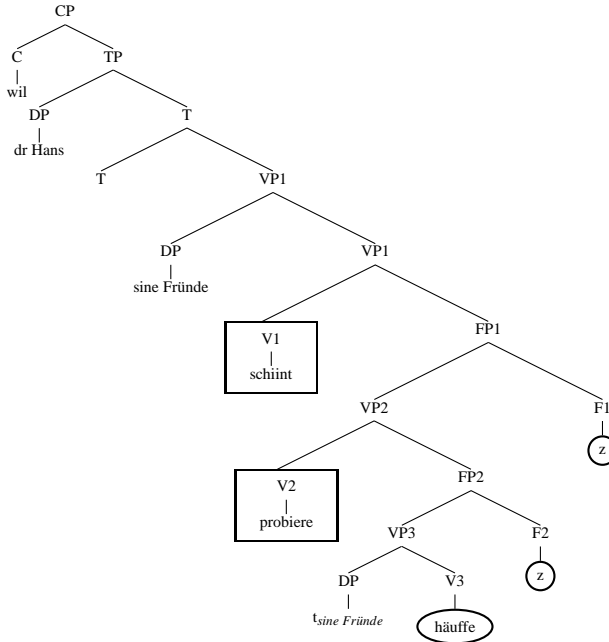
¹⁴Missing *z* seems to be optional, which can be accounted for if FP2 can undergo extraposition so that it patterns like the 3rd construction in standard German, see Salzmann (2013b: 91-100). According to Cooper (1995: 188f.), missing *z* is limited to Verb Raising cases and is blocked in Verb Projection Raising, i.e., when there is non-verbal material in the verb cluster. However, this claim could not be verified in an informal survey. Furthermore, a google search delivers two counter-examples, see (ia) and (ib):

- (i) a. ... *ohni öpe jeh mau säuber probiere₁, Dütsch z rede₂*
 without PRT ever once self try.INF German to speak.INF
 ‘without ever trying to speak German oneself’
<http://www.chefkoch.de/forum/2,22,296109/An-alle-CHer-Wir-zelebrieren-den-Kantoenligeist.html>, found on 28.3.2013.
- b. *S Ziel isch nid blibe z’ stah sondern versueche₁ glich z bliebe₂*
 the goal is not stay.INF to stand.INF but try.INF same to stay.INF
 ‘The goal is not to make no progress but to try to remain the same’
<http://www.mosiweb.ch/maennerriege/maennerriege.htm>

Another counter-example can be found in the description of the dialect of Bosco Gurin, see Comrie and Frauenfelder (1992: 1058) (the complementizer *fer* selects a *z* as does *tüa/tian*; the infinitive of causative ‘do’ always appears as a gerund);

- (ii) *Ech ha ts Büach kchöiff, fer ts Chenn tian₁ waldsch z leeran₂.*
 I have.1SG the book bought for the child make.GER Italian to learn.GER
 ‘I bought the book in order to make the child learn Italian.’ *dialect of Bosco Gurin*

(40)



Once (40) is linearized, there are two *z* adjacent to the final verb V3. By assumption, haplology reduces them to one *z* and in the final step, local dislocation places *z* before V3 (given a cyclic PF-derivation, haplology may in fact rather be an instance of deletion under identity of the higher *z* if in a prior step the lower *z* is affixed onto the verb):¹⁵

(41) a. V1 V2 V3 *z z* both *zs* adjacent → haplology: V1 V2 V3 *z z̸*

¹⁵The same haplology effect with the infinitival particle is found in Frisian; while the cluster order is normally strictly descending, the 3rd construction allows for (partially) ascending 312 orders. In (i), both the complementizer *om* and V1 *hoeve* ‘need’ select a *te*-infinitive. Interestingly, we only find one *te*, crucially before the last verb. The facts follow if there is displacement and haplology (the fact that V1 appears as a bare infinitive and not as a gerund, which is normally selected by *te*, suggests that there has been no *te*-deletion), cf. Den Dikken and Hoekstra (1997: 1062) and Eric Hoekstra (p.c.):

