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RESEARCH

Underlying and derived glides in Middle High German

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The present study investigates the phonology of glides in Middle High German. On the basis of surface contrasts between prevocalic nuclear glides in syllable-final position ([VG.V]) and postvocalic glides in onset position ([V.GV]), it is argued that the latter were underlying glides (e.g. the /w/ in [le.wə] 'lion') and that the former were glides derived from vowels (e.g. the offglide [o̯] in the diphthong [uo̯] from /uo/). Underlying glides are argued to be [+consonantal], while nuclear glides – like the vowels from which they derive – are [–consonantal].

The analysis of Middle High German bears on several debates involving glides in the theoretical literature. First, a treatment with an underlying glide in /VGV/ cannot be reanalyzed by treating the vowels as peaks (e.g. Harris & Kaisse 1999 for Argentinian Spanish). Second, the treatment of underlying glides as [+consonantal] is to be preferred over alternatives which analyze those sounds as [–vocalic] (e.g. Nevins & Chitoran 2008 for several languages). Third, an analysis of nuclear structure is adopted (from Harris & Kaisse 1999) which enables one to interpret which element in a complex nucleus is the peak and which is the nonpeak without stipulation. Fourth, the contrastive syllabification of surface glides (i.e. [VG.V] vs. [V.GV]) is shown to be a diagnostic of underlying glide languages that has not been discussed in the literature to date.

Keywords: glide; hiatus; diphthong; syllable structure; syllabification; Middle High German

1 Introduction

The goal of the present article is to examine the phonological patterning of glides in a specific language in order to shed light on some of the debates involving those sounds in the theoretical literature. The language investigated below is Middle High German (MHG), an earlier descendant of New High German (NHG) spoken from 1050–1350; see Paul (2007). In Middle High German there were many words with a glide ([w] or [j]) that can be shown on the basis of phonological patterning to be in onset position, e.g. [wo. xə] 'week', [le.wə] 'lion', as well offglides in six diphthongs, e.g. [o̯] in [buo̯x] 'book'.[1] An important property of Middle High German is that there are contrasts between an onset glide between vowels ([V.GV]) and the offglide in a diphthong before a vowel ([VG.V]), e.g. [le.wə] 'lion' vs. [leį̯.ə] 'layman'. That contrastive parsing is not discussed in the theoretical literature on underlying glides (see below).

I argue that surface diphthongs like [uo̯] consist of a peak (vowel) and a non-peak (glide), which both belong to the same (complex) nucleus. The glide portion of a diphthong is derived because its nonsyllabicity is predictable based on its location as the second member of the nucleus; e.g. [uo̯] is underlyingly /uo/. The assignment of nuclear

[1] In the remainder of this paper I transcribe derived glides with the subscript arch (e.g. [o̯]) and underlying glides with the symbols [w] and [j].

structure creates a representation in which the second part is interpretable as a glide (and not as a vowel) in a way to be made explicit below. By contrast, onset glides like the [w] in [le.wə] are shown to be phonemic (/lewə/); such underlying glides are defined as [+consonantal] sounds otherwise identical featurally with the corresponding vowels (e.g. /u/). Significantly, the onset glide words like [wo.xə] cannot be analyzed as derived (i.e. from /u/) because of the contrast with diphthongs like /uo/, e.g. [uo̯fər] 'bank'.

The analysis of MHG glides described above is important because it sheds light on several theoretical issues discussed in the cross-linguistic literature on glides. First, Middle High German can be added to the growing list of languages which possess phonemic glides (see Levi 2004; Nevins & Chitoran 2008). Second, Middle High German glides (e.g. the /w/ in /lewə/) cannot be alternatively captured by analyzing either one or both of the adjacent vowels as underlyingly nuclear and the surface glide as a segment lacking an underlying nucleus. Linguists who advocate the latter approach for glides with a phonologically deviant behavior in other languages include Levin (1995), Guerssel (1986), and Harris & Kaisse (1999). Third, the proposed analysis of underlying glides as [+consonantal] is more explanatory than the alternative featural approach defended by Nevins & Chitoran (2008) which employs the feature [±vocalic]. Fourth, the treatment of derived glides in diphthongs supports the model of nuclear structure proposed by Harris & Kaisse (1999) on the basis of the patterning of glides in Argentinian Spanish. According to that model, a complex nucleus consists of a second projection of N, which is the locus of glides. The advantage of that framework is that it enables one to unambiguously interpret which vocalic element in a diphthong is the glide (and which is the peak). Finally, the contrastive syllabification referred to above ([VG.V] vs. [V.GV]) is shown to be a structural property defining languages with underlying glides that has not been discussed in the literature cited above.

The remainder of this paper is structured in the following way. I discuss various proposals on how to analyze glides (in Section 2), and then I consider how glides are analyzed in terms of syllable structure (in Section 3). In Section 4 I introduce the data from Middle High German. In that Section I consider diphthongs, the status of hiatus, onset glides and philological evidence for the proposed analysis. My analysis of glides in Middle High German is presented in Section 5. In Section 6 I discuss the theoretical relevance of the present treatment. In particular, I demonstrate that the underlying peak approach fails for data from Middle High German and that glides and vowels should not be analyzed with the feature [±vocalic]. I also show that the model of nuclear structure endorsed below is advantageous over competing models and situate Middle High German in the theoretical discussion concerning underlying glide languages and underlying peak languages. The paper concludes in Section 7.

