German particle and prefix verbs at the syntax-phonology interface[1]

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Abstract
In this paper we provide a derivational, minimalist account of the construction of particle and prefix verbs in German. In particular, we focus on the different stress patterns associated with particle and prefix verbs and on the positioning of the bound morpheme *zu* 'to' in particle and prefix verbs. Building upon an earlier proposal put forward by Biskup & Putnam (2009), we assume that particle and prefix verbs are derived from similar derivational mechanisms. They differ only with respect to whether or not the p-element (i.e., preposition or particle) incorporates into the root. This distinction is the base for the different behavior of prefix and particle verbs with respect to the stress pattern and the position of the infinitival marker *zu*. Since German particles are prepositions that remain in situ in the prepositional phrase, they allow *zu* to intervene between them and the verb. For this reason, they constitute a strong prosodic word and bear the primary stress in the particle verb. In contrast, verbal prefixes are incorporated prepositions, hence *zu* cannot be inserted between the prefix and the verb later in the derivation. Consequently, verbal prefixes form a weak prosodic word in combination with the verb and cannot bear the primary stress pattern. Finally, in this paper we explore whether a phase-based model of syntactic theory can account for the syntax-phonology interface issues that ensue within a derivational approach to particle and prefix verb formation in German.

Key words: particle (verbs), prefix (verbs), preposition, German, syntax-phonology interface, spell-out, phases

1. Introduction

While superficially particle and prefix verbs appear to share the same structure, namely a "prefix" preceding a root verb, e.g., *be+freien* 'free' (prefix verb) and *mit+kommen* 'come along' (particle verb), a closer examination of the behavior of these two types of verbs reveals a different underlying structure. The general pattern of German particle and prefix verbs is this: When a prefix verb appears in the infinitival form without the infinitival marker *zu*, the prefix and the verb form one word and the accent falls on the syllable following the prefix, as demonstrated in (1). When a prefix verb in the infinitival form co-occurs with the infinitival marker, then *zu* cannot intervene between the prefix and the verb, as shown in example (2). The infinitival marker must precede the prefixed verb such that they do not form a word; see example (3). Similarly as in the case of prefix verbs (1), when a particle verb appears in the infinitival form without the infinitival marker *zu*, the particle and the verb form one word, but in this case, the accent is present on the particle, as illustrated in (4). When a particle verb in the infinitival

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form co-occurs with the infinitival marker, then *zu* is sandwiched between the particle and the verb, in contrast to prefix verbs; compare (5) with (2) and (3). The infinitival marker *zu* cannot precede the particle verb, as demonstrated in example (6). The data show that the generalization holds for all three pairs of verbs: for pairs of verbs with a homophonous prefix and particle (the (a) cases), for pairs of verbs with a non-homophonous prefix and particle that are allomorphs (the (b) cases) and for pairs of verbs with a non-homophonous prefix and particle that are not allomorphs (the (c) cases).

		Homophonous particle/prefix	Non-homophonous particle/prefix (allomorphs)	Unrelated particle/prefix
(1)	[Pref-ˈV]	a. über-ˈsetzen over/across-set 'translate'	b. ent-ˈlaufen away/out-run 'run away'	c. über-ˈtreiben over-drive/make 'exaggerate'
(2) *	[Pref-*zu*-V]	a.* über-zu-setzen over/across-to-set	b.* ent-zu-laufen away/out-to-run	c.* über-zu-treiben over-to-drive/make
(3)	[*zu* Pref-ˈV]	a. zu über-ˈsetzen to over/across-set 'to translate'	b. zu ent-ˈlaufen to away/out-run 'to run away'	c. zu über-ˈtreiben to over-drive/make 'to exaggerate'
(4)	[ˈPart-V]	a. ˈüber-setzen over/across-set 'take across'	b. ˈaus-laufen out-run 'run out'	c. ˈvor-stellen before-place 'present, introduce'
(5)	[ˈPart-*zu*-V]	a. ˈüber-zu-setzen over/across-to-set 'to take across'	b. ˈaus-zu-laufen out-to-run 'to run out'	c. ˈvor-zu-stellen before-place 'to present, introduce'
(6) *	[*zu* Part-V]	a.* zu über-setzen to over/across-set	b.* zu aus-laufen to out-run	c.* zu vor-stellen to before-place

From this, several questions arise. What is the difference between the prefix verbs' behavior, as in (1)-(3), and the particle verbs' behavior, as in (4)-(6) based on? Why do we observe the opposite patterns with respect to the accent and the ordering of morphemes? In the case of prefix verbs, the accent is present on the verb and in the case of particle verbs it is present on the appropriate particle, as shown by the comparison of (1) and (4). Whereas in the case of prefix verbs the infinitival marker *zu* must precede the prefix and the verb, in the case of particle verbs the marker must follow the particle and precede the verb, as shown by the comparison of (2) and (3) with (5) and (6). Which factors play a role in these patterns? Are they of syntactic, semantic or phonological nature? What kind of interplay is taking place between them?

As for the theoretical background, our analysis will be couched in terms of the late Minimalism. In other words, it is important for our analysis that narrow syntax can work with particular morphemes. In addition, we follow the Distributed Morphology (DM) approach in that there is a morphological component on the PF branch, where certain morphological processes can happen and where particular vocabulary items are inserted.

As for particles and prefixes themselves, we assume that they are in fact not as different as they seem to be at first sight. Many authors investigating particles and prefixes in different languages have argued that these elements belong to the category 'preposition'; see Jackendoff (1973), Emonds (1976, 1985), van Riemsdijk (1978), den Dikken (1995), Zeller (2001),

Matushansky (2002), Gehrke (2008). Also in the case of German prepositional elements, it has been shown that most German verbal prefixes are historically derived from prepositions and have cognates with particles contained in particle verb constructions; see Wunderlich (1987), Kluge (1989), Stiebels & Wunderlich (1994) and Stiebels (1996, 1998), among others. Furthermore, it has also been argued that German particles and prepositions are derivationally related (van Riemsdijk & Huijbregts (2002), Asbury, Gehrke & Hegedűs (2007)), that German prefixes and prepositions are derivationally related as well (McIntyre 2006), and the same has been proposed for the relation between German prefixes, particles and prepositions (Biskup & Putnam 2009).

In this paper, we develop a derivational, minimalist approach to the licensing of tense-chains in connection with particle and prefix verbs. Building upon the assumptions of Biskup & Putnam (2009), who advance the hypothesis that particle and prefix verbs are the result of identical derivational mechanisms. What still remains somewhat of a mystery in minimalist syntax is the degree of syntactic structure that is present at PF. As discussed by Embick & Noyer (2001), Grohmann (2007), and Grohmann & Putnam (2007), the syntax-phonology interface is more appropriately understood as a "road to PF" with certain operations requiring more syntactic structure (e.g., the licensing of particle/prefix verbs) than others (e.g., linearization principles). Here we explore how/if a phase-based version of minimalism is able to account for the phonological properties of these verbs in connection with their tense properties. In section 2, we explicate the phonological properties of prepositions and particles and their interaction with German(ic) stress patterns. In this section we also integrate this discussion of the morpho-phonological properties of prefix and particle verbs into a phased-based minimalist framework. Section 3 serves as a testing ground for our hypotheses where we present detailed derivations of particle and prefix verbs in German, focusing exclusively on the syntax-PF interface. Section 4 concludes this paper.