- (i) ... *om net kontrolearre*₃ *hoeve*₁ *te wurden*₂
to not check.PRT need.INF to become.GER
‘in order not having to be checked’

312 *Frisian*

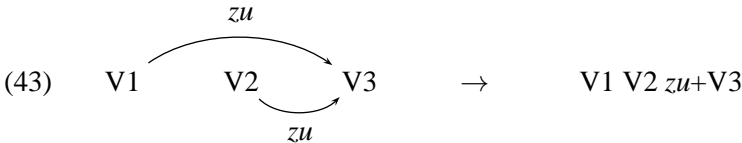
In the standard German 3rd construction, haplology seems to be possible as well in 312 orders, but the facts are subtle and require empirical verification:

- b. V1 V2 **z+V3** Local Dislocation
 ↑_{LD} ↓

Haplology effects are not limited to *z(u)*. In the dialect of Barchfeld, we find haplology of the *ge*-infinitive. In (42), V1 and V2 both select a *ge*-infinitive. While V2 appears as supine, V3 occurs in the *ge*-infinitive, see Höhle (2006: 70):

- (42) *ə meçd₁ lɪwə kɛnd₂ gə-awəd₃*
 I would like.1SG rather can.SUP GE-work.INF
 ‘I would rather like to be able to work.’ *dialect of Barchfeld*

The haplology effect can be schematically illustrated as follows:



4.3.2. Selectional requirements of V1 and V2 in an inclusion relationship

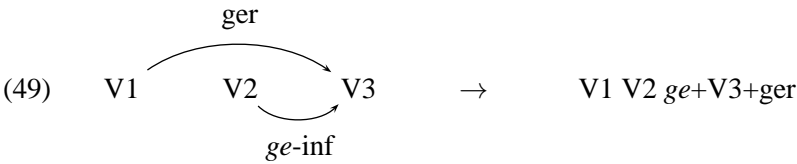
Haplology also plays a crucial role when two non-infinitival forms are in an inclusion relationship. In the following example from the dialect of Barchfeld, V1 selects a gerund (roughly: a long infinitive) while V2 selects *zu*+gerund. While V2 appears as a supine, V3 occurs with *zu*+gerund, see Höhle (2006: 70):

- (44) *sɪ wɪbd₁ dɔs ned bɪyçd₂ tsə dʊ-n₃*
 she will.3SG this not need.SUP to do-GER
 ‘She won’t have to do this.’ *dialect of Barchfeld*

-
- (ii) *ohne das Buch verstehen₃ (??zu) glauben₁ zu können₂*
 without the book understand.INF to believe.INF to can.INF
 ‘without believing to be able to understand the book’ 312 *Standard German*

Normally, though, the 3rd construction in standard German involves extraposition and does not show any displacement; in Swiss German, both haplology and extraposition seem to be possible, see Salzmann (2013b).

The following figure summarizes the displacement in this configuration:



5. Absence of displacement

In this section, I will briefly discuss cases where there is no displacement although the structural condition, viz., an ascending order, is given.

5.1. Finite morphology

Given the selectional requirements of finite morphology – it selects for a stem – displacement of finite morphology should only occur if V1 (and V2 in a 3-verb-cluster) selects an infinitive, i.e. nothing. However, displacement with finite morphology is generally unattested, even in ascending orders. There is one famous constructional exception: in Swabian verb clusters with V2 = ‘help’, which normally selects a bare infinitive, displacement *is* possible, cf. Steil (1989: 41):¹⁸

- (50) *I hedd ned denkt, daß mr der hëlfa₁ kochd₂.*
 I had.SUBJ.1SG not think.PRT that me that one help.INF cook.3SG
 ‘I wouldn’t have thought that he would help me cook.’ *Swabian*

While it may be unsurprising from a functional perspective that finite morphology is usually not displaced, one still needs a formal implementation. There are essentially two options that derive the correct result: Either there is Agree between the functional head and the target verb as proposed in Adger (2003) and Wurmbrand (2012). Alternatively, the functional head undergoes Lowering, cf. Embick and Noyer (2001), i.e. downward head-movement. Both operations are sensitive to hierarchical structure so that the morphology will end up on the highest verb of the cluster, viz. V1.

