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# The Status of Extrasyllabic Consonants in English and German*

## 1. Introduction

Since the advent of nonlinear phonology many linguists have either assumed or argued explicitly that many languages have words in which one or more segment does not belong structurally to the syllable. Three commonly employed adjectives used to describe such consonants are 'extrasyllabic', 'extrametrical' or 'stray'. Other authors refer to such segments as belonging to the 'appendix'.

Examples of German and English words that are commonly assumed to contain stray consonants in three separate contexts have been presented in (1). The extrasyllabic consonants in these words have been underlined.

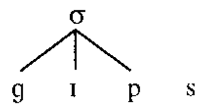
(1) a. Word-final following a three member rhyme:
Freund 'friend' find

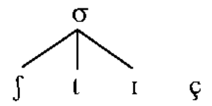
b. Word-final following an obstruent:
Gips 'plaster' lapse

c. Word-initial preceding an obstruent:
Stich 'sting' stay

Stray consonants have been argued to exist in both German and English in other contexts as well. For example, some authors hold that the rhyme in both languages is maximally bipositional at a certain representational level, in which case the final consonant in a word like *keep* is extrasyllabic (Borowsky 1990).

Various non-linear representations have been proposed to express the 'extrasyllabicity' of segments like the ones in (1). The ones I am concerned with in the present article analyze the underlined consonants in (1) structurally as being outside of the syllable, as in (2). For transparency I ignore here both subsyllabic constituency as well as higher level prosodic constituents to which the stray consonants are sometimes assumed to attach. For reasons to be made clear below I refer to syllables like the ones in (2), in which the stray consonant is situated outside of the syllable, as *abstract* syllables.

(2) a.



b.
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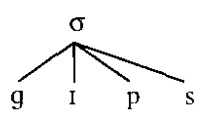
The vast majority of phonologists working within nonlinear frameworks who have examined German have concluded that the underlined consonants like the ones in (1a), (1b) and/or (1c) have representations in which the 'stray' segment does not belong to the syllable, as in (2), e.g. Wiese (1988, 1991), Giegerich (1989, 1992a), Hall (1992a, b), Yu (1992a, b), Wiese (1996), Grijzenhout (1998). Studies in which the underlined consonants in English words like the ones in (1) have been argued to have representations like the ones in (2) are also quite common in the literature. Seven such treatments are Kiparsky (1981), Selkirk (1982), Borowsky (1990), Clements (1990), Goldsmith (1990: 148ff.), Giegerich (1992b), and most recently Hammond (1999).

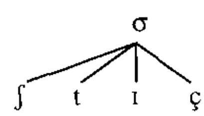
The type of extrasyllabicity in the examples in (1) differs markedly from the type of extrasyllabicity discussed by other authors. For example, in many treatments of English a syllabic sonorant is analyzed as stray at an early stage in the derivation, e.g. the /m/ in *rhythm*. Thus, according to many (rule-based) approaches the first three segments /ɹɪð/ are syllabified and the /m/ is extrasyllabic, after which a rule of sonorant syllabification applies. What makes the extrasyllabic /m/ in *rhythm* different than the extrasyllabic /s/ in *lapse* is that the /m/ in the former word cannot possibly be associated with the preceding syllable because English has a strict ban on syllables ending in obstruent+ sonorant and therefore makes the /m/ syllabic so that it can be pronounced. For clarity I refer to the extrasyllabicity in (2) as *licenced extrasyllabicity* (after Goldsmith 1990: 108) and the kind of extrasyllabicity in the English word *rhythm* as *contingent extrasyllabicity*. The topic of this article is therefore restricted to licenced extrasyllabicity in German and English.

As I point out in §2 below the representations in (2) with licensed extrasyllabicity only make sense if they hold for an abstract stage in a derivation and not for surface representations. Since excellent phonological evidence can be adduced from German and English that the stray consonants in (2) are actually associated with the syllable in the surface representation, proponents of the structures in (2) must posit a rule, commonly referred to in the literature as 'stray segment adjunction', that associates a stray consonant with a syllable. The result is what I refer to below as *surface* syllables, like the ones in (2):

(3) a.




b.




Thus, licensed extrasyllabicity can be thought of as involving consonants that are dangling in limbo, typically at a word edge, but that the 'dangling' property is only temporary, since it is lost when they are ultimately linked up with syllables, as in (3).

In the present article I evaluate the status of licensed extrasyllabicity in two closely related West Germanic languages, namely German and English. The reason I have chosen these particular languages is that the data and analyses in both German and English are strikingly similar.[1] In fact, it would be fair to say there is a tradition in the

[1] The German and English data to be discussed below have clear parallels in yet another West Germanic language, namely Dutch. Linguists who have argued that Dutch words like the ones in (1) contain certain consonants that are represented structurally as in (2) include Booij (1983: 258-260), Trommelen (1984: 87-90), van der Hulst (1984: 98-100) and Booij (1995: 26ff.). See my comments on Dutch in §4.

generative literature on these two languages of treating the underlined consonants in words like the ones in (1) structurally as in (2). It is the purpose of the present article to put an end to this tradition. My goal in the present article is twofold: (i) to show that there is no licensed extrasyllabicity in German and English and indeed that there is no derivational stage like the ones in (2) in which licensed extrasyllabicity in either of these languages exists; and (ii) to convince the reader that the evidence commonly believed to support representations like the ones in (2) can be accounted for in a non *ad hoc* manner by referring to the surface representation alone, as in (3). A formal treatment of this evidence in terms of well-formedness conditions that hold for a concrete level of representation will subsequently be proposed.

This article is organized as follows. In §2 I discuss the status of licensed extrasyllabicity in the three contexts in (1) in German and English. I ultimately reject analyzing the consonants such as the underlined ones in (1) as stray and propose a novel treatment in which I account for the facts of both languages by considering only the surface as opposed to an abstract stage in the derivation. In §3 I summarize and refute arguments for licensed extrasyllabicity in two additional contexts in German and English. §4 is a brief discussion of the status of licensed extrasyllabicity in other languages. In §5 I provide a brief analysis of how some data usually assumed to require contingent extrasyllabicity might be accounted for by referring to the surface representation alone. Concluding remarks are made in §6.

## 2. Licensed extrasyllabicity in German and English in three contexts

### 2.1 Introduction

This section is devoted to a systematic presentation of the German and English data in which consonants in the three contexts in (1) have been argued to be stray, as in (2). The reasons many linguists consider these segments to be unassociated with the syllable will be discussed (and ultimately rejected) in §2.3.

Examples of German and English words that are said to contain a stray consonant in word-final position have been provided in (4). Henceforth I employ the abbreviation 'S' for 'stray consonant with a representation as in (2) due to licenced extrasyllabicity'. The words have been divided into two separate categories which define the context in which S occurs. In (4a) S is word-final following a three member rhyme, i.e. after (i) a short vowel + two consonants, (ii) a long vowel + a single consonant, or (iii) a diphthong + single consonant, and in (4b) it is word-final following an obstruent. Throughout this article I present German examples in the left column and English examples in the right.

(4) a. Word-final following a three member rhyme:

| | | |
|---|---|---|
| Mond | 'moon' | fiend |
| Freund | 'friend' | find |
| Feind | 'enemy' | sound |
| Haupt | 'chief' | count |
| Markt | 'market' | pounce |
| feucht | 'moist' | launch |

| | | |
|---|---|---|
| Krebs | 'cancer' | lounge |
| film-t | 'film (3p. sg.)' | film-ed |
| feil-sch | 'bargain (imp. sg.)' | pond-s |
| Wurf-s | 'litter (gen. sg.)' | elv-es |

b. Word-final following an obstruent:

| | | |
|---|---|---|
| Gips | 'plaster' | lapse |
| Wachs | 'wax' | six ([sɪks]) |
| Abt | 'abbott' | apt |
| Akt | 'act' | act |
| oft | 'often' | lift |
| Last | 'burden' | list |
| hübsch | 'pretty' | adz |
| Jag-d | 'hunt (noun)' | bagg-ed |
| lob-t | 'praise (3p. sg)' | jabb-ed |
| Monat-s | 'month (gen. sg.)' | save-s |
| Dach-s | 'roof (gen. sg.)' | book-s |

In the first seven German and English pairs in (4a) S belongs to the root and in the final three pairs it is a suffix. The S in (4b) can similarly belong to either the root, as in the first six pairs, or it can be a suffix, as in the final four. Note that the three German examples in (4a) *Haupt*, *Markt* and *feucht* as well as the two English words *ponds* and *elves* could also be listed under (4b) because the final consonant is a coronal obstruent.

An important generalization often cited in the literature concerns the type of consonant that can be an S. Generally speaking an S in both German and English is restricted to the class of coronal obstruents, but a more precise statement distinguishes both the two languages and the two environments. Thus, in (4a) and (4b) German S = [t s ʃ], i.e. [–sonorant, CORONAL]. In environment (4a) English S = [t d s z t͡ʃ d͡ʒ], i.e. [–sonorant, CORONAL], but in environment (4b) S = [t d s z], i.e. [–sonorant, CORONAL, +anterior]. These facts are summarized in (5):

(5)

| language | environment | features for S |
|---|---|---|
| German | (4a) | [–sonorant, CORONAL] |
| English | (4a) | [–sonorant, CORONAL] |
| German | (4b) | [–sonorant, CORONAL] |
| English | (4b) | [–sonorant, CORONAL, +anterior] |

There are, however, some gaps. For example, no German word exists in which S = [t͡ʃ]. There are apparently no English words in which S = [ð ʃ ʒ].