2. The proposal
2.1 Prepositions and their interaction with German stress patterns

Let us begin our analysis with the difference between prefix verbs and particle verbs with respect to the stress pattern. As noted above, in the case of prefix verbs, e.g., *ent'kommen*, the verb root, i.e., *kom-* receives the stress.[2] Conversely, with particle verbs, e.g., *'mit.kommen*, the primary stress of the verb falls on the particle *mit*, rather than on the verb root. In our analysis of how these accentual differences emerge, we assume that prepositional phrases are phases and that in analogy to the verbal phase they are composed of the little *p* and the big P (see Svenonius 2003). In certain cases - concretely, when the preposition does not move to the verbal domain, just to *p* - the preposition (also with its complement if it is present) can be sent to the interfaces independently of the verb that selects the prepositional phrase (to be more accurate, the prepositional phrase is selected by the root, which becomes the verb later). To put it differently, prepositions have their own phonological domain (PF) and their own semantic domain (LF). This has important consequences for the stress pattern and the interpretational properties of particle and prefix verbs.

We propose that in the case of particle verbs, the preposition stays in the prepositional phrase, hence the preposition and the verb are sent to the interfaces by different operations of Spell-Out. This means that the preposition and the verb occur in different phonological and

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[2] In Germanic roots, the first element is stressed when there is more than one syllable, *'ar.beit*- 'work'.

semantic domains, as illustrated in (7). Since the root is sent to the interfaces together with the functional head (here *v*) determining the syntactic category of the word (Marantz 2001), we assume per analogiam that P is spelled out together with the head *p*.

(7) particle verbs
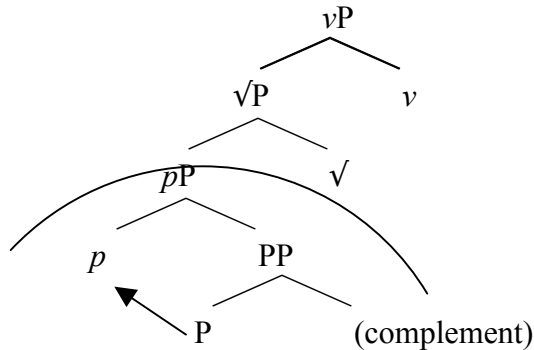
As demonstrated in (7) above, the *p*P phase is transferred to the external interfaces (LF and PF) prior to the introduction of the root into the derivation. Since the preposition is still a part of the prepositional phrase at this point, then it would receive the accent at PF in absence of an overt object. A closer examination of the facts reveals how this is possible.

Assuming that different phrases, including prepositional phrases, are in part distinguished from other similar phrases by intonation and stress patterns highlighting their constituent structure, the story emerges. Typically, while lexical words such as nouns, adjectives, and verbs are stressed in phrases, receiving more prominence in the overall intonational phrase or tone group, functional words like prepositions or articles are *not* stressed (cf. Hall 2003). It is instead, their complements or objects, i.e., noun phrases that will instead receive the stress. Thus, in the phrases *mit Johann* 'with Johann' or *für den Mann* 'for the man', the syllables of the objects, namely *Jo* and *Mann*, receive the greater prominence in the phrase. It should also be noted that even pronouns--which do not typically receive stress in intonational phrases—can also be elevated to "stressable" status when serving as the object of the preposition, e.g., *für ˈihn* 'for him' of *mit ˈihr* 'with her'. However, when the object has been replaced by *wo-* or *da-*, e.g, *womit* 'with what; with which', or *damit* 'with it', the stress is often shifted to the preposition.[3] It thus follows that if the object is left unspecified at the time of Spell-Out (i.e., when the preposition is complement-less or when the object is covert) then the stress that would normally be assigned to the object of the PP is ultimately reassigned to the preposition itself in a manner analogous to the case shown above for the *da-* and *wo-*compounds.
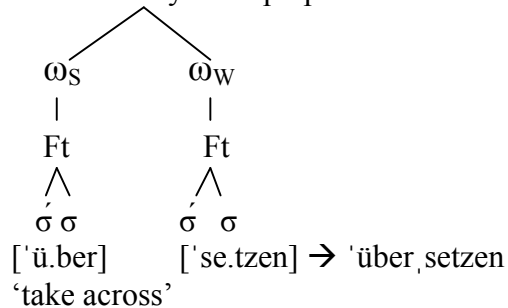
Although individual words, whether lexical or function words, contain a prominent syllable, for instance, the first syllable is accented in the disyllabic prepositions *ˈü.ber* 'over' and *ˈge.gen* 'against', the stress received at the PF of the *p*P phase permits the preposition to be stressed at the sentence level. This claim is evidenced when the particle appears in phrase final position. In short, the nucleus, i.e., the most prominent syllable of the intonational phrase, is typically the

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[3] It should be noted that for some high frequency forms with *da-* such as *darin* 'in it; therein', the stress can occur optionally on either syllable. However, this optionality is not universally the case for all *da-* compounds. If optionality is not possible, then the preposition will typically be the part of the compound to receive stress. This optionality is generally not found for *wo-* compounds.
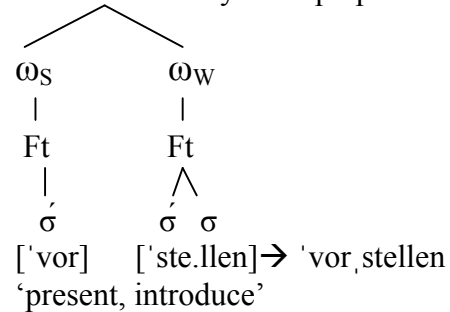
final lexical item in that phrase except when this is a verb (Hall 2003).[4] Particles, however, can receive that final stress, demonstrating yet again the ability of these prepositions to receive stress when they are functioning without their explicit object, i.e., when they are functioning as particles of a verb. Thus, in receiving stress at Spell-Out prior to the introduction of the verb in the derivation, the preposition, whether monosyllabic (8b) or disyllabic (8a), assumes the status of a prosodic word independent of the verb able to stand on its own, separate from the verb with which it will be associated as its particle. This is illustrated in (8) below. This claim concurs with arguments from Wennerstrom (1993) who has likewise argued that "if a prefix is semantically analysable with respect to its stem," i.e., its meaning is transparent as would be the case for particles derived from prefixes, then it "forms an independent ω" (p. 341).

(8) Particle verbs
a. With disyllabic prepositions   b. With monosyllabic prepositions

ω_S ω_W ω_S ω_W

Ft   Ft   Ft   Ft

σ́ σ   σ́ σ   σ́   σ́ σ

['ü.ber]   ['se.tzen] → ˈüberˌsetzen   ['vor]   ['ste.llen]→ ˈvorˌstellen
'take across'   'present, introduce'

Since the preposition has been elevated to "stressable" at the sentence level akin to that of a lexical word, it behaves more like the first element of a compound than as a prefix. Following Booij and Rubach (1984:14), the first of two phonological words in simple compounds is strong (indicated by subscript "s"). Consequently, the stressed syllable of the first phonological word, i.e., of the preposition, receives the primary stress, while the stressed syllable of the weak (indicated by subscript "w") phonological word, namely the verb, receives secondary stress.