¹⁸ Another example of this type is described in Schmeller (1821: 379ff.) for Bavarian where V1 is ‘go’ and the finite morphology ends up on V2.

5.2. *te*-placement in Dutch

As mentioned at the beginning, Dutch systematically differs from German with respect to the placement of non-finite morphology: Unlike $z(u)$ in German, the infinitival particle *te* always occurs on the immediately dependent verb even though the order in the verb cluster is usually ascending. In (51), *te*, selected by the complementizer *zonder* ‘without’, occurs on V1:¹⁹

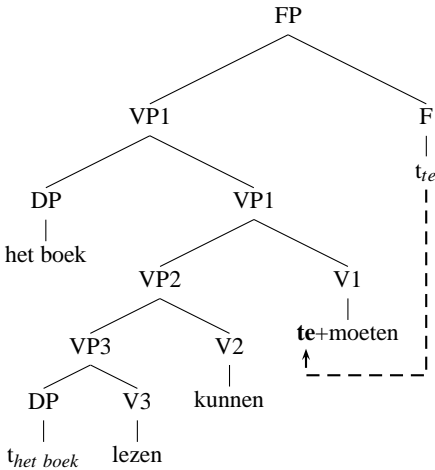
- (51) *zonder het boek te moeten₁ kunnen₂ lezen₃.*
 without the book to must.INF can.INF read.INF
 ‘without being able to read the book.’ 123 *Standard Dutch*

As with finite morphology, the correct result obtains if the placement of *te* is the result of Agree or Lowering. A possible implementation of (51) in the framework adopted here looks as follows: the functional head hosting *te* is lowered onto the highest verb of the verb cluster, see (52). Since this operation is sensitive to hierarchical relations, possible reordering operations in the verb cluster such as e.g. VP-inversion to derive ascending orders do not interfere with it, see (53) (the correct result thus obtains irrespective of the order between the two operations).

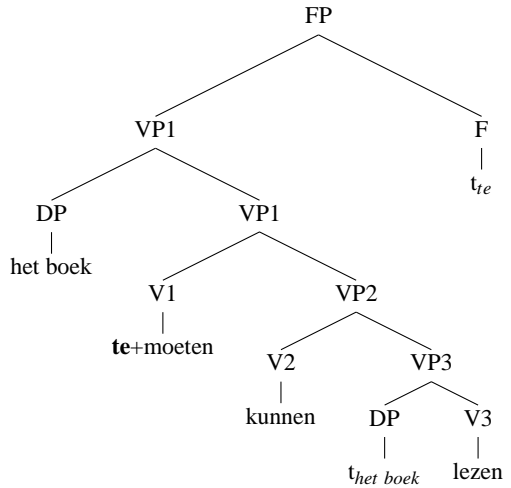
¹⁹I am aware of one potential case of displacement, so-called *te*-shift: The complementizer *voor* selects *te* and V1 *komen* selects an infinitive. However, *te* occurs on V2, see Zwart (1993: 103) for discussion:

- (i) *voor komen₁ te werken₂*
 for come.INF to work.INF
 ‘to come and work’

dialect of Geel

(52) *te*-Lowering:

(53) VP-inversion:



Note that Agree/Lowering does not take place in all varieties of Dutch: *te* can remain an independent element: *te* can occur before a verbal complex with 231 order, see (54a/b) or before the object in (54c):²⁰