2 Background

According to one approach, glides can be made distinct from the corresponding vowels with the feature [±syllabic]. That segmental treatment (summarized in (1)) is typical for early generative phonology (e.g. Chomsky & Halle 1968: 354):

(1) Glides: [–consonantal, +sonorant, –syllabic]
Vowels: [–consonantal, +sonorant, +syllabic]

The proposal in (1) has been criticized by a number of linguists on the grounds that syllabicity can and should be captured directly in terms of syllable structure and that the segmental feature [±syllabic] is therefore redundant. In particular, only glides but not vowels are present in the margin (onset or coda).

According to an alternative view, [±syllabic] is dispensed with, in which case glides and the corresponding vowels are identical featurally (i.e. they are both [–consonantal, + sonorant]), and they only differ in terms of position in the syllable. Some of the treatments along those lines include Clements & Keyser (1983), Selkirk (1984), Kaye & Lowenstamm (1984), Levin (1985) and Guerssel (1986). Since only non-syllabic sounds like glides can be in the margin, an underlying [–consonantal, +sonorant] coda or onset segment is interpreted as a glide, but that same feature complex is interpreted as a syllabic sound (a vowel) in the nucleus. Glides like [u̯ i̯] are therefore assumed according to the aforementioned view to be derived from the corresponding high vowels /u i/, as in the hypothetical examples in (2). In (2) and below I adopt the view that syllable structure is not present in underlying representations (although some would disagree, as I point out below). All four of the glides in (2) are examples of DERIVED GLIDES because they are only interpretable as glides after syllable structure is assigned. In (2) and the remainder of this section I adopt a traditional approach to syllable structure with the three constituents onset (O), nucleus (N) and coda (C). In Section 3 I replace that approach with a more enriched syllable structure.

(2) a. /u ɑ/ → u̯ ɑ (O, N)

b. /i ɑ/ → i̯ ɑ (O, N)

c. /ɑ u/ → ɑ u̯ (N, C)

d. /ɑ i/ → ɑ i̯ (N, C)

The surface glides in (2a, b) are referred to below as ONSET GLIDES and the ones in (2c, d) as CODA GLIDES. Hypothetically, a vowel plus glide sequence (or the reverse) could be parsed in the same nucleus (NUCLEAR GLIDES). That is the type of representation usually assumed for diphthongs (see below for discussion).

An example illustrating the approach depicted in (2) can be observed in Blevin's (1995: 222–223) treatment of glides in the the Austronesian language Lenakel, spoken on Vanuatu. Blevins notes that high vowels and the corresponding glides in that language are in complementary distribution: high vowels are found in the contexts C _ C, C _ # and # _ C, while glides occur elsewhere, i.e. _ V and V _. She subsequently argues that surface glides are derived from the corresponding high vowels, as in (2a, b). That type of approach captures syllabicity alternations in Lenakel, as in the first person morpheme /-i-/, e.g. /i-ak-ol/ → [i̯a.gɔl] 'I do it', /t-i-ak-ol/ → [ti̯a.gɔl] 'I will do it', /i-n-ol/ → [i.nɔl] 'I have done it'.

Although glides and vowels are clearly positional variants in Lenakel and many other languages, other languages have been shown to have contrasts between glides and the corresponding vowels. For example, the Argentinian Spanish data in (3) from Harris & Kaisse (1999: 123) illustrate a surface contrast between a glide plus vowel sequence and a hiatus sequence consisitting of the corresponding high vowel plus glide. In the following I abbreviate that contrast as [G_αV] vs. [V_α.V], where 'G_α' represents the glide corresponding to 'V_α'.

(3) vic[já]ba 's/he vitiated'
vac[i.á]ba 's/he emptied'

Examples like the ones in (3) have been analyzed in the literature in two ways. According to the first approach, the hiatus sequence [V_α.V] is interpreted as the anomalous one; hence, the first vowel in that string (e.g. the high vowel [i]) is marked in the underlying

representation as a PEAK (nucleus), but the surface glide in a [$G_{\alpha}V$] sequence (e.g. the glide [i̯]) is an underlying high vowel that lacks a nucleus in the underlying representation. The term 'peak' is defined as the element that is syllabic. The approach characterized by UNDERLYING PEAKS – indicated with the curly brackets ({}) – is illustrated in (4a). Featurally, the surface glide in [$G_{\alpha}V$] and the high vowel in [V_{α}.V] are identical in that treatment because they are both the same vowel in the underlying representation; the only difference between the glide and high vowel is the presence of a nucleus on one and its absence on the other. The second treatment takes the [$G_{\alpha}V$] sequence to be anomalous, in which case the glide is analyzed as an underlying (phonemic) segment distinct from the underlying high vowel in [V_{α}.V]. The UNDERLYING GLIDE approach is depicted in (4b). In contrast to the underlying peak treatment in (4a), the surface glide in [$G_{\alpha}V$] and the surface high vowel in the hiatus sequence [V_{α}.V] differ in terms of a segmental feature (the nature of which is to be discussed below).