On the contrary, for prefix verbs, we propose that the preposition moves and incorporates into the root and the verbal head, as schematized in (9) (for discussion of preposition incorporation, see Baker (1988); for other proposals treating verbal prefixes as incorporated prepositions, see, for example, Walinska de Hackbeil (1986) for English, Mulder (1992) for Dutch, Biskup & Putnam (2009) for German, Miller (1993) for Classical Greek, Romanova (2006), Biskup (2009) for Slavic languages).

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[4] When spoken without contrastive stress, it is the final word *Lied* 'song' in the sentence *Hans singt ein Lied* 'Hans sings a song' that serves as the nucleus of the tone group. In the past tense, *Hans hat ein Lied gesungen* 'Hans sang a song', the nucleus is again *Lied* since the verb *gesungen* is not typically allowed to contain the nucleus. However, in short clauses such as *Er singt* 'he sings' where the first word is a pronoun and thus unstressed, the nucleus will be on the verb *singt*.
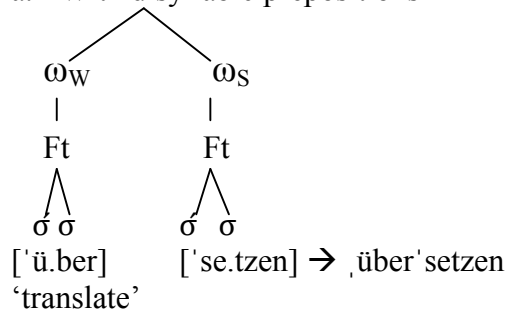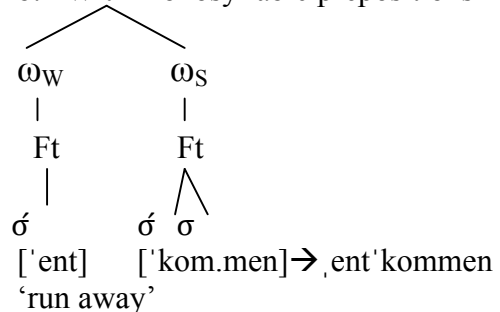
(9) prefix verbs
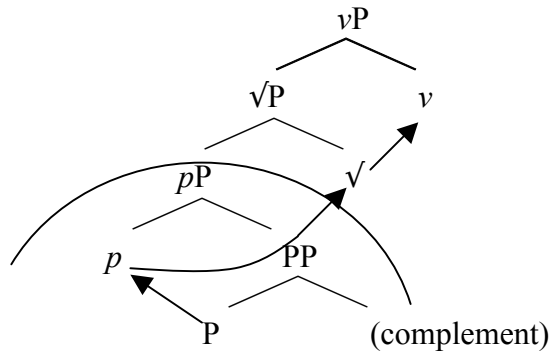
Consequently, the preposition and the verb occur in the same Spell-Out domain in prefix verbs, which means that phonologically and semantically they have a closer relation to one another than the verb and preposition do in the particle verbs. Thus, the preposition and the verb must negotiate their meaning together and as would be expected, the resulting meaning should be more idiosyncratic with a less semantically transparent relationship between the prefix and the verb than in the case of non-incorporated prepositions.[5] Another subsequent consequence of the verb and preposition spelling out together is that they must also negotiate their stress pattern together. Consider for a moment the examples illustrated in (10) demonstrating the output of Spell-Out.

(10) Prefixed verbs

a. With disyllabic prepositions

ω_W ω_S
| |
Ft   Ft
σ σ   σ σ
[ˈü.ber]   [ˈse.tzen] → ˌüberˈsetzen
'translate'

b. With monosyllabic prepositions

ω_W ω_S
| |
Ft   Ft
σ   σ σ
[ˈent]   [ˈkom.men] → ˌentˈkommen
'run away'

As seen in (10), the prepositions again constitute their own prosodic words since they are either disyllabic, e.g., *über*, or monosyllabic with full vowels rather than schwa. Since the preposition is going to incorporate into the verb, it is not spelled out overtly in the *p*P phase and thus cannot inherit the stress as was the case for the particle verbs.[6] It is consequently in the next phase, i.e., the *v*P phase when the preposition has already been incorporated into the verb, that stress is assigned. Without the additional "accentedness", the prosodic word containing the preposition is treated as a prefix to the verb. Following Booij and Rubach (1984), prefixal phonological words

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[5] This way, we extend Marantz's (2001) proposal with two different domains for word formation corresponding to different interpretational domains also to the syntactic structure below the root.
[6] We assume that the preposition bears a feature that signals that the preposition must move out of the *p*P-phase, hence the preposition results as covert (copy) at the PF. Due to space considerations, we will not speculate further at this time on the exact nature of this feature.

are weak as indicated by subscript "w". The primary stress is thus assigned to the stressed syllable of the strong prosodic word, namely the verb.

In sum, it is the timing of the Spell-Out of the prepositions in prefix and particle verbs that distinguishes these verbs not only semantically and syntactically but also in terms of the stress placement. When prepositions are spelled out in a separate phase from the verbs with which they become associated, they receive the stress of their covert or missing objects; but if they incorporate into the verb, the prepositions fail to attract the stress of the missing or covert objects. This distinction results in differential assignment of "strong" and "weak" labels to the prosodic words containing the prepositions. Prepositions in the particle verbs are strong and thus attract primary stress, while prepositions incorporated into the verbs as prefixes are weak and thus not able to carry main stress.

2.2 Testing the proposal: particle verbs, prefix verbs and prepositional phrases
In order to test our proposal, we compare minimal pair prepositions. There are several prepositions in German that are ambiguous between the particle behavior and the prefix behavior, for instance, *durch, hinter, über, unter*.[7] Given our proposal, we expect that the pattern with the accented verb [P-'V] will have more idiosyncratic meaning than the pattern with accented preposition ['P-V]. A closer look at data reveals that our proposal is correct. In most cases, the prefixed verbs seem to be more lexicalized. Compare the (a) cases with the accent on the preposition and (b) cases with the accent on the verb in the following examples.