- (54) a. *mee Valere te [[willen₂ [dienen boek kuopen₃]] een₁]*
 with Valere to want.INF that book buy.INF have.INF
 ‘with Valere having wanted to buy that book’
West Flemish Haegeman (1998: 635)
- b. *Die banke moes oop geweest het, om dit gister te*
 the bank should open been have to it yesterday to
[[kan₂ betaal₃] het₁].
 can.INF buy.INF have.INF
 ‘The bank should have been open to have been able to buy it
 yesterday.’
Afrikaans, Donaldson (1993)
- c. *hest volk genug te heu in schuur bringen?*
 have.2SG people enough to hay in barn bring.INF

²⁰Interestingly, displacement in Dutch seems to be marginally possible in ascending present participle clusters, see Hoeksema (1993), although at least in earlier stages of the language, non-displacement was possible as well in that construction. In German, ascending participial clusters systematically allow for displacement, see Sternefeld (2006: 661).

‘Do you have enough people to bring the hay into the barn?’

Gronings, Zwart (1993: 103)

5.3. Non-finite morphology faithfully realized

While the morphology is usually displaced in ascending orders, there are also cases where the morphology is faithfully realized on the immediately embedded verb. This seems to be the case quite generally in the dialect of Sonneberg, see Höhle (2006: 66). In (55), V1 selects a gerund and V2 selects a *ge*-infinitive. The result is that V2 occurs as a gerund and V3 as a *ge*-infinitive:

- (55) *ich waar*₁=*sch runtər kinn-a*₂ *gə-reiss*₃
 I will.1SG=it down can.GER GE-tear.INF
 ‘I will be able to tear it down’

Sonneberg

Technically, one can assume either Agree F1–V2 and F2–V3 or Lowering of the functional heads F1 and F2 to derive this fact. Note, though, that this pattern seems to be quite rare. According to Höhle (2006), faithful realization seems to be confined to this particular dialect. At this point, I do not know what causes the cross-linguistic variation.

The lack of displacement is schematically illustrated in (56):

- (56)  *no displacement*

Another case I am aware of are certain 3-verb clusters in Swiss German with 123 order where V1 is a perfective auxiliary and V2 is either ‘hear’, ‘help’, ‘learn’, ‘stop’ or ‘begin’. V2 is realized as a participle and V3 as a bare infinitive. Here is an example with *ufhöre* ‘stop’:²¹

²¹The infinitive, viz., the IPP-form, is a possibility as well with these verbs, see section 7 below. Another potential case of faithful realization are clusters with V1 = perfective auxiliary and a *zu*-selecting verb as V2. One can find such examples in Bernese German in 123 order with the morphology faithfully realized. However, with *zu*-infinitives, the faithful realization could be due to extraposition, see Salzmann (2013b). Extraposition as the source for faithful realization is unlikely for the two examples in the text because extraposition of bare infinitives is generally taken to be impossible (although I would not know how to prove that they are not).

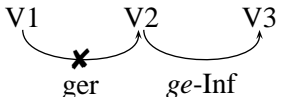
- (57) *dass dis Herz vo sälber hät₁ ufghört₂ schlah₃.*
 that your hart by itself have.3SG stop.PRT beat.INF
 ‘that your heart has stopped beating by itself’
<http://gaestebuch.007box.de/index.php?gbname=gb10323&pos=110>; 30.12.2015

5.4. V3 only realizes requirements of V2, requirements of V1 suppressed

In 4.3, we saw that marked, i.e. non-infinitival forms can be combined on V3 if they are morphologically compatible with each other. However, we also find a different pattern in this configuration: the requirements of V1 are suppressed. This is illustrated in (58) where V1 selects a gerund and V2 a *ge*-infinitive (as in the example in (47)). While V3 appears as a *ge*-infinitive, V2 occurs in the bare infinitive (thus a default form), see Höhle (2006: 68):

- (58) *ə wyəd₁=s ne(d) könd₂ ərəb gə-ris₃*
 he will.1SG=it not can.SUP down GE-tear.INF
 ‘He won’t be able to tear it down.’ *Kleinschmalkalden*

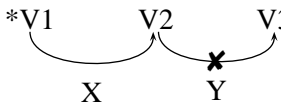
To my knowledge, this pattern is rare and generally only arises if V2 selects a marked form as well (i.e. not a bare infinitive, see Höhle 2006: 70, ex. 48 for two further examples from Barchfeld). Schematically, we find the following:

- (59)  *selectional properties of V1 suppressed*

The logic of this pattern can be understood once we consider a systematic gap in the placement of non-finite morphology addressed in the next subsection.