(4) a. Underlying peaks

/$V_{\alpha}V$/	→	[$G_{\alpha}V$]
/{V_{α}}V/	→	[V_{α}.V]

b. Underlying glides

/$G_{\alpha}V$/	→	[$G_{\alpha}V$]
/$V_{\alpha}V$/	→	[V_{α}.V]

In the remainder of this section I concentrate on the approach in (4b) because that is the one I adopt in my analysis of Middle High German. I discuss and reject (4a) for Middle High German in Section 6.2.

Both treatments in (4) have a number of adherents. Advocates of the underlying peak analysis include Levin (1985), Guerssel (1986) and Harris & Kaisse (1999). Some of the linguists who adopt some variant of the underlying glide approach are Hume (1994), Hyman (2003), Levi (2004), Hall (2006), Nevins & Chitoran (2008) and Levi (2011). Levi (2004) lists the following languages with underlying glides: Imdlawn Tashlhiyt Berber (Afro-Asiatic), Cree (Algonquian), Karuk (Hokan), Sundanese (Austronesian), Yawelmani (Yokuts), Tahltan (Athabaskan), Pulaar (Niger-Congo), Turkish (Altaic), and Pashto (Indo-Iranian).

Underlying glides (as in 4b) and derived glides (as in Lenakel) have been shown in some of the studies cited above to exhibit contrastive phonological behavior. The generalization is that glides derived from vowels (e.g. [i̯ɑ] from /iɑ/ in 2) behave phonologically like vowels, while underlying glides (e.g. [jɑ] from /jɑ/ in a hypothetical example) pattern with consonants to the exclusion of the vowels (and derived glides). For example, an underlying glide – like a consonant – could be transparent to rules affecting vowel features (e.g. vowel harmony), but a derived glide – like a vowel – should not be. By contrast, an underlying glide should not be transparent to rules affecting consonant features (e.g. consonant harmony), but an underlying glide could be.

The generalizations described in the preceding paragraph have been captured in some of the theoretical literature cited above by adopting the following two claims: (A) glides derived from high vowels are identical featurally with those high vowels; and (B) underlying glides are featurally distinct from the corresponding phonemic high vowels. The predictions are two-fold: first, if vowels and the corresponding derived glides are identical featurally, then the derived glides will behave phonologically like vowels. Second, if underlying glides are featurally distinct from the corresponding high vowels (and derived glides), that they will not pattern together with those segments.

While there appears to be some agreement in the literature for (A) as well as (B), the nature of the features involved differs from author to author. For example, several linguists have argued that the two types of glides can be captured with the binary feature [±consonantal]: on this view, phonemic glides are [+consonantal], while vowels and derived glides are [–consonantal]. In Section 5 below I defend the featural treatment in (5) for Middle High German.

(5) Underlying glides as [+consonantal]

	Vowels	Glides derived from vowels	Underlying glides
	/i u/	[i̯ u̯]	/j w/
[sonorant]	+	+	+
[consonantal]	–	–	+

The derived glides discussed in the present analysis are underlying vowels that surface as nuclear glides in diphthongs, but none of the data I consider involve glides derived from vowels that surface in the onset or in the coda (see 2). Because that type of example does not exit in the material I discuss below, I do not conside whether or not the features in the penultimate column in (5) also hold for those other types of derived glides.

There is precedent in the cross-linguistic literature for analyzing certain glides as [+consonantal], as in (5). See in particular the discussion in Levi (2004: 21ff), who summarizes some of the proposals in the unpublished literature not available to me. Hayes (1989) suggests that English onset glides are [+consonantal]. According to Hyman (2003), glides are underlyingly either [–consonantal] or [+consonantal] depending on the language, but all glides are [+consonantal] on the surface.[2]

Nevins & Chitoran (2008) take a different approach to underlying glides. According to those authors, all three categories in (5) are [–consonantal], and the contrast between vowels and the corresponding phonemic glides is captured with the binary feature [±vocalic]: vowels are [+vocalic] and phonemic glides are [–vocalic]. Note that the featural approach in (6) rejects claim A above (that glides derived from high vowels are featurally identical with those high vowels). The model in (6) is also endorsed by Padgett (2008) and Huang (2014).