(11) a. ˈdurch-kreuzen
      through-cross
      'put a cross/cross out'
    b. durch-ˈkreuzen
      through-cross
      'spoil/thwart somebody'

(12) a. ˈunter-halten
      under-hold
      'hold under'
    b. unter-ˈhalten
      under-hold
      'amuse, sustain'

(13) a. ˈüber-stehen
      over-stand
      'protrude'
    b. über-ˈstehen
      over-stand
      'weather'

These examples demonstrate that the particle verbs in these cases have a locative (compositional) meaning, whereas the prefix verbs in the (b) cases have metaphoric or idiosyncratic meanings; compare also *übersetzen* examples in (1) and (6) above.[8]

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[7] Not all prepositions can be used as verbal prefixes in German. On the other side, most verbal prefixes probably could be analyzed as incorporated prepositions. Note that allomorphs do not necessarily have to be homophonous.
[8] An anonymous reviewer points out that although it is true that prefixes have a tendency to have a closer semantic relationship to their verbs than do particles, it is not difficult to find exceptions; e.g., *entkommen* ('to escape'; which is closer to the literal meaning of getting out/away from something than is auskommen), *entreißen* ('to snatch away'; which is more compositional than ausreißen 'run away'), and *umfahren* ('to drive around an obstacle') (cf. see also Harnisch (1982) and Hinderling (1982)). We agree that it is somewhat disingenuous not to mention that particles are (occasionally) capable of non-compositionality. As for the reviewer's suggestion that we could consider that particles incorporate into their verbs covertly, we disagree with this strategy. As a matter of fact, such an assumption would force us to loose the basic distinction between particle and prefix verbs. As for non-compositional particle

According to our analysis, the same pattern should also arise with non-homophonous particles and prefixes. Biskup & Putnam (2009) argue that the German prefix *ent-* and the particle *aus* are different copies of the preposition *aus*. If the preposition *aus* incorporates into the verb, then it is spelled out as the prefix *ent-*. The following example shows that the expectation is correct. The particle verb with the accent on the preposition *aus* has the compositional meaning and the prefix verb with the accent on the root has a lexicalized meaning.

(14) a. ˈaus-sprechen   b. ent-ˈsprechen
         out-speak   away/out-speak
         'pronounce'   'correspond, meet'

So far, we have investigated differences in the stress pattern between prefix verbs and particle verbs. However, what about prepositional phrases themselves? Our analysis predicts that if a preposition takes an overt complement such that both the preposition and its complement stay in the prepositional phrase – so that we observe a full prepositional phrase selected by a verb – a third type of the stress pattern appears. Specifically, the accent falls on the prepositional complement (cf. 15a). The reason for this is that the preposition is sent to the PF with its complement and must negotiate the stress pattern with it, as discussed above. Since prepositions are typically not stressable in tone groups and intonational phrases, then the complement receives the stress for the prepositional phrase. This contrasts with the particle verb case, where the preposition must bear the accent since it is the only overt element in the prepositional phrase interpreted at the PF and it therefore assumes the complement's stress (cf. (15b) and (15c)), as well as with the prefix verb case, where the preposition must negotiate its accent properties with the verb at the PF (cf. 15d). In the following examples, the relevant stressed syllable is bolded. Each of these examples demonstrates that the predictions are correct.

(15) a. Er wird den   Wanderer [über   den   ˈFl**u**ss]PP setzen.
         he will the   wanderer across the   river   set
         'He will ferry the wanderer across the river.'

     b. Er setzt den   Wanderer ˈ**ü**ber.
         he set   the   wanderer across
         'He is ferrying over the wanderer.'

     c. Er wird den   Wanderer ˈ**ü**bersetzen.
         he will the   wanderer set.across
         'He will ferry over the wanderer.'

     d. Er wird den   Arˈtikel über**s**etzen.
         he will the   paper   translate
         'He will translate the paper.'

Example (15a) shows that in the full prepositional phrase *über den ˈFl**u**ss* 'across the river', it is the prepositional complement that receives the accent and not the preposition itself. This accent

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verbs such as *aufhören* 'to stop', one possible angle to pursue in future research would be to suggest that these verbs are derived compositionally; however, if a special meaning is available, this process could be 'undone'.

pattern contrasts with the particle verb example in (15b) and (15c), where the accent falls on the non-incorporated preposition (particle). Recall that the preposition also conveys a non-overt complement whose accent it assumes. This in turn contrasts with the prefix verb example in (15d), where the accent falls on the verbal root, not on the incorporated preposition (prefix). Thus, full prepositional phrases with the preposition and its complement staying in *p*P can be schematized as (16).

(16)   full *p*P as complement
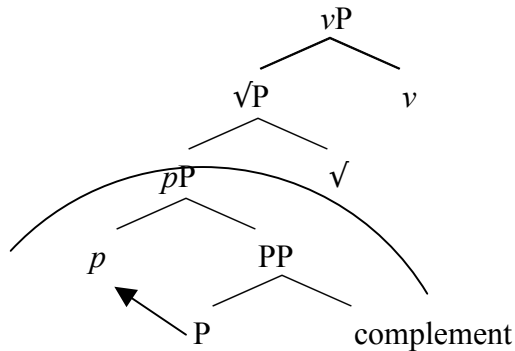
At this point, the question arises how particular morphemes in the proposed structures form a word. In the case of full prepositional phrases, the analysis seems to be straightforward; the head movement of the root to *v* and P to *p* can derive the appropriate pattern with the verb, preposition and the complement.[9] Similarly, in the case of prefix verbs, head movement (concretely, movement of P to *p*, then to the root and *v*) can also derive the appropriate word form, the prefixed verb. How does it work in the case of particle verbs, where the preposition does not incorporate into the verb and yet we observe one word in certain contexts? We assume that words are not necessarily formed only by head movement. They also can be formed as a consequence of the distributional properties of the morphemes from which they are derived; see Julien (2002). Julien proposes, among other configurations, that two morphemes X and Y can form a word if Y is the head of the complement of XP. The result of this type of word formation would furthermore employ the stress pattern of compound words. Leaving aside details of Julien's syntactic approach, this is the particle verb configuration. Thus, even if the preposition (particle) is not incorporated into the verb, it can be treated as part of the verbal word because it regularly occurs in front of the verb. If the non-incorporated preposition has an overt complement, then the complement intervenes between the preposition and the verb and, of course, no word is formed. This is the full *p*P configuration described above.

To sum up this section, differences in the stress pattern can be accounted for if we analyze particles as non-incorporated prepositions and prefixes as incorporated prepositions. In the case of full prepositional phrases, the preposition, of course, also does not incorporate into the verb.

2.3 *Zu* and finiteness
In this section, we turn to the difference between particle verbs and prefix verbs with respect to the position of the infinitival marker *zu*. Recall that with particle verbs the infinitival marker *zu* is sandwiched between the particle and the verb, whereas with prefix verbs *zu* must precede not only the verb but also the prefix.

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[9] For more on the higher verbal structure, see section 3.

In this paper we adopt the core tenets of Biskup & Putnam's (2009) analysis according to which the difference between particle and prefix verbs in German can be reduced to derivational procedures rather than underlying structural differences. Our study, however, will attempt to provide a deeper explanatory account than Biskup & Putnam's previous study in two respects: First, we discuss the interplay between phonology (most notably, with respect to accent patterns) and the morpho-syntax of prefix and particle verbs in German. In their previous study, Biskup & Putnam isolate and discuss the primary semanticosyntactic restrictions that regulate the *ent-/aus-*alternation but they avoid any detailed discussion of the (morpho-)syntax-phonology interface involved in the construction and evaluation of these structures. Second, we expand their analysis of the prepositional (non-)incorporation and discuss why the presence of the infinitival morpheme *zu* seems to block the incorporation of the preposition into the verb. Now, let us look at the following data.