5.5. A missing pattern

Interestingly, the pattern with the requirements of V1 realized on V2 but those of V2 suppressed does not seem to be attested:²²

- (60)  *selectional properties of V2 suppressed*

²²I am only aware of one example, viz. ex. 41 in Höhle (2006: 69) where V1 selects *zu*+gerund while V2 selects a *ge*-infinitive; the result is that V2 appears as a supine while V3 occurs as *zu*+gerund.

I propose that this pattern as well as the one in section 5.4 follows from cyclicity at PF:

Given an inside-out/bottom-up derivation at PF, the functional head F2 (selected by V2) above V3 will first be attached to V3. the second functional head F1 selected by V1 will come next, but cannot attach if it is incompatible with the V3+F2-complex:

(61) [[V3+F2]+F1]

If F1 and [F2+V3] are not compatible, there seem to be different possibilities: in some instances, the structure is ungrammatical, i.e. crashes at PF, as in the non-finite ascending clusters in Bernese German, cf. (34c). Alternatively, F1 is deleted as a last resort, cf. (58), i.e. the requirements of V1 are suppressed. Given that due to cyclicity, F2 is always attached before F1, last resort deletion can only affect F1, therefore accounting for the absence of the pattern in (60).

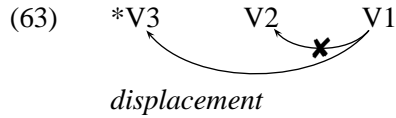
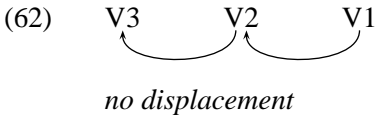
It is not quite clear when last resort deletion is possible and when it is not. For the Bernese data in (34c) one might argue that last resort deletion is blocked because there is a ‘cheaper’ repair, viz. the descending order where no deletion is necessary. Unfortunately, I do not know whether in cases like (58) alternative orders are available. If not, deletion of V1 may indeed be the only option.²³

To summarize the possibilities for displacement: displacement is felicitous if (a) V2 selects an infinitive, i.e., nothing so that no clash can obtain and only one affix is attached to V3; or (b) if the requirements of V1 and V2 are compatible, cf. section 4.3. Consequently, the requirements of V2 are never suppressed, as expected under cyclicity.

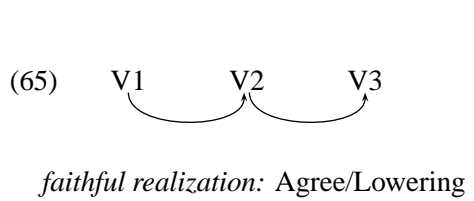
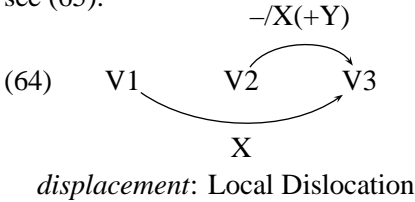
5.6. Summary

Before concluding the paper, I will briefly list the possible patterns in 3-verb-clusters. The crucial distinction is again between ascending and descending orders. In descending orders we find faithful realization of the morphological requirements; displacement is systematically absent:

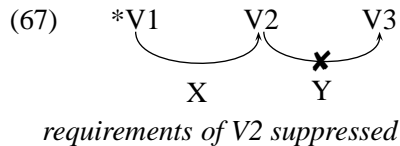
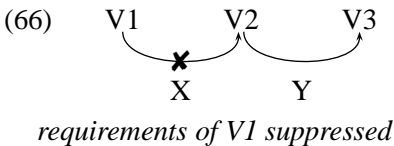
²³Note that last resort deletion may also be an alternative explanation for the haplology patterns in 4.3.1 and 4.3.2. However, given the possibility of cumulativity in (47), last resort deletion of the requirements of V1 is not sufficient to capture all patterns. Consequently, one arguably needs both compatibility and last resort deletion.