In all of the words in (4) only a single consonant can be an S. An examination of the following examples reveals that up to three S's can occur in environments (4a) and (4b) in both German and English. In such words S typically involves some combination of [s] and [t], which either occur as an inflectional suffix or as a part of the root.[2]

(6) a. Word-final following a three member rhyme:

| | | |
|---|---|---|
| Herbst | 'autumn' | six-th ([sɪksθ]) |
| hilf-st | 'month (2p. sg. ind.)' | find-s |
| Herbst-s | 'autumn (gen. sg.)' | pounce-d |
| feilsch-st | 'bargain (2p. sg.)' | |

[2] The genitive singular of *Herbst* 'autumn' as *Herbsts* is highly marked. The preferred pronunciation is with [əs], i.e. *Herbstes* (see Vennemann 1982: 299, Wiese 1988: 101, footnote 21).

b. Word-final following an obstruent:

| | | |
|---|---|---|
| Axt ([ʔakst]) | 'axe' | text ([tʰɛkst]) |
| sag-st | 'say (2p. sg. ind)' | relax-ed ([ɹi:lækst]) |
| | | text-s ([tʰɛksts]) |

Note that some of the S's in the examples above could be listed under both (6a) and (6b). For example, the [s] and [t] in *hilfst* are word-final following a three member rhyme and word-final following an obstruent.

The words in (7) illustrate that word-initial position preceding an obstruent is a third context for an S. The sound(s) in phonetic transcriptions in the second column correspond to the German S.

(7) Word-initial preceding an obstruent:

| | | | | |
|---|---|---|---|---|
| a. | Specht | [ʃ] | 'sparrow' | |
| | stehen | [ʃ] | 'stand' | |
| | Skelett | [s] | 'skeleton' | |
| b. | Spruch | [ʃ] | 'saying' | spring |
| | Strauß | [ʃ] | 'ostrich' | strange |
| | Sklave | [s] | 'slave' | sclerosis |
| c. | Psychologie | [ps] | 'psychology' | |
| | Psalm | [ps] | 'Psalm' | |
| | Xylophon | [ks] | 'xylophone' | |

The German words and the English glosses in (7a) begin with two consonants; the German and English examples in (7b) begin with three consonants. In all of these words, German S = [s ʃ] and English S = [s]. Greek loan words in German like the one in (7c) illustrate that S need not be restricted to a coronal fricative. Proponents of representation (2b) for words like the ones in (7a) and (7b) often either ignore the additional nonnative words in (7c), treat the consonant cluster as the mirror-image of an affricate (e.g. Wiese 1988: 93), or analyze fricatives as being more sonorous than stops, in which case there is no S in (7c).

To summarize up to this point, many linguists have argued that an S occurs in German and English in the three contexts in (8):

(8) Three environments for stray consonants:
a. word-finally after a three member rhyme
b. word-finally after an obstruent
c. word-initially before an obstruent

Some linguists have claimed that only a subset of the environments in (8) allow an S. These environments and the studies in which they are proposed are dealt with in §2.3. Some S's exist in German and English in environments other than the ones in (8) as well. I discuss (and refute) these treatments in §3.

Linguists who have argued explicitly that the underlined consonant in German words like the ones in (4a) is an S include Wiese (1988: 99-102, 1991: 114ff.), Yu (1992b: 174), Wiese (1996: 47-49; 55-56) and Grijzenhout (1998: 31-32). Those who have argued that underlined consonant in environment (4b) is an S include Wiese (1988: 99-102; 1991: 116-117, 120), Hall (1992a: 122-126, 1992b: 122-126), Yu (1992a: 29, 46, 1992b), Giegerich (1992a: 158-159), Wiese (1996: 265) and Grijzenhout (1998: 31-32). The extrasyllabicity of the underlined consonant in German words like the ones in (7) is endorsed by Wiese (1988: 95-99), Hall (1992a: 75ff.), Yu (1992a: 29, 40, 46, 1992b: 174), Féry (1995: 73ff.) and Grijzenhout (1998: 29-30).[3] Some studies on English in which the underlined consonant in words like the ones in (4a) is treated representationally as in (2) include Kiparsky (1981: 253-255), Giegerich (1992b: 144ff.), and Kenstowicz (1994: 259-261). That an S occurs in environment (4b) is argued to be true by Kiparsky (1981: 253-255), Clements (1990: 288ff.), Durand (1990: 211-212), Giegerich (1992b: 147-150), Kenstowicz (1994: 260-261), and Hammond (1999: 98-100). Clements (1990: 288ff.) and Kenstowicz (1994: 258) argue that an S occurs in environment (8c).[4, 5]

The S in words like the ones in (4), (6) and (7) are assumed to have the three properties in (9):

(9) a. German and English S occurs at a word edge only.
   b. Word-final German and English S are restricted to [–sonorant, CORONAL] or [–sonorant, CORONAL, +anterior] sounds (see (5)).
   c. Word-initial English S is restricted to [s]. Word-initial German S = [s ʃ]; in certain (Greek) loan words German S = [p k].

Word-initial German [s] occurs only in loan words, regardless of whether or not [s] is an S, e.g. *Smaragd* 'emerald', *Snob* 'snob', *Skellett* 'skeleton', *City*.

I conclude this section with brief comments concerning property (9a). All of the examples discussed up to this point involve grammatical words. However, an S can also occur word-internally as the first part of a compound, as in (10a), or as the stem in a word that contains affixes, as in (10b):

| | | | | |
|---|---|---|---|---|
| (10) | a. | Herbst-ferien | 'autumn break' | sound wave |
| | | Obst-garten | 'fruit garden' | text-book ([tʰɛkst]) |
| | b. | herbst-lich | 'autumnal' | friend-ly |
| | | be-sprechen | 'discuss' | un-speakable |

Following Booij (1995: 28-29) I hold that the generalizations in (9) govern not the grammatical word, but instead the phonological (or prosodic) word (henceforth pword).

[3] Citing Sievers (1901: §534), Vennemann (1982: 296-299) analyzes the [st] in words like *Obst* 'fruit' as a 'Nebensilbe'. Although a number of the authors listed above cite Vennemann (1982) as a study in which S's are endorsed, it is actually not clear from the text whether or not Vennemann believes in nonlinear representations like the ones in (2).

[4] See also Fujimura & Lovins (1978: 111) and Fujimura (1979), who refer to 'phonetic affixes' of English that are separate from the 'syllable core', e.g. the word sixth in their approach has three phonetic affixes, namely [s], [θ] and [s]. Since these linguists do not provide nonlinear representations one cannot conclude that these phonetic affixes are represented structurally as in (2). The first linguists to my knowledge who argued explicitly that certain consonants do not belong structurally to the syllable was Kiparsky (1981).

[5] Vennemann (1991) assumes without argument that there are no stray consonants in German. Authors who implicitly reject stray consonants for English include Fudge (1969: 265ff.), Spencer (1996: 98-100) and Roca & Johnson (1998: 286ff.). All of these linguists analyze the underlined consonants in the English examples above as being structurally inside of the syllable (but outside of the rhyme). A similar approach to the representation for 'appendix' consonants was proposed in a moraic framework for several non-Indo-European languages by Sherer (1994). According to Sherer these segments are associated structurally with the syllable but are not dominated by a mora.

The precise definition of the pword for German and English is an area of controversy, but most researchers agree that the following contexts constitute independent pwords for both languages: (i) each part of a compound, (ii) a stem in prefix+stem, and (iii) a stem in stem+consonant-initial suffix (see Yu 1992a, Wiese 1996, Hall 1999b and Raffelsiefen 2000 for German and Raffelsiefen 1999 for English).

The generalization established in the preceding paragraph has some systematic exceptions, however. Some writers have noted that an S can occur word-internally when not in pword-initial or –final position. Some representative examples have been presented in (11), in which S = [s]. In (11a) S is preceded by a sequence of short vowel + obstruent and in (11b) by a two-member rhyme ending in a sonorant segment. In both (11a) and (11b) the [s] is followed by a voiceless stop. Since the voiceless stop following the S in (11) is unaspirated the [s] is syllable-initial and not syllable-final, e.g. [æb.stɹækt], *[æbs.t$^{h}$ɹækt]. The environment for aspiration in German and English is discussed in §2.2.

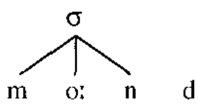
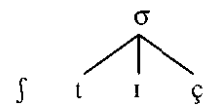
| | | | | | |
|---|---|---|---|---|---|
| (11) a. | extra | 'extra' | b. | konstant | 'constant' |
| | abstrakt | 'abstract' | | Ostern | 'Easter' |
| | abstrus | 'abstruse' | | Constraint | 'Constraint' |
| | Expansion | 'expansion' | | | |
| | Expedition | 'expedition' | | | |
| | Obstruent | 'obstruent' | | | |
| | extrem | 'extreme' | | | |

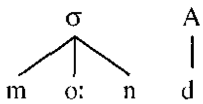
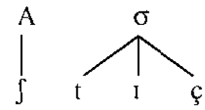
There are two generalizations that can be drawn from the examples in (11): (i) the phonetic value of S is considerably restricted than in (4), (7) and (10), since S can only be [s] in (11); and (ii) S in (11) is situated to the right of a two member rhyme ending in a [+sonorant] segment or a sequence of short vowel+obstruent. Significantly, no words exist in which [s] is located to the right of a three member rhyme. In §3.1 I present an analysis that accounts for generalizations (i) and (ii).