(17) a.   Ich   arbeite.
          I   work
          'I am working.'
          'I work.'
    b.   * Ich   zu   arbeite.
          I   to   work

(18) a.   Ich   muss   arbeiten.
          I   must   work
          'I must work.'
    b.   * Ich   muss   zu   arbeiten.
          I   must   to   work

(19) a.   Cindy   versucht [$_{CP}$ C [$_{TP}$ T$_{[-Fin]}$ PRO das   Dokument   zu   über-setzen.]]
          Cindy   tried   the   document   to   across-set
          'Cindy tried to translate the document.'
    b.   * Cindy   versucht [$_{CP}$ C [$_{TP}$ T$_{[-Fin]}$ PRO das   Dokument   über-setzen.]]
          Cindy   tried   the   document   across-set

(20) a.   Marsha   versucht [$_{CP}$ C [$_{TP}$ T$_{[-Fin]}$ PRO den   Wanderer   über-zu-setzen.]]
          Marsha   tried   the   wanderer   across-to-set
          'Marsha tried to ferry over the wanderer.'
    b.   * Marsha   versucht [$_{CP}$ C [$_{TP}$ T$_{[-Fin]}$ PRO den   Wanderer   über-setzen.]]
          Marsha   tried   the   wanderer   across-set

Example (17) demonstrates that the marker *zu* cannot appear in a finite sentence. Example (18) shows the same for sentences with more verbs; the presence of *zu* is also blocked when the finiteness is expressed by the modal verb. However, in sentences that contain prefix verbs as those in (19) and in particle verb sentences in (20), the embedded clause is non-finite, which forces the spell-out of the *zu* morpheme. Given these data, we propose that the *zu* morpheme will be spelled-out whenever the head T within the same clause is non-finite and bears the [-Finite]

feature.[10] With regard to the placement of *zu*, (19a) is a prefix verb which prevents the insertion of *zu* between the preposition and the verb (with *über* 'across' being incorporated into the verb), while (20a) is a particle verb which permits the infinitival morpheme *zu* to appear attached to the verb. How can this difference be accounted for? Before moving on, have a look at the following table.

(21)

	Present	Perfect
Active	zu lieben to love 'to love'	geliebt zu haben loved to have 'to have loved'
Passive	geliebt zu werden loved to become 'to be loved'	geliebt worden zu sein loved become to be 'to have been loved'

The table shows that the infinitival morpheme *zu* is spelled out on the highest verb in the extended projection of the main verb. This means that we need a mechanism that ensures that the [-Finite] feature of the head T is spelled out on the verb selected by the head T. Note that *zu* cannot be spelled out as the head T in the structure because this would result in a bad word order in the case of particle verbs. More concretely, with particle verbs, *zu* is placed between the particle and the root and we proposed that particles are non-incorporated prepositions; consider (7) again. Thus, if *zu* were the head T, we would get the ordering [*zu* Particle root] for the left-merged T or the ordering [Particle root *zu*] for the right-merged T.

For this reason, we propose that verbs bear an unvalued tense feature which is valued by the interpretable valued tense feature of the next higher verbal head (see Adger 2003, Alexiadou, Rathert & von Stechow 2003). This ensures that the marker *zu* appears only on the head selected by T (bearing the [-Finite] feature), i.e., on the highest verbal head. For instance, if there is a head Perf(ect) present in the syntactic structure, as in the example in the active perfect slot in table (19), T with its [-Finite] feature values the unvalued feature of the head Perf (*haben* 'to have'), which results in the spell-out of *zu* on the verb *haben*. Then, the head Perf bearing the feature [Perfect] values the tense feature of the head *v*, which results in the spell-out *geliebt* 'loved'.[11]

With respect to the affix *–en* (*-n*) present on infinite verbs, we assume that it is a default marker that is inserted when the appropriate verb does not receive a specific agreement marker. Note that the affix *–en* (*-n*) also appears in other infinitival verbal forms, in non-*zu*-infinitives like *trinken* 'drink' and in past participles of strong, i.e., irregular verbs, like *getrunken* 'drunk'.[12] Thus, if there is no T in the extended projection of the verb, *zu* cannot be spelled out and only the default marker *–en* is inserted.

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[10] The clause can be TP as well as CP. Thus, in the case of modal verbs, as in (16), the projection of the main verb is smaller than TP, in contrast to, e.g., phasal verbs like *beginnen* 'begin' and *aufhören* 'stop', which take *zu*-infinitives.

[11] The derivation of *geliebt* 'loved' is, in fact, more complex but for easiness of exposition, we will not discuss it here.

[12] The dental participle ending *–t* is the variant of *–en* that appears with weak verbs in German. However, the *–(e)n* ending appears on all infinitives regardless of whether they belong to weak (regular) or strong (irregular) verb classes.

The difference between prefix verbs and particle verbs can then be analyzed as follows. It has been argued by many authors that the infinitival marker *zu* is a prefix, which in the case of prefix verbs (and simple verbs) is spelled separately for reasons of the spelling convention; see Eisenberg (1999), Ijbema & Abraham (2000), Jacobs (2005), Sternefeld (2006), Haider (2010), among others. We follow this analysis and argue that the reason why *zu* precedes the prefix in the case of prefix verbs like (22a) is that the prefix – i.e. the incorporated preposition – is part of the complex verbal head on which the [-Finite] feature of T should be spelled out.

(22) a. zu ent-laufen
          to away/out-run
          'to escape'
      b. aus-zu-laufen
          out-to-run
          'to run out'
      c. aus der Stadt zu laufen
          out the town to run
          'to run out of the city'

On the contrary, since in the case of particle verbs the preposition stays in the prepositional phrase, it is not part of the complex verbal head on which *zu* is spelled out. The marker *zu* is prefixed only to the complex verbal head ($\sqrt{}+v$) and therefore it intervenes between the non-incorporated preposition and the root, as shown in (22b). With full prepositional phrases, the situation is similar. Since the preposition stays in the prepositional phrases, *zu* intervenes between the preposition (and its complement) and the verbal root. The difference is that the presence of the complement XP blocks the formation of one word, as demonstrated in (22c).

3. Derivations: How this system works

Here we demonstrate the conceptual consequences of adopting the (largely) united derivational approach to the generation of particle and prefix verbs discussed in the previous section. Our analysis attempts to account for both C-I as well as SM-requirements that operations in the narrow syntax must meet in licensing particle/prefix verbs. Following Marantz (1997, 2001), we adopt the stance that lexical items, i.e., √ROOTS (cf. Pesetsky 1995), possess no category specification. Under this assumption, the syntactic category of √ROOTS is determined by a structurally higher light functional element (*a, v, n*).

Our study builds upon the previous work of Biskup & Putnam (2009), where they discuss the primary syntactico-semantic restrictions that regulate the *ent-/aus*-alternation in ablative constructions in German particle and prefix verbs, but makes important additional improvements upon their proposal in our account of the morphosyntax-phonology interface. Following Epstein, Seely, & Kitahara (2010) (based on assumptions made by Chomsky (2007), the dominant view in minimalist theorizing is that the primary objective of the narrow syntax is to create legible structures first and foremost for C-I requirements. Under these assumptions, SM-requirements are achieved on a "best available fit" basis. In this respect, the (morpho)syntax-phonology interface is often under-researched and poorly understood (however see Sheer 2008, 2010 for insightful suggestions into the inner workings of the (morpho)syntax-phonology interface in a

phase-based system). As we mention in Section 2.1, particles, unlike prefixes, assume the status of a prosodic word that is able to stand on its own as a consequence of non-incorporation of the preposition into the root. The task at hand in this section is to explicate how these distinctions are recognized in the course of the derivation and to shed light on the narrow syntax's relationship to both the C-I as well as the SM interfaces.