(6) Underlying glides as [–vocalic]

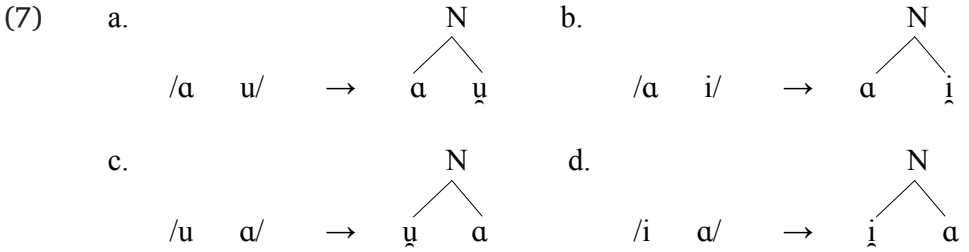
	Vowels	Glides derived from vowels	Underlying glides
	/i u/	[i̯ u̯]	/j w/
[sonorant]	+	+	+
[consonantal]	–	–	–
[vocalic]	+	–	–

If a surface glide in a syllable margin is derived from a vowel, then the underlying [+vocalic] specification changes into [–vocalic] by rule. An important component of the framework proposed by Nevins & Chitoran (2008) is that the change just described is a consequence of the fact that the derived glide is a margin segment (as in 2). In their own words (Nevins & Chitoran 2008: 4): … "derived glides become [–vocalic] automatically by virtue of placement outside a nucleus". This automatic change from [+vocalic] to [–vocalic] is triggered as the repair to an "inviolable constraint against [+vocalic] in a Syllable Margin" (Nevins & Chitoran 2008: 10).

[2] Some authors argue that vowels and glides derived from vowels differ from underlying glides in terms of place features (e.g. Halle 1995; Halle, Vaux & Wolfe 2000; see also Levi 2004 for extensive discussion). To simplify, this approach sees a vowel like /i/ and the corresponding derived glide ([i̯]) as [dorsal], while the underlying glide (/j/) is [coronal]. Other analysts argue that vowels and derived glides have vocalic features and phonemic glides have consonantal features. For example, given the model of feature geometry proposed in Clements & Hume (1995) in which features for vowels and features for consonants are segregated onto different tiers, derived glides and vowels both have features under the V-Place node, while underlying glides have features under the C-Place node.

A complete treatment of glides in Middle High German requires that I address the nature of glides in diphthongs. Much of the literature cited above is silent on how to analyze such nuclear glides. For example, it was noted above that the derived glides discussed by Nevins & Chitoran (2008) are in the onset (as in (2a, b)) or in the coda (as in (2c, d)), but not in the nucleus. However, in the case of diphthongs, both components belong to the same nucleus. If syllabification parses both segments into the that constituent (as in 7), then it needs to be determined if it is possible to predict which of the two nuclear elements is syllabic (the peak) and which is nonsyllabic (the glide). Note that the glide can be either the second element in a diphthong (OFFGLIDE), in which case the vowel plus glide sequence is a FALLING DIPHTHONG, e.g. [ɑu̯] and [ɑi̯] in (7a, b). By contrast, some languages have diphthongs whose first component is a glide (ONGLIDE), in which case the glide plus vowel sequence is a RISING DIPHTHONG, as in (7c, d). See Hall (2014a) for a recent treatment of onglides in Westphalian German. The glides in (7) can be referred to as DERIVED NUCLEAR GLIDES, in contrast to the DERIVED ONSET GLIDES and DERIVED CODA GLIDES depicted in (2).

(7)



It is assumed in (7) that both parts of diphthongs are parsed under the same nucleus, but this treatment is not without controversy. For example, several authors have argued that there are languages in which the glide in falling diphthongs is in the coda, as in (2c, d), e.g. Kaye & Lowenstamm (1984: 144f.) for French, Cser (1999) for Latin and Soultatis (2013) for Greek. That approach might be correct for the aformentioned languages, but the glides in falling diphthongs must be parsed into the nucleus in Middle High German for reasons discussed in Section 4.

An unanswered question concerning (7) is how it is possible to express in terms of phonological units the fact that one of the members of the diphthong is syllabic (the peak) and the other is not (the glide). This is possible with the feature [±syllabic] in the SPE system in (1), but if that feature is eliminated from phonological theory, then it remains to be seen how nonsyllabicity can be expressed formally.

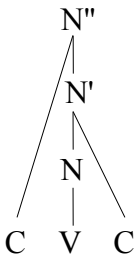
3 Glides and syllable constituency

In Section 3.1 I describe the model of the syllable I adopt in the present analysis. In Section 3.2 I consider the kind of arguments posited in the literature on phonology for determining whether or not a prevocalic glide (e.g. GV) is in the onset or in the nucleus and whether or not a postvocalic glide (e.g. VG) is in the nucleus or coda.

3.1 Syllable structure

Following Levin (1985), Kenstowicz & Rubach (1987) and Harris & Kaisse (1999), I posit that the syllable is characterized as projections of the primitive category N (=nucleus). In that model the terms “coda” and “onset” are mere names for the complement of the first (N’) and second (N’’) projections of N. A word consisting of consonant plus vowel plus consonant (CVC) therefore has the representation in (8).

(8)

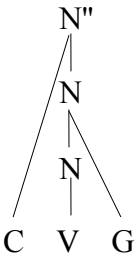


An onset glide is represented in the model in (8) as in (9a) and a coda glide as in (9d). I follow Harris & Kaisse (1999) in postulating an additional projection of N for the glide portion of diphthongs (i.e. nuclear glides). Offglides and onglides are represented as in (9c) and (9b) respectively.