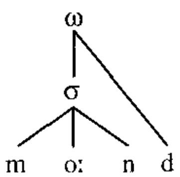
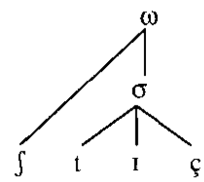
## 2.2 Licenced extrasyllabicity implies a derivation

In this section I show that all of the studies cited in the previous section in which an S is assumed in the contexts in (8) are similar: They require a derivation in which S exists only at an abstract stage and then becomes associated with the syllable at a later point. While many of the authors cited above have stated this conclusion explicitly (see below), others implicitly believe otherwise. The present section is therefore directed towards the latter set of linguists.

I begin this section with a brief review of the analysis of S's in nonlinear representations. Three structures are presented in (12)-(14). The representation in (12) is identical to the one presented earlier in (2): Here S is simply dangling outside of the syllable and is not associated with a constituent at all. Two alternative representations have been presented in (13) and (14). In (13) the S is linked to a constituent 'appendix' (=A), which itself is situated outside of the syllable. In (14) S is linked to a higher level prosodic constituent, such as the pword (=ω). All of the structures in (12)-(14) have in common that S is located outside of the syllable.

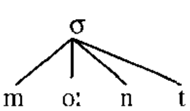
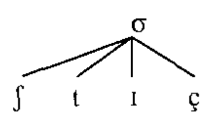
(12) a.  b. 

(13) a.  b. 

(14) a.  b. 

Linguists who assume the representation in (12) for German include Wiese (1991), Hall (1992a, b), and Wiese (1996). The structures in (13) are endorsed by Yu (1992b: 174ff.) and the ones in (14) by Wiese (1988: 96, 100).[6] In the literature on English phonology (12) is assumed by Borowsky (1990), Giegerich (1992b) and Hammond (1999).[7]

As I show below, all proponents of (12)-(14) must require that (i) these representations only hold for an abstract stage in the derivation and that (ii) at a later stage S is associated with the syllable node. Thus, the representations in (12)-(14) must be transformed into the concrete surface representations in (15):

(15) a.  b. 

The reason the representations in (15) must be correct for the surface is that the S undergoes syllable-based rules. This implies that the relevant consonant must belong structurally to the syllable. In the following paragraphs I present examples of such syllable-based rules for German and English.

The representations in (12a), (13a) or (14a) for German cannot hold for the surface because the S in environments (8a) and (8b) that are underlyingly voiced undergo Final Devoicing (henceforth FD):

(16) *Final Devoicing:*
$[-\text{son}] \rightarrow [-\text{voice}]\ /\ \_\_\ ]_{\sigma}$

Since FD only applies to syllable-final obstruents the implication is that stray consonants that undergo FD cannot be stray at this point in the derivation.[8]

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6 Grijzenhout (1998: 29) apparently adopts structure (13), in which S is linked to an appendix which itself is situated outside of the syllable, but later on in her treatment of German she analyzes the appendix as a subsyllabic constituent (p. 32). See also Halle & Vergnaud (1980: 95-96), who assume that a German S in the examples in (4a) is dominated by an appendix which is not situated outside of the syllable. Féry (1995: 64-65) believes that the German syllable is recursive and that the [st] in words like *Herbst* 'autumn' is linked to the higher of two syllable nodes.

7 Representation (14) is assumed in much current work for other languages, e.g. Rubach (1997) and Rochoń (2000: 130-135) for Polish and Green (2000) for Attic Greek and Munster Irish.

8 Considerable discussion in the literature has been devoted to the environment of German FD (see, for example, Hall 1993, Brockhaus 1995 and Wiese 1996 and references cited therein). A commonly

A similar argument can be adduced that the word-final S in English words in (4a) cannot have a representation in which the S is unattached to the syllable, as in (12a), (13a) or (14a). A number of authors have observed that syllable-final (unreleased) /p t k/ in many varieties of English are pronounced with a glottal closure (e.g. Kahn 1976: 84ff., Giegerich 1992b: 220-221, Kenstowicz 1994: 69). Some examples of a syllable-final [tˀ] have been provided in (17a) and a purely linear rule in (17b).

(17) a.

| | |
|---|---|
| sit | [sɪtˀ] |
| cats | [kʰætˀs] |
| hint | [hɪntˀ] |
| art | [ɑɹtˀ] |
| atlas | [ætˀ.ləs] |
| chutney | [t͡ʃʌtˀ.ni] |

b. *Glottalization*:
[−cont, −voice] → [+constr glottis] / [+son] __ (C)]$_\sigma$

The final two examples in (17a) illustrate that Glottalization applies syllable-finally, as opposed to word-finally.

Important for the present discussion are data like the ones in (18), in which a word-final S in environment (8a) is glottalized:

(18) coun<u>t</u>, fain<u>t</u>, pin<u>t</u>, don'<u>t</u>

Since the underlined consonant in the examples in (18) undergoes (17b) the implication is that at some point in the derivation the S loses its status of being an S and is associated with the syllable.

Let us now consider environment (8c). The reason not all of the word-initial strident fricatives in the words in (7a, b) can be situated outside of the syllable on the surface is that voiceless stops are aspirated in both German and English in syllable-initial position. Since Aspiration does not apply to a voiceless stop following an S (e.g. to the /t/ in stay), the implication is that the S cannot have the representation (12b), (13b) or (14b) at the point in the derivation where Aspiration applies. Aspiration has been stated formally in (19):

(19) *Aspiration:*
[−son, −cont] → [+spread glottis] / $_\sigma$[__

Authors who have shown that Aspiration in English is syllable-initial include Kahn (1976: 73-74) and Giegerich (1992b: 219-220).[9] For German no one to my knowledge has

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assumed alternative to (16) is that all obstruents are devoiced within a subsyllabic constituent (e.g. coda, rhyme).

One could presumably argue that FD holds at the end of a pword. Given this environment one could argue that the correct surface representation for a final S is the structure in (14a). The reason I reject (14a) as a surface representation is that this reanalysis of FD in terms of the pword cannot account for the full range of German data. A crucial argument against this treatment is that FD applies word-internally to many loan words, e.g. *Ba[k]dad, E[t]gar, Ru[k]by*, etc. (see Hall 2000a: 209). Since these monomorphemic words consist of a single pword one cannot reanalyze FD as a rule applying in pword-final position.

[9] Many authors assume that English aspiration only occurs before stressed syllables, i.e. the foot (e.g. Kiparsky 1979: 437ff., Nespor & Vogel 1986: 90-91, Iverson & Salmons 1995: 374ff.) The Kahnian ap-

explicitly argued that /p t k/ are aspirated in syllable-initial position; however, the results of various phonetic experiments reveal that /p t k/ are aspirated both word-initially, e.g. *Telefon* [tʰe.le.foːn], and intervocalically, e.g. *Miete* [miː.tʰə] 'rent'. For example, Haag (1979) and Keating (1984) both demonstrate that (utterance) initial /p t k/ have average VOT values between 60 and 70 ms., and Haag (1979) reports that intervocalic /p t k/ have VOT values between 50 and 63 ms. See also Jessen (1998), who obtained similar results in his experiments on German /p t k/. In contrast, all authors agree that /p t k/ are never aspirated when they occur after a word-initial [s ʃ], e.g. *Stamm* [ʃtam] 'stem'. I conclude that the correct context for German aspiration is syllable-initial position.[10]

In order to transform the abstract lexical representations in (12)-(14) into the concrete postlexical ones in (15) rules of stray segment adjunction like the ones in (20) are required:

(20) *Rules of stray segment adjunction:*

a. σ — [+cons] $\left[\begin{bmatrix}-\text{son}\\ \text{CORONAL}\end{bmatrix}'\right]_{\text{Word}}$

b. σ — ${}_{\text{Word}}\left[\begin{bmatrix}-\text{son}\\ +\text{cont}\\ \text{CORONAL}\end{bmatrix}'\right.$ [+cons]

Authors who posit such rules — and who therefore believe correctly that the representations in (12)-(14) depict abstract syllables — include Wiese (1991: 123-124), Hall (1992a: 75, 123ff., 1992b: 221), Giegerich (1992b: 159), Yu (1992a: 29, 1992b: 175), Wiese (1996: 56) for German and Kiparsky (1981: 254), Borowsky (1990: 179-180), Clements (1990: 289), Kenstowicz (1994: 258, 260) and Giegerich (1999: 275) for English.[11]

The derivation in (21) illustrates how an S arises and disappears at various points. The first step in (21) is the assignment of syllables to segments along the lines of the algorithms proposed by various authors (e.g. Kahn 1976 for English; Giegerich 1992b, Hall 1992a, b and Wiese 1996 for German). The reason syllabification does not incorporate the S into the syllable of either of these two words will be explained in the following section.