As a point of departure, consider the following data from (17), (18), and (22), combined and repeated here in (23), (24), and (25) for the sake of the reader:

(23) a.   Ich   arbeite.
           I   work
           'I am working.'
           'I work.'
      b. * Ich   zu arbeite.
           I   to work

(24) a.   Ich   muss   arbeiten.
           I   must   work
           'I must work.'
      b. * Ich   muss   zu arbeiten.
           I   must   to work

(25) a.   zu ent-laufen
           to away/out-run
           'to escape'
      b.   aus-zu-laufen
           out-to-run
           'to run out'
      c.   aus   der   Stadt   zu laufen
           out   the   town   to run
           'to run out of the city'

Non-finiteness can be spelled out three ways in German: 1.) as the *–(e)n* ending on an infinitive (cf. (24a)), 2.) as the bound morpheme *zu* that appears as an infix between the particle and the stem of the verb (cf. (25b)), or 3.) as the bound morpheme *zu* that appears as a proclitic to the incorporated prefix+verb combination (cf. (25a)) or as a proclitic to the simple verb, as in (25c). As claimed above, we interpret the *–(e)n* ending as the default marker, with *zu* only being spelled-out in the presence of T with [-Finite] feature in the extended projection of the verb. The question then becomes the precise placement of *zu* with regards to the verb in each of these verb types.

To begin the discussion of the particle verbs, recall from (22) above, that the particle often carries with it the meaning of a covert prepositional phrase. Hence, the examples *über.setzen* 'set (something) across' or *mít.kommen* 'come along' imply an object of the preposition akin to *über den Fluss setzen* 'set or ferry (something) across the river' or *mit uns kommen* 'come with us' where the objects of the preposition are overtly expressed.

First, let's consider the derivation of the particle verb *überzusetzen* 'to take across, to ferry over' in detail. The preposition *über* 'across' is merged with *pro*, forming the PP, as shown in

(26) below. Immediately following this derivational step, the little prepositional head *p* is merged with PP and *über* incorporates into it. Once the *p*P is formed, the entire projection is sent to Spell-Out. Since the preposition *über* is the only overt element in the *p*P phase, it forms a separate, independent prosodic word and can receive the primary accent, as discussed in section 2.1. After the Spell-Out of the *p*P phase, the √root *häng-* is merged with the projection *p*P. The functional head *v* is merged and determines the syntactic category of the √root. Then, the root incorporates into *v*. The light *v*-head bears an unvalued uninterpretable Tense feature, which awaits the value of the next higher verbal head, as discussed in the previous section. Since *überzusetzen* is an infinitival verb, PRO appears in the Spec,*v*P. Upon successful completion, the *v*P phase is then shipped to Spell-Out, thus forming the second prosodic word.

At this point we must address the fact that the *v*P phase is transferred to the interfaces with an uninterpretable feature, which results in an ill-formed derivation that "crashes" in standard analyses. There are three basic options how to circumvent this potential problem. The first possibility is to assume that T, i.e., the functional head that bears an interpretable Tense feature, is part of the (lower) *v*P phase (see Richards (2007) for the relevant discussion). We reject this option for reasons that will become clear below in the discussion of prefix verbs. More concretely, if T is spelled out in the CP phase and the root with the incorporated preposition (prefix) in the *v*P phase, then *zu* – which spells out the [-Finite] feature of T – is prefixed to the whole preceding Spell-Out domain and in this way we derive the right order of the particular morphemes.

Another option would be to separate the LF and PF Spell-Out and suggest that *v*P is spelled out as the PF phase but not as the LF phase. Some linguists (cf. Matushansky (2005), Marušič (2005), and Hicks (2009)) indeed have postulated that the C-I and SM interfaces interact at different stages with "phases," resulting in the hypothesis that separate PF- and LF-phases exist. Ultimately, such a claim that LF- and PF-phases are separate entities may be correct, however, to test such a claim with empirical data would take us too far afield from the present study.

Therefore, we will pursue a third option, where the *v*P phase is transferred to the interfaces in spite of the fact that it contains an uninterpretable Tense-feature (see also Epstein, Kitahara, & Seely 2010 for a similar proposal). Such an understanding of a phase-based derivational system has to adopt a view that uninterpretable features are "invisible" at the interfaces. Given their nature, uninterpretable features cannot be interpreted by the LF. Since they are semantically vacuous (in our case, times are interpreted in T and not in *v*), we take it to mean that C-I is blind to them (see Zeijlstra 2009). Consequently, the presence of the uninterpretable Tense-feature on the head *v* does not result in a derivational crash.[13] Thus, the T head with its [-Finite] feature value is then merged with *v*P and values the unvalued uninterpretable feature on the head *v*. The [-Finite] feature on *v* results in the morphophonemic spell-out of the prefix *zu* at the PF.

At this juncture, we still need to consider when/how the infinitival *–(e)n* ending appears on the infinitival verb and under what circumstances that takes place. In the analysis we adopt here, we argue that the φ-features on T are not valued during the course of the derivation. Since PRO does not bear valued φ-features, the φ-features on T remain unvalued. Therefore, when T – and the rest of the CP phase – is transferred to the interfaces, the features are realized as the default marker *–(e)n*.[14] Given the discussion of uninterpretable features above, the unvalued uninterpretable φ-features on T do not pose a problem for the interfaces. Similarly as *zu*, *–(e)n*