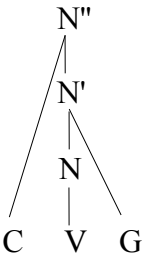
(9) a.

b.

c.



d.



In Section 4 I argue that the prevocalic glide in MHG words with the parsing [V.GV] are in the onset (as in (9a)), while glides parsed [VG.V] are in the nucleus (as in (9c)). No MHG glides occur in (9b) or (9d).

3.2 Arguments for constituency

A number of proposals have been made in the cross-linguistic literature concerning the way in which prevocalic glides (i.e. GV) and postvocalic glides (i.e. VG) should be parsed in terms of syllable-internal constituents; see Yip (2003) for an overview. For example, a word-initial glide could be parsed into the onset (as in (9a)) or into the nucleus (as in (9b)). The mirror-image question can be posed with respect to a word-final glide (i.e. (9c) vs. (9d)).

Several arguments for constituency have been discussed in the literature which bear on the question of how to determine which of the structures in (9) is correct (e.g. Booij 1989; Davis & Hammond 1995; Cser 1999; Yip 2003; Hall 2014a). The argument I discuss below is based on phonotactics. In general, if there are few or no restrictions governing the type of consonant that can occur before a prevocalic glide (i.e. the C in CGV), then the nuclear glide representation in (9b) is correct. By contrast, the onset glide analysis in (9a) is appropriate if there are restrictions on the preceding consonant(s). Thus, if there is a common domain (e.g. the nucleus), then restrictions can apply to the segments within that domain, particularly if the features are identical/similar. The nuclear glide representation therefore implies that there is a tighter bond between the glide and the following vowel: if a glide can only precede a restricted set of vowels, then structure in (9b) is correct, but if there are few or no restrictions concerning the types of vowels that can follow a glide, then we would be dealing with (9a). Mirror-image arguments hold for the distinction between (9c) and (9d). For the former, there are expected to be restrictions on the preceding vowels, but restrictions on the vowel and the glide in (9d) are not expected to be observable.

A number of authors have examined the behavior of prevocalic (and postvocalic) glides in various languages and have argued in favor of either (9a) vs. (9b) or (9c) vs. (9d). For

example, Davis & Hammond (1995) argue that the post-consonantal prevocalic glide [i̯] in English words like *cute* in (10a) is a nuclear glide, while the post-consonantal prevocalic glide [u̯] in words like *twin* in (10b) is as onset glide. ('[i̯]' and '[u̯]' are transcribed '[y]' and '[w]' in the original source).

(10) a. cute [ki̯ut]
puny [pi̯uni]
music [mi̯uzɪk]

b. twin [tu̯ɪn]
sway [su̯e]
quack [ku̯æk]

The reason (9b) is correct for the [i̯] in (10a) is that [i̯] can only be followed by the vowel [u] and that there are few restrictions concerning the consonants that can precede it. However, for many speakers of American English, [i̯u] cannot be preceded by a coronal consonant; cf. words like <tune> [tu:n] (*[ti̯un]). This constraint is commented on below. By contrast, [u̯] in (10b) can be followed by all sorts of vowels, but there are tighter restrictions concerning the type of consonant which can precede it. In particular, [u̯] cannot be preceded by a sonorant. Note that English has a strict ban on onset clusters consisting of two sonorants (see (11)). Treating [u̯] in (10b) as an onset glide (while treating [i̯] in (10a) as a nuclear glide) means that the otherwise needed ban on two-sonorant onset clusters in (11) correctly rules out sonorants before [u̯] and correctly allows sonorants before [i̯] (e.g. [mu̯] in *music* from (10a)).

(11) Constraint on two sonorant onsets
*$_{\sigma}$[ml, *$_{\sigma}$[mr, *$_{\sigma}$[nl, *$_{\sigma}$[nr, *$_{\sigma}$[mn, *$_{\sigma}$[nm
*$_{\sigma}$[rl, *$_{\sigma}$[lr, *$_{\sigma}$[rn, *$_{\sigma}$[rm, *$_{\sigma}$[ln, *$_{\sigma}$[lm,

Davis & Hammond (1995) adopt the view endorsed by Steriade (1988) that a sonority-based constraint between two adjacent sounds (like the one in (11)) counts as an argument in favor of treating those sounds as belonging to the same constituent (e.g. onset). By contrast, a (non-sonority-based) constraint against homorganic tautosyllabic sequences can hold between subsyllabic constituents and therefore does not provide an argument for constituency. One example of a homorganicity constraint is the avoidance of a coronal consonant plus [i̯u] referred to above. This can be interpreted as an avoidance of two adjacent [coronal] sounds if the palatal glide [i̯] – like all palatals – is analyzed as [coronal]; see Hall (1997) and literature cited therein. A second example involves languages that disallow sequences like [mu] and [u̯u]. This is the avoidance of adjacent labial sounds (*[labial][labial]), but the constraint refers to homorganicity and therefore it does not imply that [m] and [u] or [u̯] and [u] are both nuclear. Note that the co-occurrence restrictions between a glide and the following vowel referred to above are not attributable to a constraint against sonority. (These co-occurrence restrictions are not discussed by Steriade 1988.) I therefore follow Davis & Hammond (1995), who see them as an argument for analyzing the onglide plus vowel sequence together under the nucleus.[3]