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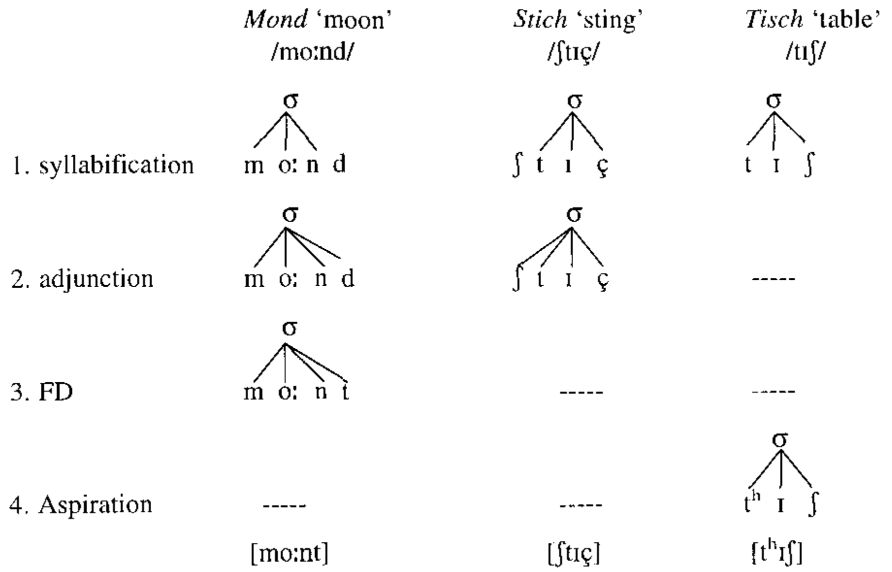
proach I am assuming includes rules of ambisyllabification making reference to stress; thus the /p/ in *apart* is aspirated because it is in absolute syllable-initial position, whereas the /p/ in *happy* is not aspirated because it is ambisyllabic. Rule (19) therefore only applies to a non-ambisyllabic syllable-initial /p t k/. Assuming for the sake of argument that the foot-based teatment for English is correct, one could presumably analyze the *s* in words like *stop* nonlinearly in such a way that it is linked to the foot. While this representation might be true for the surface, the mirror-image representation for some of the words discussed above (e.g. the *t* in *count*) cannot be correct for reasons mentioned above.

[10] Kohler (1977: 160) notes that German /p t k/ can be aspirated in final position as well, e.g. *Rad* [ʀaːtʰ] 'wheel'. I assume that German requires a second context in the Aspiration rule in (19) to account for these additional facts.

[11] Recall from (5) that English S is restricted to *anterior* coronals in context (8b). What this implies is that (20a) only holds for environment (8a) and that a specific adjunction rule would be necessary to account for the S in (8b).

(21)




All of the authors cited above who have argued that certain segments are stray require derivations like the one in (21). This is stated explicitly in Giegerich (1989: 12, 18ff., 44-46), Wiese (1991: 122-124), Hall (1992a: 75, 123ff., 1992b: 221), Yu (1992b: 175), Wiese (1996: 56) for German and Kiparsky (1981: 253-255), Borowsky (1990: 179ff.), Clements (1990: 289), Kenstowicz (1994: 258-260) and Giegerich (1999: 275ff.) for English.[12]

The generalization expressed in the previous paragraph is made explicit in (22). The statement in (22) is language specific, since stray segments in other languages can presumably exist on the surface (see §4 below for discussion).

(22) Licensed extrasyllabicity implies a derivation

Since licensed extrasyllabicity implies a derivation the question is whether or not the generalizations that have been adduced in favor of stray consonants can be restated in a non *ad hoc* way so that they refer to the surface representation. This is the goal of the following section.

## 2.3 An evaluation of the arguments for licensed extrasyllabicity

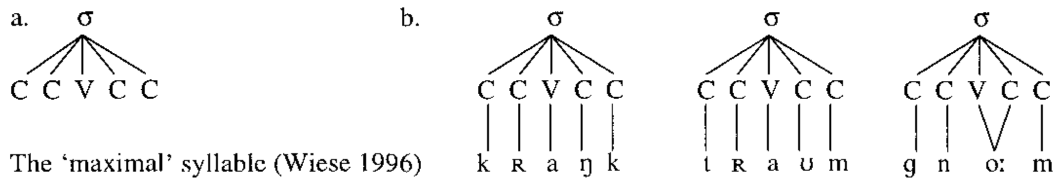
In this section I present and refute arguments that have been invoked in support of analyzing the underlined consonants in German and English words like the ones in (4), (6) and (7) as an S. These arguments are discussed in §2.3.1 and §2.3.2. In both of these subsections I demonstrate that the data can be explained by referring to *surface* syllable structure, as in (3), without recourse to stray consonants or a derivation.

[12] Féry (1995) operates within an optimality theoretic framework, in which the candidates evaluated represent the surface and not an abstract stage in the derivation. However, her treatment of German implicitly requires a derivation because her abstract representations with S's needs to be transformed into concrete surface representations in which these consonants belong to the syllable.
Lamontagne (1993) proposes that nonmoraic consonants (e.g. the /d/, /k/, /ɹ/ and /n/ in the English word *endocrin* (p. 32)) are an S. It is unclear how this author accounts for the aspiration and glottalization facts of English without assuming stray segment adjunction rules.

### 2.3.1 Maximal syllable structure

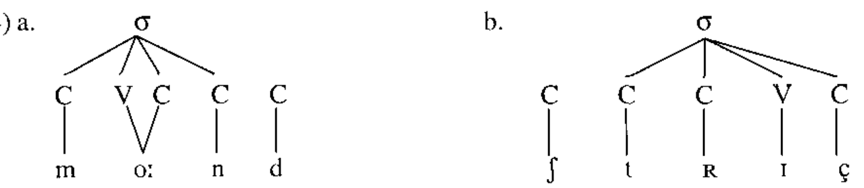
#### 2.3.1.1 German

Based on an earlier study by Moulton (1956), Wiese (1988) argues that the German syllable has the maximum form in (23a), i.e. a single V slot preceded and followed by two C positions respectively. The template in (23a) is also accepted in Wiese's later publications (e.g. Wiese 1991, 1996).

(23)



Sample representations of the three German words *krank* 'sick', *Traum* 'dream', and *Gnom* 'gnome' consisting of the maximum syllable in Wiese's model in (23a) have been presented in (23b). Note that Wiese's treatment requires long vowels to be analyzed structurally as VC and not as VV as is commonly assumed (e.g. Clements & Keyser 1983).

Mouton (1956) and Wiese (1988, 1996) observe correctly that a three member rhyme (= the VCC part of (23a)) can only be exceeded by coronal obstruents (see (4a)). The latter author concludes that since there is no slot for such consonants in template (23a), that they are situated outside of the syllable. He makes a similar generalization concerning the onset (= the first two C positions in (23a)): Two-member onsets can be preceded by [s ʃ] (see (7b)), which must be located outside of the syllable because they do not fit into template (23a). Two representative examples are provided in in (24) (=(2)): [13]

(24)


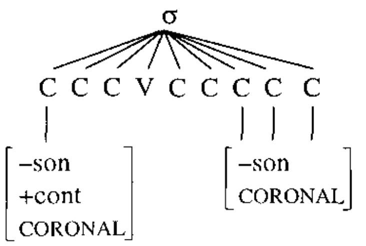

The phonotactic generalizations that motivate the template in (23a) are not a compelling reason for treating consonants like /d/ and /ʃ/ in (24) as an S. In order to capture the fact that the structure in (23a) can only be preceded and or followed by certain coronal obstruents, I propose that this additional segmental information be incorporated into the template itself. Thus, I reject the template in (23a) for abstract syllables and adopt the one in (25) for the maximal *surface* syllable of German:[14]

---

[13] In contrast to Wiese (1988), Wiese (1991: 124ff.) holds that the initial fricative in words like the ones in (24b) is not an S but that this fricative and the following stop form a complex segment which is the mirror image of an affricate.

[14] The template in (25) has been formalized in terms of CV positions to facilitate a comparison with Wiese's equivalent in (23a). The phonotactic facts discussed in this section could presumably stated in some other formal way as well (e.g. X-positions, onsets, rhymes, moras).

(25)




(25) states that a two-member onset (i.e. two pre-V consonants) can only be preceded by a coronal fricative[15] and that a three member rhyme (i.e. two postvocalic C positions) can only be followed maximally by three coronal obstruents.

My treatment correctly predicts that the sounds commonly assumed to be stray are situated in pword-initial or pword–final position (see property (9a)). That the initial coronal fricative and the final coronals in (25) are situated at pword edges is a consequence of the prosodic hierarchy (Nespor & Vogel 1986): All syllable-edge consonants in German and English must also be pword-final because the pword dominates the syllable. In §3.1 I make additional comments concerning the relationship between the maximal syllable in (25) and the pword.

In a procedural model the S's in words like the ones in (24) need to be linked up to the syllable at a later stage in the derivation anyway; hence, even Wiese's analysis of the abstract syllable in (23a) requires (25) as a template for German *surface* syllables. Indeed, one can speculate that the reason Wiese does not mention (25) in his publications is that he (implicitly) feels that there is no need to refer to the surface syllable.

Note that the structure in (25) is not more complicated than the one in (23a). The reason is that the additional featural information in (25) must be captured in Wiese's model in some other way, e.g. through rules of stray segment adjunction like the ones in (20). Since the present treatment eschews these rules the additional segmental information is incorporated into the template itself.[16]

### 2.3.1.2 English

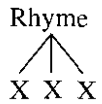
Similar arguments have been adduced from English phonology that the rhyme part of the syllable contains a maximum of three skeletal slots, as in (26a). Sample representations of words that exceed that structure are presented in (26b):

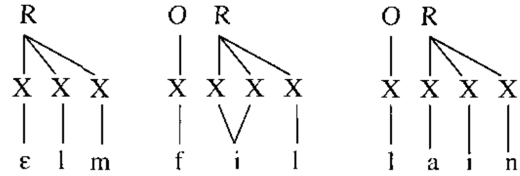
---

15 Based on very similar data from Dutch, Booij (1995: 26) argues that the Dutch onset is maximally three skeletal positions, the first of which is /s/.