In ascending orders, however, we find displacement as in (64), depending on the compatibility between the forms selected by V1 and V2. With finite morphology and in some dialects and in Dutch, we find faithful realization, see (65):



Finally, If the requirements of V1 and V2 are not compatible, we find suppression of the requirements of V1, see (66). The reverse pattern, suppression of the requirements of V2, is not found, see (67):



6. Conclusion/implications

I have argued in favor of a post-syntactic approach to the placement of non-finite morphology in German. Concretely, there are separate functional projections for all non-finite forms. These functional heads are linearized head-finally, in accordance with the head-final character of German. The vocabulary items are inserted into these functional heads and are associated with their verbal host by means of Local Dislocation, an operation sensitive to linear order and adjacency. As a consequence, the non-finite morphology always ends up on the last verb of the cluster. If the order in the complex is strictly descending, viz., (3)21, which in my approach involves two instances of complex head formation at PF, the non-finite morphology will appear to be well-behaved. However, once the order in the cluster deviates from the

strictly descending (3)21 order, we get the impression of displacement; crucially, though, there is no displacement operation. Rather, the morphology is always placed in the same way; displacement is just an illusion created by partially ascending cluster orders. It can be seen as the result of a conflict between the general head-finality of the language and the possibility of (partially) ascending verb clusters (in certain varieties). Importantly, not even a special placement rule needs to be assumed. Rather, Local Dislocation is the result of the dependent/affixal nature of the vocabulary items, i.e. their selectional requirements, which are also sufficient to capture the restrictions on displacement.

The phenomenon clearly argues against pre-syntactic morphology as well as against handling morphological selection by means of upward Agree: the placement of non-finite morphology in German depends on linear precedence rather than hierarchical notions such as c-command and minimality. One of the strongest advantages of the PF-perspective is that the placement has no effect on the interpretation: at LF, the correct hierarchical relations are retained so that the non-finite morphology applies to the correct verb/events.

7. Appendix: the IPP-effect

In the displacement cases reviewed so far, V2 (or more generally, non-final verbs), appears in a default form, usually in the infinitive (or, in the dialects discussed in Höhle 2006: 57-63, as a supine). There is an obvious link to the IPP-phenomenon: The middle verb in ascending 3-verb-clusters with V1 selecting a perfect participle usually appears in the infinitive in Dutch and in many German varieties. The crucial difference w.r.t. the displacement cases is that the participial morphology is suppressed throughout, i.e. V3 occurs in the infinitive (selected by V2), as e.g. in (68):

- (68) *dass er si hät₁ ghööre₂ singe₃*
 that he her has hear.INF sing.INF
 ‘that he heard her sing’

Swiss German

(68) thus forms a minimal pair with the PPI-case in (15) where V2 also appears as an infinitive but V3 crucially appears as a participle. In 5.4 I argued that suppression of the requirements of V1 normally only takes place if V2 selects a form other than the bare infinitive. But there is evidence that at least

with certain verbs and perhaps in certain dialects, suppression of the properties of V1 occurs systematically. For instance, in the dialect of Barchfeld, a gerund or a *ge*-infinitive selected by V1 can be suppressed even though V2 selects a bare infinitive, cf. (Höhle 2006: 71, ex. 49(ii), 51(i))

- (69) a. *deə kɔsd₁ ən sɛ:₂ {læY₃ / gə-læY₃}*
 you can.2SG him see.INF run.INF *ge*-run.INF
 ‘You can see him run.’
 b. *iç wa:ɐ̯₁ ən lɔs₂ {Ruf₃ / Rufə₃}*
 I will.1SG him let.INF call.INF call.GER
 ‘I will have [someone] call him.’ *dialect of Barchfeld*

Displacement seems optional with certain V2 (apparently perception verbs), subject to conditions that are not understood, see ex. 49–53 in Höhle (2006). Similar examples are found in Wasungen and Ruhla, cf. Höhle (2006: 69, ex. 42/43).