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[13] Alternatively, one could propose that the problem with the Spell-Out of the *v*P phase is later "repaired" when T values the offending feature of *v*.
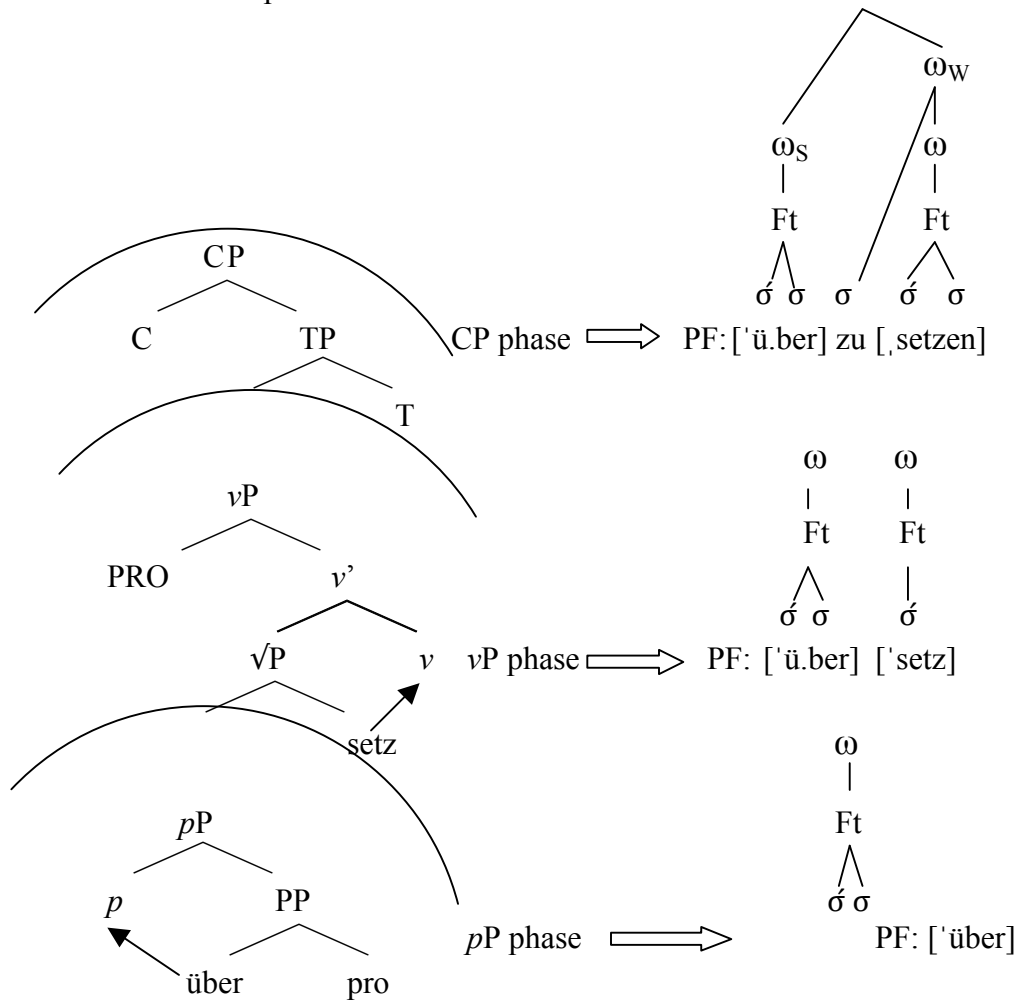
[14] We analyze the infinitives here as CPs, as e.g. in control constructions.

cannot represent the head T itself (see the discussion in the preceding section again). Therefore, we propose that *–en* is lowered to the closest verb – in the case of particle and prefix verbs discussed here, the head *v* - by the operation of morphological merger.[15]

We do not analyze *–(e)n* as a morphophonemic reflex of the operation Agree between T and the lower verbal head due to the fact that we would have to assume that the feature(s) agreeing with T can be present on different heads (in different structures) and that it always must be the highest verbal head selected by T. Note that the marker *–(e)n* always appears on the highest verb in the extended projection of the main verb (and on the passive auxiliary in the passive perfect), as shown in table (21). As discussed in section 2.2, we assume that words can also be formed as a consequence of the distributional properties of the morphemes from which they are derived (Julien 2002). Therefore, the preposition (particle), which is not incorporated into the verb, can be treated as part of the verbal word and consequently the marker *zu* results as the infix, as schematized in (26).

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[15] Since in raising/ECM construction the embedded clause does not contain C, then given feature inheritance (Chomsky 2008), the infinitival T lacks φ-features. We assume that this lack of φ-features on T again results in the default marker *–(e)n* at the PF, which is lowered to *v* by the operation of morphological merger.

(26) The derivation of the particle verb *überzusetzen*

ω_W
ω_S ω
Ft   Ft
σ́ σ σ   σ́ σ

CP
C   TP   CP phase ⟹ PF: ['ü.ber] zu [ˌsetzen]
T

ω ω
Ft   Ft
σ́ σ   σ́

*v*P
PRO   *v*'
√P   *v*   *v*P phase ⟹ PF: ['ü.ber] ['setz]
setz

ω
Ft
σ́ σ

*p*P
p   PP   *p*P phase ⟹   PF: ['über]
über   pro

Phonologically, the particle spells-out on its own in the *p*P phase forming its own phonological word. In the next phase, the verb spells-out with stress on the initial root syllable. Finally, in the CP phase, the *zu* and the infinitive ending *–(e)n* spell-out. [16] As a verbal proclitic spelling the Tense-feature of *v*, *zu* attaches to the leftmost edge of the prosodic structure containing the verb.[17] Prosodically, the particle and verb are then combined with the additional bound morphemes, *zu* and *–(e)n* after which primary and secondary stress are negotiated. As noted earlier, since the particle had received stressability from its *p*P phase, the association between the verb and its particle resembles that of compounding. Consequently, the first prosodic word, namely the particle, receives the primary stress and the stressed syllable of the verb is assigned secondary stress.

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[16] Although we have combined the particle and the verb together phonologically at the later CP phase and therewith assigned the "strong" and "weak" labels at that time, here at the Spell-Out of the CP phase, we set aside any argumentation about whether it would be best to combine them at an earlier phase of the derivation, e.g., the *v*P, as it does not bear on the ultimate purpose of this illustration namely to demonstrate that the particle would receive the primary stress.

[17] We follow Booij (1996) here in projecting an additional ω to which the proclitic is adjoined.

Now, we turn finally to prefix verbs. Let us consider, e.g. the derivation of the infinitival verb *zu übertreiben* 'to exaggerate', as schematized in (27). The preposition *über* takes no complement in this case and projects PP. Then, the little prepositional head *p* is merged with PP and *über* incorporates into it. In the next step, the entire projection is sent to Spell-Out. Since *über* bears a feature signalling that it will move, it must remain covert and there is nothing overt in *p*P at the PF that can be stressed.

After the Spell-out of the *p*P phase, the √root *treib-* is merged with *p*P and the preposition incorporates into it.[18] In the next step, the functional head *v* determining the syntactic category of *treib-* is merged and the complex head [$_v$ [über *p*] √treib] incorporates into it, creating [$_v$ [$_v$ [über *p*] √treib] *v*]. As in the case of particle verbs, the PRO argument is merged in Spec,*v*P and then the entire *v*P projection is sent to Spell-Out. Since the preposition incorporated into the *treib-* forms a weak prosodic word, as discussed in section 2.1, it is not able to carry the main stress and the stress is assigned to the√root *treib-* at the PF; see (27).