16 Wiese (1988: 98-99) claims that there is orthographic evidence for treating the underlined consonants in word-initial position in (24b) as an S. According to him the sound [ʃ] is written as <s> if it is an S, otherwise, /ʃ/ is written as <sch>, e.g. *Spatz* [ʃpat͡s] 'sparrow', *stehen* [ʃteːən] 'stand' vs. *Schnee* [ʃneː] 'snow', *schmal* [ʃmaːl] 'narrow', *schreiben* [ʃʀaibən] 'write'. However the spelling rule could just as easily make reference to a following obstruent: The sound [ʃ] is written as <s> if it is followed by an obstruent, otherwise [ʃ] is written as <sch>.

(26) a. The maximal rhyme of English: b.

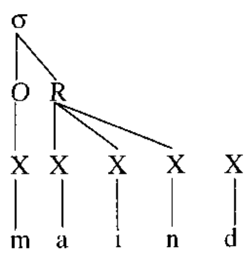



Linguists who assume the maximal rhyme structure in (26a) in various representational frameworks include Kiparsky (1981), Giegerich (1992a: 144ff.) and Kenstowicz (1994).[17]

The preceding authors assume that a three member rhyme of English can only be exceeded by coronal obstruents (see (4a)) and conclude that the final consonant in examples (4a) is therefore situated outside of the rhyme at the point in the derivation where (26a) holds. The mirror image generalization concerning the [s] in the English examples in (7b) is generally assumed as well. A typical representation (see Giegerich 1992a: 148) for this abstract stage is provided in (27):

(27)




One important point not mentioned in the literature is that a three member rhyme of English — in contrast to German — can be exceeded by consonants other than coronal obstruents. Some representative examples are listed in (28):

(28) born, cork, morgue, form, warf, warp, absorb

All of the examples in (28) have in common that the rhyme contains a sequence of [oː] + [ɹ]. By contrast, no other three member rhyme of English can be exceeded by segments other than coronal obstruents.[18]

The alternative to the maximal rhyme in (26a) which I adopt is the template in (29), in which the rhyme consists maximally of five positions, the final two of which are restricted to coronal obstruents. The onset contains maximally three slots, the first of which is [s].[19]

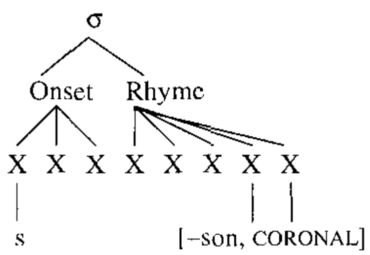
---

[17] Some linguists have proposed that the English coda can contain at most two segments, in which case the only words in (4a) which contain an S are the final three, i.e. *film-ed, pond-s, elv-es* (see Selkirk 1982: 350ff., Durand 1990: 211-212, Hammond 1999: 94). Thus, according to the latter approach only a subset of the underlined consonants in (4a) is an S.

[18] Pronunciation of the words in (28) with [oː] is typical for speakers of American English (see Hammond 1999: 62)

[19] An alternative to the [s] in syllable-initial position is to have only two X slots for the onset and to analyze [sp st sk] as single segments (see Fudge 1969: 268ff., Selkirk 1982: 348-349 and Lamontagne 1993: 243ff.).

(29)




The reader is referred to Giegerich (1992a: 150), who proposes that the English surface syllable has a structure along the lines of (29). My treatment differs from Giegerich's because he also has an abstract syllable template like the one in (26a) for the rhyme.

In order to account for the words in (28), any treatment of English requires in addition to (29) a special template that refers specifically to rhymes of the form [oːɹ] which allows for (certain) consonants to follow which are not necessarily coronal obstruents.

## 2.3.2 Sonority

The argument that the underlined consonant in words like the ones in (4b), (6) and (7) is an S is based on the assumption that German and English conform strictly to the SONORITY SEQUENCING GENERALIZATION (henceforth SSG) in (30a) (from Selkirk 1984). Similar versions are posited by Sievers (1901), Jespersen (1904), Vennemann (1972), Hooper (1976) and Clements (1990). A commonly assumed sonority hierarchy is presented in (30b):

(30) a. SONORITY SEQUENCING GENERALIZATION (SSG): In any syllable there is a segment constituting a sonority peak which is preceded and/or followed by a sequence of segments with progressively decreasing sonority values.

b. SONORITY HIERARCHY: Vowel > R > l > Nasal > Obstruent

See, for example, Hall (1992a, b), and Wiese (1996), who assume (30b) for German and Hammond (1999: 86), who posits the same hierarchy (word-finally) for English.

As in many other languages the SSG plays a pivotal role in the phonotactics of German and English. For example, in syllable-final position many German and English words end in two consonants that show a sonority fall and thus conform to the SSG. Representative examples of word-final two member consonant clusters that satisfy the SSG have been provided in (31a). In contrast, the reverse ordering of the consonants in (31a) cannot occur in syllable-final position, e.g. *[pm ŋk kl sl ml]]$_{\sigma}$.

(31) a. Possible sequences of two word-final consonants:

| | | | |
|---|---|---|---|
| *nasal+obstruent:* | plump | 'awkward' | pump |
| | krank | 'sick' | sink |
| liquid+obstruent: | Kalk | 'lime' | bilk |
| | Kurs | 'course' | course |
| liquid + nasal: | Hirn | 'brain' | barn |
| | Halm | 'stalk' | film |
| lateral + rhotic: | Kerl | 'fellow' | Carl |

b. Possible sequences of two word-initial consonants:

| | | | |
|---|---|---|---|
| obstruent+nasal: | Knie | 'knee' | snow |
| obstruent+liquid: | Glas | 'glass' | glass |
| | groß | 'big' | grow |

The mirror image generalization holds for onset position, as illustrated in (31b).

However, the words in (4b), (6) and (7) above all violate the SSG because they contain words with two obstruents in initial or final position. Representative examples have been presented in (32). The words in (32a) end in two obstruents and the ones in (32b) begin with two obstruents:

(32) SSG violations:

| | | | |
|---|---|---|---|
| a. | oft | 'often' | raft |
| | Gips | 'plaster' | lapse |
| | Last | 'burden' | list |
| b. | Skat | 'skat (game)' | skin |
| | Stich | 'sting' | stay |

The underlined sequences in (32) all violate the SSG given surface syllabifications like [.last.] and [.skaːt.], in which no stray consonants exist. If the SSG as stated in (30a) is an exceptionless generalization governing the structure of German and English syllables — so the argument goes — then the edgemost underlined consonant in (32) cannot belong structurally to the syllable.

A clear majority of current phonologists draw three conclusions from the data in (32):

(33) a. the SSG governs the rules of German and English syllabification exceptionlessly
b. the final consonant in words like the ones in (32a) and the first consonant in the words in (32b) is an S
c. the rules of stray segment adjunction in (20) do not obey the SSG.

These asumptions imply a derivation: The SSG holds without exception at an earlier stage (for example, at the lexical level in Lexical Phonology) and then 'turns off' at a later stage, e.g. at the postlexical level.

In the remainder of this section I argue that there is no stage in the derivation in which the underlined consonants in (32) are an S. Thus, in my treatment the only representation that counts is the surface syllable structure, as illustrated in (34) (=(3)):

(34)


My analysis rests on the following assumption: All of the generalizations regarding German and English sound structure that have been adduced in support of stray consonants can be recast in a non *ad hoc* way by referring simply to the surface representation and not to abstract stages in a derivation. One example illustrating my assumption was discussed in the preceding section, i.e. the templates in (25) and (29), which depict the maximal surface syllable for German and English respectively.

I account for the sonority data by relaxing the SSG in (30a) in such a way that sequences of obstruents can occur in either syllable margin. Once the reformalization of the SSG is accomplished syllable structure could either be assigned by means of a rule-based algorithm (e.g. Kahn 1976) or by evaluating various candidates in an optimality theoretic approach (Prince & Smolensky 1993). Since my analysis is surface-oriented, I have chosen to cast it within the latter framework, which, in its original incarnation, relies on the assumption that all candidates evaluated are surface representations and not representations at an abstract stage in a derivation.

Any OT analysis requires some kind of constraint that refers to the sonority values of adjacent consonants. One might assume that this constraint has a form along the lines of the SSG in (30a) (see Féry 1995: 44 for German), in which case one would analyze it as a violable constraint, since surface representations like the one in (34) do not satisfy it. However, the key to my analysis is that I reject the SSG in (30a) and adopt in its place the constraint SON in (35), which was proposed by Raffelsiefen (1995: 12) to account for the distribution of German schwa. SON has a similar function to the SSG, but differs from it because it refers specifically to clusters of consonants at syllable edges that contain at least one sonorant consonant.

(35) SON: A sonorant in the syllable onset may only be followed by elements of higher sonority; a sonorant in the syllable coda may only be preceded by segments of higher sonority.

A similar revision of the SSG in such a way that obstruent clusters are allowed in initial and final position is proposed by Rochoń (1999: 125ff.) for Polish. The reason I adopt SON in (35) is that Rochoń's constraint also allows sequences of nasals, liquids and glides, all of which are unattested in German and English.