It is not fully clear how this pattern can be related to those we have established in the rest of the paper. One possibility could be to subsume it under the suppression pattern in 5.4. One would additionally have to assume that – for reasons not understood – the infinitive can be present syntactically after some verbs/in some varieties so that because of cyclicity, the infinitive attaches first and will consequently block displacement from V1. However, while this correctly blocks displacement of participles selected by V1 as in (34c) and (68) and still allows for displacement of *z(u)* as in (13) and (14) (as it is a superset of the bare infinitive), it fails for the cases in (69) since the *ge*-infinitive and the gerund should be compatible with the bare infinitive (given the logic about morphological compatibility above). The same goes for an example from Altenburg where V1 selects *zu*+gerund and V2 a bare-infinitive. V3 occurs in the bare infinitive so that *zu* appears to be suppressed, see Höhle (2006: 68, fn. 23) even though *zu* (+gerund) should be compatible with the bare infinitive.

It seems, thus, that there are instances of deletion that cannot be motivated on the basis of morphological incompatibility. This is particularly obvious in the case of IPP because the effect also obtains in 132 clusters as in (70) even though the participial morpheme would be the only one affixed onto

V2 (since a potential infinitive morpheme if syntactically present would be affixed onto V3).²⁴

- (70) *dass er es {hat₁ lesen₃ können₂ / *hat lesen₃ gekonnt₂}*
 that he it has read.INF can.INF has read.INF can.PRT
 ‘that he was able to read it’ 132 Standard German

Furthermore, Dutch also displays the IPP-effect even though there is no displacement in the language.

The prospects of unifying the IPP-cases and the lack of displacement in (69) are dim. In the East-Middle German examples in (69), the lack of displacement could be argued to result from deletion of F1 whenever F2 is syntactically present. Attaching several affixes onto V3 would thus be ruled out as a matter of principle with morphological compatibility playing no role. The optionality could then result from the optional presence of InfP. In examples with IPP, one will instead need to assume that participial morphology is deleted systematically in (partially) ascending clusters. Consequently, displacement as in (9b) is still possible as V2 has not received any functional morphemes yet. Importantly, deletion of the participial morphology has to be limited to ascending orders (although there are some exceptions in Austrian German).

To conclude, then, although the IPP-effect in strictly ascending 123 clusters can partly be related to displacement, its occurrence in 132 clusters and in Dutch more generally cannot and therefore requires additional assumptions. Despite the progress I believe we have made in understanding the placement of non-finite morphology in German, the IPP-effect thus remains a serious *pièce de résistance*.²⁵

²⁴To make things even more complex, there are clusters with 132/312 and 1432 with V1 = perfective auxiliary that fail to display the IPP-effect. See Meurers (2000: 223) for an example from Standard German with V2 = *glauben* ‘believe’. Swiss German generally fails to show the IPP-effect in the double perfect in 132 and 312 orders, e.g. *hät₁ ghöört₃ ghaa₂* ‘has heard had’.

²⁵An alternative possibility suggested by data like (57) would be to assume that participial morphology in present-day German (and its dialects) actually undergoes Lowering/is placed by Agree. In standard German, the affix would be obligatorily deleted in ascending orders before vocabulary insertion (and replaced by the infinitive), in Swiss German this would be optional in ascending orders. Perhaps, the supinal forms found in East Middle German could also be a reflex of that: V2 does receive features from V1, but for some reason, a different exponent than the participle is inserted. Possible evidence for a featural relationship between

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V1 and V2 in dialects with supines comes from the fact that V1 and V2 sometimes agree in mood, i.e. a different supine is chosen depending on the mood of V1, see Höhle (2006: 58f.).

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