(27)   The derivation of the prefix verb *übertreiben*
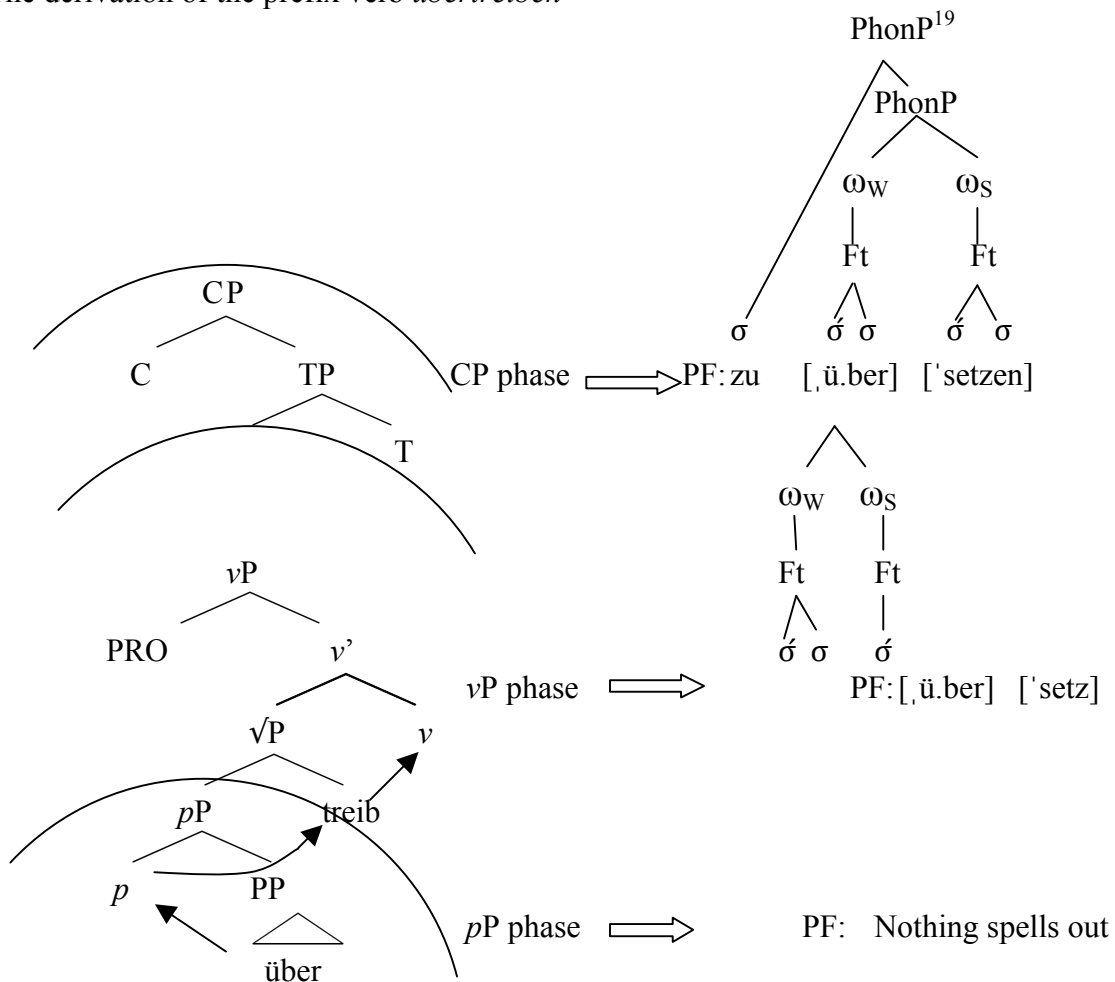
[18] In the case of transitive *übertreiben*, the direct object would be merged in Spec,√P.
[19] We adjoin the proclitic to the left edge of the prosodic structure by repeating the prosodic structure below as Booij (1996) did using ω (cf. (26)).

Turning to the CP phase, the head T with its [-Finite] feature is merged with *v*P and values the uninterpretable Tense feature on the head *v*. Finally, the head C is merged and the CP phase is sent to the interfaces. At the PF, the morpheme *zu* expressing the [-Finite] feature of T is prefixed to the *v*P Spell-Out domain and the order *zu+über+treib* emerges. In other words, the incorporation of the preposition makes the *zu* "blind" to the verb root, giving it only access to the left side of the complex (preposition+root). Therefore, *zu* precedes the preposition in prefix verbs, in contrast to particle verbs, where the preposition stays in *p*P. Similarly as in the case of particle verbs, the default marker *–(e)n* reflects the unvalued φ-features of the head T and is lowered to the head *v* by the operation of morphological merger.

Prosodically, the stress of the incorporated preposition, i.e., the prefix, and the verb can be negotiated potentially as early as their Spell-Out at the *v*P phase where they are linked together immediately. Following Booij and Rubach (1984), the phonological word containing the prefix, i.e., the incorporated preposition, is weak, whereas the verb's prosodic word is strong. Consequently, we see a reversal of stress assignment from the particle verbs. In this case, the verb receives primary stress, while the prefix receives secondary stress. Since the preposition and verb have already been combined to form a single unit morphologically and prosodically by the time they enter the CP phase, it is to the leftmost edge of this prosodic and morphological structure, namely the prefix, that *zu* can attach. Here, we have labeled this as "PhonPh"[20] to indicate that the prosodic words of both the prefix and verb have already combined to form a prosodic unit which the clitic cannot penetrate. Simply put, *zu* adjoins to the far left edge of this prosodic unit.

4.   Conclusions and remaining puzzles
In a derivational approach to the construction of particle and prefix verbs in German along the lines of those proposed by Biskup & Putnam (2009), the placement of the bound morpheme *zu* in connection with particle and prefix verbs poses significant changes to our current (limited) understanding of the syntax-semantics and syntax-phonology interfaces. In this paper, we discussed in detail the challenges that a derivational approach to particle/prefix verbs must address.

Although this study makes significant progress towards a better understanding of the syntax-phonology interface in a phase-based variant of the Minimalist Program, much work remains to be done. From a mere empirical standpoint, in future work we intend to investigate other related synchronic and diachronic Germanic languages in connection with our theoretical claims that we adopt here. Second, and perhaps more importantly, a more comprehensive treatment of particle/prefix verbs in German(ic) must also include an account of the behavior of the perfective *ge*-prefix in juxtaposition to the bound morpheme *zu*:

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[20] Here "PhonPh" represents some prosodic structure rather than necessarily the specific meaning of "Phonological Phrase". The contrast between the particle and prefix verbs highlights difficulties for discussions of clitics or indeed any structure attaching to or emerging with the result of the combination of prosodic words or structure. A grid approach to stress would avoid any such difficulties, however, it is unclear how much grid structure would become available at each phase of Spell-Out since most articles addressing the prosody of syntax treat prosody and stress using grid structure *post hoc* after sentences or phrases are already formed. However, a minimalist approach involves the Spell-Out of PF throughout the derivation. Since such a theoretical discussion is beyond the scope of this paper, we set it aside at present.

(28) a. *ent-*ge*-kommen
    b. *ge*-ent-kommen
    c. aus-*ge*-kommen
    d. *ge*-aus-kommen

In conclusion, we return to the fundamental questions that we raised at the very beginning of this paper concerning a phase-based minimalist understanding of the syntax-phonology interface; namely, (i) is the licensing of particle and prefix verbs in German predominantly syntactic, semantic, or phonological in nature?, and (ii) what kinds of interplay are taking place between them. As we have argued in this paper, a phase-based derivational approach is capable of accounting for these syntax-phonology mapping issues. Ad (i), our analysis shows support for an analysis of particle/prefix verbs that can equally account for syntactic, semantic, and phonological aspects of these constructions. We have argued that the different accent pattern, the different placement of *zu* and the different lexico-semantic properties of particle and prefix verbs is based on whether or not the appropriate preposition incorporates into the verb (root) in the narrow syntax. Ad (ii), when the preposition and the verb occur in the same Spell-Out domain (i.e. in prefix verbs), phonologically and semantically they have a closer relation to one another than the verb and preposition do in the particle verbs, where they occur in different Spell-Out domains. This results in a different accent pattern and a meaning which is more idiosyncratic than in the case of non-incorporated prepositions. The theoretical ramifications of this approach may lead to certain necessary adjustments with regard to our current understanding of long-standing components of the Minimalist Program such as the No Tampering Condition (NTC) and Transfer. We leave a detailed discussion of these matters for future research.

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