The constraint SON allows syllable-final sequences like the ones in (36a) while ruling out those in (36b). The mirror-image generalization holds for syllable-initial position as well (see (36c, d). Significantly, a sequence of two obstruents in either syllable edge satisfies SON vacuously, as shown in (36e).

| | | | | | |
|---|---|---|---|---|---|
| (36) a. | liquid+nasal]$_\sigma$ | satisfies SON | c. | $_\sigma$[obstruent+liquid | satisfies SON |
| | rhotic+lateral]$_\sigma$ | satisfies SON | | $_\sigma$[obstruent+nasal | satisfies SON |
| | liquid+obstruent]$_\sigma$ | satisfies SON | d. | $_\sigma$[liquid+obstruent | violates SON |
| | nasal+obstruent]$_\sigma$ | satisfies SON | | $_\sigma$[nasal+obstruent | violates SON |
| b. | nasal+liquid]$_\sigma$ | violates SON | e. | obstruent+obstruent]$_\sigma$ | satisfies SON |
| | lateral+rhotic]$_\sigma$ | violates SON | | $_\sigma$[obstruent+obstruent | satisfies SON |
| | obstruent+liquid]$_\sigma$ | violates SON | | | |
| | obstruent+nasal]$_\sigma$ | violates SON | | | |

SON is undominated in the grammar of German and English because it is not violated by any surface syllables.

Three additional constraints have been posited in (37):

(37) a. PARSE-SEG: All segments are parsed into syllables.
b. NOCOMPCODA: The coda contains at most one segment.
c. DEP-V: A vowel in the output corresponds to a vowel in the input.

PARSE-SEG is the constraint that guarantees maximal parsing of segments into syllables. In other words, representations like the ones in (2) entail a violation of PARSE-SEG because the stray segment is unparsed, whereas representations like the one in (34) satisfy it. Since neither German nor English has extrasyllabic consonants PARSE-SEG is undominated.[20] The markedness constraint NOCOMPCODA in (37b), which derives motivation from typologically diverse languages (see Jakobson 1962, Malmberg 1963, Pulgram 1970 and Vennemann 1988), says that sequences of two or more consonants in the coda are disallowed. In contrast to SON and PARSE-SEG, NOCOMPCODA is low ranked in German and English because there are many words in both languages with sequences of two or more consonants in syllable-final position. DEP-V is the constraint that prevents the epenthesis of a vowel. Since German permits the epenthesis of vowels (i.e. schwa), as in examples like the ones in (38), DEP-V is lower ranked than other constraints.[21] In the rule based treatments referred to in note 21 the final sonorant consonant in these and similar words is as contingent extrasyllabicity (recall §1); that is, syllabification applies only to the first three segments in a stem like /hy:gl/ and the /l/ is stray, after which a rule of schwa epenthesis applies. The pronunciation with a syllabic sonorant is also possible, e.g. [.hy:.gl̩.] for *Hügel*.

| | | | | |
|---|---|---|---|---|
| (38) | Hügel | /hy:gl/ | [.hy:.gəl.] | 'hill' |
| | Beutel | /bɔʏtl/ | [.bɔʏ.təl.] | 'bag' |
| | Laden | /la:dn/ | [.la:.dən.] | 'store' |

Equivalent English examples (e.g. *rhythm, table*) are usually analyzed with syllabic sonorant consonants as opposed to a sequence of schwa+consonant, i.e. [tʰeɪbl̩] and not [tʰeɪbəl], see Borowsky (1990).

The ranking for German and English among the four constraints posited above is presented in (39):

(39) Son, Parse-Seg » Dep-V » NoCompCoda

NOCOMPCODA is subordinated to DEP-V because complex codas that do not violate SON, i.e. a combination of obstruents, are tolerated. This is illustrated in the the tableau in (40) for *Gips* 'plaster', which is a representative example of a word in which the final consonant is assumed to be an S. Note that my analysis chooses the first candidate, namely [.gɪps.] without an extrasyllabic consonant, as optimal:

(40)

| /gɪps/ | SON | PARSE-SEG | DEP-V | NOCOMPCODA |
|---|---|---|---|---|
| →[.gɪps.] | | | | * |
| [.gɪp.s] | | *! | | |
| [.gɪ.pəs.] | | | *! | |

---

[20] Hammond (1999: 99ff.) argues explicitly that PARSESEG (= his constraint PARSE) is violable in English to allow for stray consonants on the surface, e.g. the *t* in *apt*.

[21] For rule based treatments of German schwa epenthesis see Wiese (1988), Giegerich (1989), Hall (1992a, b) and Noske (1993). For an alternative OT analysis of German data like the ones in (38) below in which no epenthesis is assumed, see Raffelsiefen (1995).

The winning candidate in (40) satisfies SON, PARSE-SEG, and DEP-V. The NOCOMPCODA violation is irrelevant, since this constraint is low ranked. The second candidate in (40), which has a stray [s], loses out because of the PARSE-SEG violation and the third one, in which a schwa has been epenthesized, because it does not fulfill DEP-V.

Tableau (41) is an evaluation of the lexical item *Laden* 'store', which is representative example of a word in which schwa epenthesis occurs. This tableau is significant because it shows how it is possible to eliminate contingent extrasyllabicity by syllabifying at a single level of representation.

(41)

| /la:dn/ | SON | PARSE-SEG | DEP-V | NOCOMPCODA |
|---|---|---|---|---|
| [.la:dn.] | *! | | | * |
| [.la:d.n] | | *! | | |
| →[.la:.dən.] | | | * | |

The first candidate loses out due to the SON violation, the second because PARSE-SEG is not fulfilled. The winner [.la:.dən.], while violating DEP-V, wins out because DEP-V is lower ranked than SON and PARSE-SEG.[22]

In the preceding paragraphs I have presented a surface analysis of the German and English data in (4b) in such a way that no S is required. I conclude this section by considering and rejecting a second argument that the underlined consonant in the German examples in (4b) is an S. In order to account for the lack of syllable-final [mk mç] clusters in German, Grijzenhout (1998: 32-33) argues that in German (and in Dutch) the place feature [LABIAL] can only appear in the right-most position in a rhyme. Given this condition, [mk mç] cannot occur because both segments are in the rhyme and yet the labial consonant [m] is not the right-most member. If a labial consonant only occurs as the right-most member of a rhyme then the implication is that the first consonant in a rhyme can only be a labial if it is the only consonant in the ryhme, e.g. the [p] in Lob 'praise', or if it follows another labial consonant, e.g. the [m] in *plump* 'awkward'. Apparent counterexamples to Grijzenhout's claim are words ending in labial+coronal sequences, like *oft* 'often', *Abt* 'abbot', and *Amt* 'office'. However, she deals with these words by analyzing the final consonant as an S, thereby upholding her generalization concerning the distribution of labial consonants in a rhyme.

There is an alternative (non *ad hoc*) way of filtering out syllable-final [mk mç] in which no S is required. Syllable-final [mk mç] can be ruled out with a negative syllable-structure condition barring the syllable-final sequence [PERIPHERAL] [PERIPHERAL], where [PERIPHERAL] is defined as the node in feature geometry that dominates [LABIAL] and [DORSAL] (see Rice 1994). Note that my analysis correctly rules out all other combinations of syllable-final labials and dorsals, i.e. [pk kp fk kf fp fç çf pç çp].[23] Thus, it is not clear what advantage Grijzenhout's treatment has over the alternative in which no S is required.

[22] Note that my analysis requires an additional constraint that rules out schwa epenthesis in word-final position, e.g. [.la:.dnə.]. See Raffelsiefen (1995) for a lengthy analysis of such examples.

[23] The *pf* in examples like *Kopf* 'head' is not filtered out because I analyze it as an affricate and not as a sequence of two segments. Final sequences of homorganic nasal+stop, e.g. [mp ŋk], do not violate the negative syllable structure condition just described because they consist of a single instantiation of [PLACE] and [PERIPHERAL].

## 3. Licensed extrasyllabicity in two additional contexts

In the preceding section I provided an analysis of German and English in which data previously thought to require abstract syllables as in (2) were reanalyzed in such a way that only the surface syllable structure is required.

In addition to the three environments in (8), some authors claim that licensed extrasyllabicity exists in other contexts in German and English as well. The reason I treat these additional contexts in a separate section is that their use is restricted to a small number of authors and does not seem to be as widely accepted as the environments in (8).

### 3.1 The final consonant of a three member rhyme

Borowsky (1990) invokes licensed extrasyllabicity to account for the distribution of what I refer to below as 'three member' English rhymes. An examination of her data reveals that rhymes consisting of three skeletal positions or more surface either (i) word-finally, (ii) word-internally at the end of each part of compounds or (iii) before a suffix of the form CV(C).[24] Following Borowsky's analysis of English, Yu (1992a: 50ff., 1992b: 181-184) makes similar observations for German. In the following examples the relevant word-internal rhyme has been underlined. As indicated in the final pair in (42a) and (42b) Borowsky's generalization governs rhymes consisting of *at least* three members.