[3] An anonymous referee points out that sonority restrictions that apply across syllable domains are attested. For instance, there are cases of restrictions on nucleus plus coda combinations, e.g. low sonority nuclei like schwa cannot co-occur with high sonority codas like [r]. Another sonority restriction which applies across syllable boundaries is the Syllable Contact Law. It is not possible to comment on these observations without deviating from the present topic. Significantly, the type of example referred to above (e.g. the Syllable Contact Law) simply does not arise in the material from Middle High German presented below.

4 Middle High German glides

I discuss below offglides in diphthongs (Section 4.1), the status of hiatus (Section 4.2), glides surfacing only in syllable-initial position (Section 4.3) and textual evidence for the analysis of glides (Section 4.4). The glides in diphthongs are shown to be nuclear, while syllable-initial glides are in the onset. In section 5 I argue that the nuclear glides are derived from the corresponding high vowels and that the onset glides are phonemic.

4.1 Nuclear glides (diphthongs)

The six diphthongs of Middle High German are presented in (12) and (13). The former consist of a mid vowel plus high offglide ("mid-high diphthongs") and the latter of the mirror image, i.e. high vowel plus mid vowel offglide ("high-mid diphthongs"). In the first three columns in both data sets I give the MHG orthography, my interpretation of the phonetic representation (following Paul 2007: 103–108), and a representative example.[4]

(12) MHG mid-high diphthongs

			MHG	Gloss
a.	<ei>	[eɪ̯]	seite	'page'
b.	<ou>	[oʊ̯]	loufen	'run'
c.	<öu>	[øʏ̯]	vröude	'joy'

(13) MHG high-mid diphthongs

			MHG	Gloss
a.	<ie>	[iɐ̯]	bieten	'offer'
b.	<uo>	[uɔ̯]	uofer	'bank'
c.	<üe>	[yɐ̯]	müede	'tired'

All six MHG diphthongs are falling in the sense that the first component is the peak (the syllabic sound) and the second component the non-peak (the offglide). Evidence for that interpretation comes from the way in which those diphthongs are realized in modern German. This is clearly the case for the three mid-high diphthongs in (12), which are now realized as [ɑɪ̯ ɑʊ̯ ɔʏ̯] in New High German; see (14). The change from mid-high diphthongs of Middle High German to their reflexes in New High German therefore only involved a change in quality of the first component, but the non-syllabicity (and also the quality) of the second component of those diphthongs remained the same.

(14)

		MHG		NHG
a.	<ei>	[eɪ̯]	>	[ɑɪ̯]
b.	<ou>	[oʊ̯]	>	[ɑʊ̯]
c.	<öu>	[øʏ̯]	>	[ɔʏ̯]

The same reasoning can be applied to the high-mid diphthongs. Although they shifted to the long monophthongs [iː uː yː] in New High German, a diphthong realization of (13) is attested in many Upper German varieties (Bavarian, Alemannic; see Schirmunski 1962: 229; Wiesinger 1970). For example, the realization with a nonsyllabic vowel ([ə̯]) as the second component in the final column of (15) is common for many varieties of Swiss German. The examples here are drawn from Standard Swiss German (SSG; Hove & Haas 2009). In that source the authors indicate with a diacritic that the second component of the diphthong is the offglide.

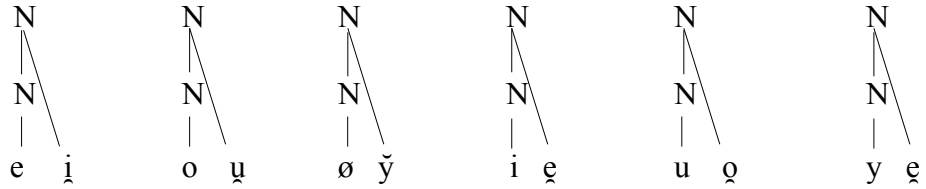
[4] The phonemic monophthongs of MHG are /i iː y yː u uː e eː ø øː o oː æ æː a aː ə/.

(15)

		MHG		SSG
a.	<ie>	[iẹ̯]	>	[iə̯]
b.	<uo>	[uọ̯]	>	[uə̯]
c.	<üe>	[yẹ̯]	>	[yə̯]

I adopt an analysis of MHG diphthongs in which both components belong to the same nucleus. Phonological arguments to that effect (based on the arguments from Section 3.2) are discussed below. The model of nuclear structure introduced in Section 3.1 is applied to the diphthongs of Middle High German in (16).