(42) a. Rhyme consisting of three or more skeletal positions before a compound boundary:

| | | |
|---|---|---|
| Werk-statt | 'workshop' | arm-chair |
| Zeit-geist | 'Zeitgeist' | sound-wave |
| Buch-weizen | 'buckwheat' | height-assimilation |
| Obst-garten | 'fruit garden' | text-book |

b. Rhyme consisting of three or more skeletal positions before a CV(C) suffix:

| | | |
|---|---|---|
| fünf-zig | 'fifty' | event-ful |
| leb-los | 'lifeless' | bound-less |
| Ein-heit | 'unit' | apart-ment |
| herbst-lich | 'autumnal' | exact-ly |

Word-internal rhymes like these in contexts other than the ones in (42) are highly restricted in their distribution. For example, in English the underlined sequences like the ones in (42) can only occur word-internally in monomorphemes if the final consonant of the rhyme shares the same place of articulation with the following consonant, as in (43a). The other context in which word-internal rhymes consisting of at least three members occur in monomorphemes is in proper names, as in the German and English examples (43b).

[24] Borowsky does not say explicitly that three member rhymes can occur in environment (iii), but an examination of her examples indicates that (iii) is a correct generalization. According to Borowsky three member rhymes can only occur in environments (i), (ii) and before level 2 suffixes but not before suffixes of level 1. The reason she does not consider environment (iii) above is that she employs the three member rhyme restriction to account for vowel shortening in examples like *kept* (cf. *keep*). In contrast to Borowsky (1990), my goal in the present section is to account for the *surface* distribution of three member rhymes.

(43) a. Word-internal rhyme consisting of three or more skeletal positions in monomorphemes:
dainty
chamber
boulder

b. *Word-internal three-member rhyme in proper names:*

| | |
|---|---|
| Elmhurst | Siegmund |
| Thompson | Kleinhenz |
| Grimsby | Bernhard |

Thus, the question is why there are no monomorphemes (other than the systematic examples in (43)), in which a three member rhyme occurs word-internally, e.g. **areelba*, **agelmda*.[25]

Operating in the Lexical Phonology framework, Borowsky (1990) accounts for the limited distribution of three member rhymes derivationally with a constraint that operates only at level 1, whereby rhymes can contain maximally two skeletal slots. A nearly identical proposal for German is contained in Yu (1992a: 50ff.).[26] Since constraints at level 1 also account for the structure of monomorphemic words, a ban on three member rhymes at this level correctly rules out nonoccurring words like **areelba*, **agelmda*. However, the cost of Borowsky's and Yu's analysis is that the final consonant in all of the underlined sequences in (42) must be treated as an S at level 1 until it is linked up with the syllable at level 2.

A constraint operating at level 1 that turns off at level 2 is clearly not compatible with the present analysis. In order to account for the English and German data in (42), i.e. the restricted distribution of rhymes consisting minimally of three skeletal positions, I posit the following positive condition (from Hall 2000b), which holds for the surface representation:[27]

(44) A rhyme consisting of three or more skeletal positions only occurs at the end of a pword.

The generalization in (44) is a restriction on the (maximal) rhyme part of the templates presented earlier (i.e. (25) for German and (29) for English). Recall from the discussion involving the data in (10) that many writers consider the pword for German and English to be (i) each part of a compound and (ii) the stem in stem+consonant-initial suffix. Since all of the underlined sequences in (42) satisfy (44), there is no need to assume an S. Nonoccurring examples like **areelba*, **agelmda* cannot exist in my analysis because a single morpheme cannot consist of more than one pword (see Hall 1999a).

In (11) I presented words with a pword-internal [s], which according to the traditional view I reject would be treated structurally as an S, e.g. the [s] in *extra*. (44) accounts for the generalization established earlier, according to which a pword-internal

[25] Note that the examples in (11) above are not exceptions to the generalization established here because the word-internal [s] is syllable-initial, e.g. *abstract* [æb.stɹækt].
A more detailed analysis of the ideas presented in this section can be found in Hall (2000).

[26] See also Kager & Zonneveld (1986), who argue that the Dutch rhyme is maximally bipositional.

[27] The part of the rhyme that occurs in pword-final position does not constitute a constituent, given a traditional model with skeletal positions and the subsyllabic constituents onset, nucleus, coda and rhyme. One could speculate that the part of the 'rhyme' that occurs in pword-final position is a third mora, in which case (44) would describe the distribution of trimoraic syllables. I leave this possibility open for further study.

[s] never surfaces after a three member rhyme. The reason for this gap is that a three member rhyme like [eːk] in a hypothetical word like [eːk.stɹa] would be in pword-internal position, contrary to the prediction made by (44). (44) also accounts for the fact that the S in all of the examples in (11) is [s] (and never a coronal stop like [t]). The reason the S must be [s] and not [t] is that the [t] could not be parsed into either of the adjacent syllables. To illustrate, onsider the [t] in a hypothetical monomorphemic word like *aptfrak*. The parsing [æpt.fɹæk] cannot be correct because the first syllable violates (44) and the syllabification [æp.tfɹæk] is not legal because [tf] does not occur in English.

Consider now the words in (43). Examples like the ones in (43b) are unproblematic for my treatment because proper names behave as two pwords in other respects.[28] My analysis allows for words like the ones in (43a) if (44) refers to segments that dominate a [PLACE] node that is not multiply linked (see Borowsky 1990, who makes a similar proposal). Since the consonant following the underlined sequences in (43a) is homorganic with the ryhme-final segment, the two sounds share the same [PLACE] node and therefore escape (44) by formal means (see Hayes 1986 and Schein & Steriade 1986 for two possible treatments).

## 3.2 A word-final consonant

A large body of work on Metrical Phonology in German and English (and in other languages) has argued that the rules of stress asignment can only work properly if the final consonant in a word is 'extrametrical' (see Hayes 1980: 150ff., 1982, Giegerich 1999: 241ff. for English; Giegerich 1985, 1989: 18 and Yu 1992a for German). In this section I consider and reject analyzing extrametrical consonants structurally in terms of licensed extrasyllabicity, as in (2). The environment for licensed extrasyllabicity presented in this section bears directly on other issues in the phonology of German and English, for which many derivational analyses have been proposed (i.e. syllabification and stress assignment). It is not the purpose of the present section to make concrete proposals for these other areas of phonology; instead, I make several different suggestions for how the facts can be accounted for without assuming that the final consonant is not linked to a syllable. Future research will determine which of the options I discuss below is correct.

Examples English verbs are provided in (45) (from Giegerich 1999: 243). In (45a) the final syllable is stressed and in (45b) the penult. Extrametrical consonants have been underlined:

| | | |
|---|---|---|
| (45) | a. maintáin | b. édit |
| | usúrp | márry |

These examples show that in verbs the final syllable is stressed if it is heavy (=(45a)) and the penult if the final syllable is light (=(45b)).

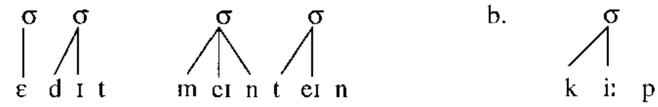
[28] One property shared by proper names and compounds in German is that they allow a sequence of [tk], e.g. *Brat-kartoffeln* 'fried potatoes', *Edgar*, whereas this sequence is ruled out morpheme-internally. Examples of phonological generalizations in English that do not hold for proper names are discussed in Raffelsiefen (1993: 90-92).

Giegerich (1985: §2.3, 1989: 7ff) makes the same generalization concerning German word stress. As illustrated in (46) below, the final syllable is stressed if it is heavy (=(46a)) and the penult if the final syllable is light (=(46b).

| | | | |
|---|---|---|---|
| (46) a. | Elemént | b. | Agénda |
| | Magazín | | Aróma |
| | Büró | | Logaríthmus |

An important component of the analysis described in the preceding paragraph is syllable weight. Basing his analysis on the earlier treatment by Hayes (1980: 150ff.), Giegerich assumes that a 'heavy' syllable has a branching rhyme (Giegerich 1989: 7, 1999: 243). Since the final rhyme in both *maintain* and *edit* is branching for Giegerich, he reasons that stress can only be predicted in these and similar words if the final consonant is not associated with the syllable, as in (2). Thus, Giegerich argues that the extrametricality in (45) and (46) translates into an abstract syllable structure like the one in (47a) in which the final consonant is not linked to the syllable. This type of licensed extraprosodicity is accomplished by a general rule stating that a final consonant in a word is stray. Since it is an exceptionless rule it applies not only to the final consonant in disyllabic words as in (47a), but also in monosyllabic words, as in (47b).

(47) a.

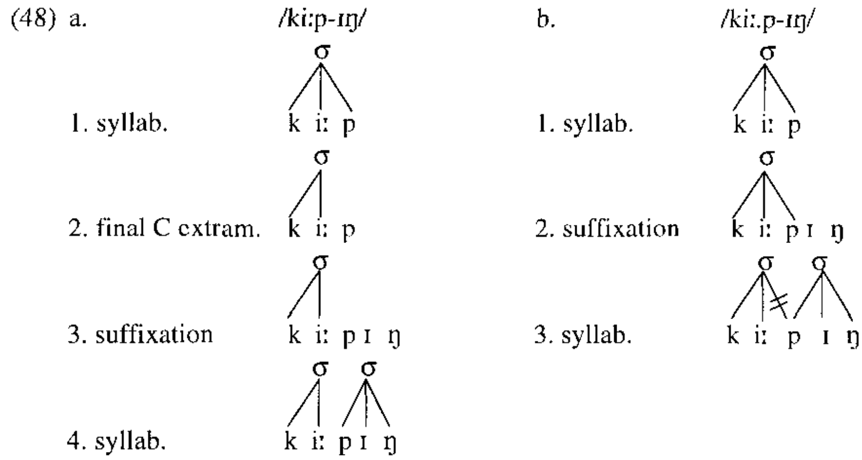



In the remainder of this section I consider and reject the arguments for analyzing the final consonant as stray, as in (47). I demonstrate that the facts of English and German can be accomodated by referring to the surface syllable structure alone.