(16)



It is not possible to predict which of the two components in the diphthongs in (16) is syllabic (peak) and which is nonsyllabic (offglide) on the basis of vowel sonority (e.g. De Lacy 2006; Parker 2011) because there are mirror-image sequences, e.g. mid-high [ei̯] vs. high-mid [iẹ̯]. Instead, the generalization is that the second member of the diphthongs is the glide.[5]

The arguments for constituency from Section 3.2 point to the conclusion that the offglide in the diphthongs is nuclear, as in (16). There are no significant sonority-based cooccurrence restrictions involving the offglide in the diphthongs and the following segments. The examples in (12) and (13) illustrate that all six diphthongs can surface in an open syllable followed by a consonant, e.g. [sei̯.tə] for (12a). The additional items in (17) and (18) show that both mid-high diphthongs and high-mid diphthongs also occur in a closed syllable, but there do not appear to be significant sonority-based restrictions concerning the type of consonant that can or cannot follow the offglide. In terms of manner of articulation, that consonant can be an obstruent, nasal or liquid.[6]

(17) MHG mid-high diphthongs

			MHG	Gloss
a.	<ei>	[ei̯]	teil	'part'
			bein	'leg'
			greiff	'grasped'
b.	<ou>	[ou̯]	schour	'shower'
			troum	'dream'
			bouc	'bent'

(18) MHG high-mid diphthongs

			MHG	Gloss
a.	<ie>	[iẹ̯]	bier	'beer'
			hielt	'held'
			brief	'letter'

[5] Middle High German had no triphthongs, i.e. a sequence of glide-vowel-glide (e.g. [i̯ei̯]) under the same nucleus. The absence of triphthongs is a consequence of the fact that a glide cannot occupy the first part of a complex nucleus.

[6] [yẹ̯] and [øy̆] are restricted in their occurrence to open syllables. Whether or not this is systematic or accidental is a question I leave open.

b.	<uo>	[uo̯]	fuor	‘went’
			tuon	‘do’
			buoch	‘book’

In sum, the offglide in the six MHG diphthongs occupies the second-level N slot in the model of the syllable described in Section 3.1.

All six of the diphthongs have in common that they consist of two short vowels. By contrast, there are no diphthongs in which one component is long. There are different ways of capturing this generalizations formally, although the details exceed the scope of the present paper. I adopt the constraint in (19):

(19) NUCLEUS CONDITION: both parts of a diphthong are short.

Given the Nucleus Condition, there are diphthongs like [ou̯] and [ie̯] but none like [o:u̯] or [i:e̯].

4.2 The status of hiatus in Middle High German

Since the six diphthongs of Middle High German consist of a sequence of two short vowels, a contrast between one of those diphthongs and a corresponding hiatus sequence would involve a sequence of two short vowels, each of which are syllable peaks:

(20) Potential diphthong vs. hiatus contrasts
a. [ei̯] vs. [e.i]
b. [ie̯] vs. [i.e]

There is no evidence at all that Middle High German possessed hiatus sequences like the ones in (20), a generalization captured with (21):

(21) NO HIATUS: there is no hiatus sequence consisting of two short vowels (*V̆.V̆)

Hiatus sequences like the ones listed in (20) could potentially occur if words ending in a short vowel combined with a suffix beginning with a short vowel. I demonstrate below that that type of example is nonattested. One reason for the absence of hiatus with short vowels is that etymological short vowels – as well as their long counterparts – were neutralized to schwa ([ə]) in unstressed syllables by Vowel Reduction. That development is illustrated by examples from Old High German ending in [i], e.g. *hirti* [hirti] ‘shepherd’, which were realized in Middle High German with [ə], i.e. *hirte* [hirtə]. (Words like that one follow the Germanic pattern of initial stress.) Given Vowel Reduction and the initial stress pattern, Middle High German words ending in a short vowel were essentially restricted to those ending in [ə].

In the reverse dictionary of Middle High German (Bachofer et al. 1984) a small number of words is listed ending in short full vowels (i.e. short vowels other than schwa) that could potentially combine with suffixes beginning with a short vowel to form hiatus sequences like the ones in (20). However, there are several reasons why adjacent peaks in words like these are not possible. For example, some of the words in question belong to lexical categories that do not combine with suffixes (in 22a) or consist of contracted forms whose second part cannot combine with a suffix (in 22b). Other examples involve Latinate loanwords whose second syllable resisted the change to schwa by Vowel Reduction (in 22c). Since the latter type of word is a noun, it can potentially co-occur with a short vowel-initial inflectional suffix (e.g. the suffix [-ə] indicating plurality for many nouns), but [fusti] is very rare item and is apparently not attested in the MHG corpus as an inflected form. As noted above, MHG words ending in the short full vowels as in (22a–c) are exceedingly

rare due to the regularity of Vowel Reduction. By contrast, hundreds of words are attested which end in the short vowel schwa, one of which is listed in (22d). However, inflectional endings for nouns ending in schwa are not vowel-initial, but instead consist of a single consonant (e.g. /netsə-s/ 'net, GEN.SG.', /netsə-n/ 'nets'. The same generalization holds for other lexical categories, i.e. verbs and adjectives.