Giegerich (1989, 1999) argues that the representations like the ones in (47), in which the final consonant is not linked to the syllable, are advantageous for two reasons:

The first argument for representations like the ones in (47a) is that the stress facts in (46) can be accounted for; that is, one can capture the generalization that a word-final VC syllable (but not a word-internal VC syllable) counts as light. Since syllable weight is calculated according to subsyllabic structure (i.e. rhymes and X slots), then in Giegerich's view the final consonant in words like *edit* should not be associated with the syllable at the point in the derivation when the stress rules apply.

Giegerich's second argument for abstract representations like the ones in (47a) is simultaneously an argument for the abstract representations of monosyllabic words as in (47b): These structures can account for the generalization that a final consonant in a stem is in the onset when a (vowel-initial) suffix is appended without a resyllabification rule, i.e. a rule that alters preexisting syllable structure. Thus, Giegerich envisions a derivation as in (48a) for a word like *keep-ing*, as opposed to the one in (48b):




Were the stem-final consonant in *keep-ing* [kʰi:.pɪŋ] in syllable-final position at the point in the derivation when the rules of syllabification apply (see step 1 in (48b)), then these rules must be endowed with the power to change prexisting syllable structure (see step 3 in (48b)). In Giegerich's view derived words like *keep-ing* are syllabified cyclically but the rule of final consonant extrametricality applies on the first cycle, i.e. prior to the addition of a suffix, and therefore produces the structure in (47) for the root as the output of the first cycle (see step 2 in (48a)). After the suffixes are added, syllabification is applied once again, and since the /p/ is not linked with the syllable node, syllabification on the second cycle is structure building (see step 4 in (48a)).

Final extrametricality, as in (47), is not necessary to account for the German and English facts outlined above. I begin by considering two alternative explanations for the stress data (see (i)-(ii) below) and then syllabification.

(i) Many authors see the use of extrametricality as described in (45) and (46) simply as a device that 'designates a particular constituent as invisible for purposes of rule application' (Hayes 1995: 57) and therefore express extrametricality in phonological representations with some kind of diacritic, e.g. edi<t>. Hayes (1995: 106) states quite clearly that final consonant extrametricality does *not* imply that the final consonant has an abstract syllable structure in which the final consonant is not linked with the syllable node, as in (47). Thus, one could account for the 'invisibility' of the final consonant in (46) to stress assigment in a rule based framework with a rule designating the final consonant in a word as extrametrical in the Hayesian sense.

(ii) The final consonant in (45) and (46) could be situated outside of the rhyme but be linked directly to the syllable (see note 5 for linguists who have made this suggestion for English). Such representations allow one to treat the final syllable in (45a) and (46a) as heavy (because the rhyme is branching) and those in (45b) and (46b) as light (because the rhyme is nonbranching).

Consider now the syllabification facts discussed above. In order to account for the fact that VCV syllabifies as V.CV in German and English I assume the two constraints in (49):

(49) a. ONSET: All syllables have an onset
b. ALIGN-R: (stem, right, syllable, right)

Given the ranking ONSET » ALIGN-R then the correct syllabification obtains, as illustrated in the following tableau for *keep-ing*. The right stem boundary is marked in (50) with '|'.

(50)

| /k iː p ɪ ŋ/ | ONSET | ALIGN-R |
|---|---|---|
| →[k iː .p\|ɪ ŋ] | | * |
| [k iː p.\|ɪ ŋ] | *! | |

Indeed, if the syllabification VCV is universally V.CV then one might want to pursue the idea that the ranking in (50) is universal.

## 4. Licensed extrasyllabicity in other languages

In §2 I argued that consonants like the ones in (1), which are assumed by many linguists to have the abstract representation in (2), are not in fact stray and that the only correct syllable parsing is one involving the surface syllable, as in (3). Thus, 'licensed extrasyllabicity' exists neither in German nor in English. That my analysis is language specific can be shown by considering briefly an example of a language with licensed extrasyllabicity in surface representations.

Languages in which licensed extrasyllabicity has been argued to exist in the surface representation include Klamath (Clements & Keyser 1983: 121ff.), Polish (Rubach 1997, Rochoń 2000), and Attic Greek and Munster Irish (Green 2000). I examine now evidence from Dutch, that suggest that certain clitics are stray on the surface. To my knowledge no one has made this suggestion for the data I discuss below.

The Dutch examples in (51a) (from Booij 1997: 271) consist of a sequence of proclitic+host. The left column lists the sequences of consonants that occur in the phonetic representation.

(51) a. tf- 't valt 'it falls'
kb- 'k ben 'I am'
ks- 'k zal 'I will'
tɣ- 't gaat 'it goes'

b. * $_{\sigma}$[tf kb ks tɣ

Since the sequences like [tf kb ks tɣ] are barred from occurring syllable-initially within lexical words, any analysis of Dutch requires a (surface true) statement like the one in (51b). In order to account for the fact that Dutch allows the examples in (51a) when the leftmost consonant is a proclitic, I asssume that the underlined consonant in (51a) cannot be linked to the syllable node in the surface representation. Hence, a representation like the one in (2b) for the data in (51a) is correct.[29]

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[29] An 'official' representation for the stray consonants in (51a) is one in which the underlined segment is

## 5. Remarks on contingent extrasyllabicity and derivations

In this section I make some brief comments on the status of contingent extrasyllabicity and how such data should be analyzed if there are no abstract syllables.

As noted in §1 many rule-based treatments of German and English analyze the final sonorant consonant in words like *rhythm* as stray at an early stage in the derivation, i.e. only /ɹɪð/ is syllabified, at which point the stray /m/ is made syllabic (or in slow speech a schwa is inserted) and then the result is resyllabified. A derivation like the one described is presupposed in much rule-based work in German and English (see Wiese 1988, Hall 1992a, b, Wiese 1996 for German, Borowsky 1990 for English).

An examination of the tableau in (41) for the German word *Laden* reveals that contingent extrasyllabicity is not necessary given the surface-based approach I have adopted. A far greater challenge to the present model are data like the ones in (52). The German examples in (52a) consist of a verb stem ending in [əʀ] plus the deverbal nominalizing suffix *–ung*. In the final column I have listed the infinitive of the corresponding verbs. The English examples in (52b) consist of a verb stem ending in a syllabic [ɹ] plus the deverbal, nominalizing suffix *–ing*:

| | | | | |
|---|---|---|---|---|
| (52) | a. | Wander-ung | 'hike' | (cf. wander-n) |
| | | Äußer-ung | 'remark' | (cf. äußer-n) |
| | | Erinner-ung | 'memory' | (cf. erinner-n) |
| | | Erober-ung | 'conquest' | (cf. erober-n) |
| | b. | hinder-ing | | |
| | | meander-ing | | |

At first glance the derived nouns in the first column seem to require a derivation: First the stem is syllabified, then a schwa is epenthesized, at which point the suffix is appended and then syllabification applies again (see Wiese 1988 and Borowsky 1990, who envision a derivation along these lines for German and English respectively).

An option that is more in line with the present proposal is that the schwa in the stem in the derived nouns in the first column of (52) is present not because of a cyclic derivation, but instead because these stems have been analogized with the corresonding verbs. Thus, the reason there is a schwa in *Wanderung* is that there is a schwa in *wandern*. Although much current work has been done on analogy (i.e. 'output-output' correspondence in Optimality Theory, see Benua 1997) I do not pursue the analogy solution here and simply leave German and English data like the ones in (52) open for further study. Only further research will be able to determine if the entire range of facts in these languages can be accounted for without reference to abstract syllables.[30]

linked to a higher constituent in the prosodic hierarchy, i.e. foot, pword etc. Booij (1997: 271) has a different explanation for the data in (51a). He assumes a distinction between a lexical and a postlexical level and that the constraint in (51b) operates only lexically. Note that my analysis requires no derivational residue (i.e. a distinction between a lexical and a postlexical level).

Booij (1995; 29) posits an 'appendix' for the syllable template of Dutch, which is situated outside of the right edge of the syllable. He apparently does not believe in a rule of stray segment adjunction like the one in (20a). It remains to be seen if the data he discusses as an argument for this structure can be reanalyzed along the lines of the present proposal for German and English.

[30] I would like to draw the reader's attention to the fact that the analogy explanation for the German data

## 6. Conclusion

In the preceding paragraphs I have shown that none of the consonants that have been claimed to be stray in German are represented structurally as in (2) and that there is no derivational stage in which abstract syllable structures like these exist. I conclude that all of the evidence that has been thought to support the structures in (2) can be redone in such a way that reference is only made to the surface syllable structure.

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in (52a) poses a clear problem for the claim put forth in this article that the surface is the only level of representation that counts for phonological generalizations. Consider *Wanderung* and *wandern* as representative examples. The stem in the former word is phonetically [vandəʀ], but in the latter word the orthographic *er* is [ɐ] on the surface, i.e. the entire word is pronounced [vandɐn]. Since [vandəʀ] ≠ [vandɐ] this example suggests that analogy is computed at a level of grammar that is *not* the surface. Thus, what may be going on here is that the (concrete) representation [vandəʀ] in the noun *Wanderung* is analogized with the abstract representation [vandəʀ] in *wandern*.

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