(22) a. di [di] 'def. article'
raco [rako] 'interjection'
ietzo [iệtso] 'adverb'
b. andi [andi] 'an + di'
c. fusti [fusti] 'knob' (< Latin fustis)
d. netze [netsə] 'net'

There is no evidence that Middle High German possessed short tautumorphemic vowels in hiatus. That generalization derives support from the fact that all of the words beginning with a sequence of two vowel graphemes in the dictionary of Middle High German (Lexer 1983) represented the six diphthongs, but none represented any other sequence. For example, the <ie> in <ieder> 'every' represented the diphthong [iệ], but there are no entries for sequences such as <ia>, <io>.[7]

Middle High German possessed several derivational suffixes beginning with a short full vowel which could potentially co-occur with stems ending in a short vowel like the one in (22d), e.g. <-ic> (-[ik]) and <-unge> ([-uŋ.gə]). However, it is clear from Bachofer et al. (1984) that the schwa in such words is consistently elided before the suffix, as in (23a, b).

(23) a. reise [reɪ̯̂.sə] 'trip'
reisic [reɪ̯̂.sik] 'on a trip'
b. liebe [liə̯̂.bə] 'love'
liebunge [liə̯̂.buŋ.gə] 'love'

Bachofer et al. (1984) list hundreds of MHG words containing the suffixes in (23), but none of them involves a stem ending in a short vowel.

Although hiatus with two short vowels was not occurring in Middle High German, that language did allow for hiatus involving a combination of at least one long vowel. Representative examples with [iː] as the long vowel are presented in (24).

(24) Hiatus sequences involving long vowels
a. vrîât [vriː.ɑːt] 'freedom' (cf. vrī 'free')
vrīunge [vriː.uŋ.gə] 'freedom'
b. vīant [viː.ɑnt] 'enemy'

The sources cited earlier for Middle High German also include examples of words in which a diphthong stands before a vowel. Five representative examples for [eɪ̯̂] are presented in (25). No examples for the other five diphthongs were found in the sources listed above. The data in (25) illustrate that [eɪ̯̂] can stand before a vowel-initial suffix, although the word [leɪ̯̂.ə] shows that [eɪ̯̂] can be tautomorphemic with the following vowel.

[7] I have not actively searched for sequences of short tautomorphemic vowels in hiatus that are not in word-initial position. Such a search is possible given the online dictionary of Middle High German (see online references below). I contend that the burden of proof lies on the shoulders who believe that such sequences were actually attested.

(25) Hiatus sequences involving diphthongs

eier	[eɪ̯.ər]	‘eggs’	(cf. ei ‘egg’)
leie	[leɪ̯.ə]	‘layman’	
leiisch	[leɪ̯.iʃ]	‘laic’	
oleiunge	[o.leɪ̯.uŋ.gə]	‘anointing’	(cf. olei-en ‘annoint’)
zweiunge	[tsveɪ̯.uŋ.gə]	‘diremption’	(cf. zwei ‘two’)

There were two suffixes beginning with a diphthong ([-uo̯t]: [arm] ‘poor’ vs. [ar.muo̯t] ‘poverty’, [-eɪ̯]: [apt] ‘abbot’, [ap.teɪ̯] ‘abbey’), but neither one occurs after a stem ending in either a monophthong or diphthong (Bachofer et al. 1984).

In sum, Middle High German did allow for hiatus, but none of those examples involve two short syllable peaks. The conclusion is that the language had no contrasts between diphthongs and the corresponding hiatus sequences, as in (20).

4.3 Onset glides

4.3.1 Phonetics of MHG <w> and <j>

Middle High German had two sounds transcribed by modern linguists as <w> and <j>, which were the reflexes of the corresponding West Germanic glides. There is agreement in the scholarly literature that those two West Germanic sounds were glides and not fricatives, although the term “semi-vowel” (or German *Halbvokal*) is more commonly employed than “glide”. See, for example, Wright (1907: 119, 122), Prokosch (1939: 46), Schirmunski (1962: 366–367), and Paul (2007: 142).[8]

The most authoritative scholarly work on Middle High German (Paul 2007: 28) considers [w] in that language to be a bilabial glide (i.e. ‘semi-vowel’ = [‘Halbvokal’]), which only shifted to [v] at a later stage. (“Das Zeichen <w> steht mhd. noch für den bilabialen Halbvokal [w] (wie engl. *w*), der erst später zum labiodentalen Laut [v] wird”).[9] At a later point in his grammar, Paul (2007: 142) writes that MHG [w] might have been the bilabial fricative (i.e. [β]), which began the shift to [v] in Late Middle High German. Paul (2007: 28) classifies the MHG reflex of WGmc *[j] as a glide (i.e. ‘semi-vowel’ = *Halbvokal*) without comment, although it is clear from the discussion on the post-Middle High German reflexes of that sound (Paul 2007: 144–145) that he believes it may have been a fricative.

I argue that the two MHG sounds in question were glides (defined featurally in Section 5) and not fricatives. The most compelling evidence for the glide interpretation is that the sounds representing <w> and <j> are retained as glides in many modern German dialects. Two representative examples from a variety of Southern Bavarian (Schatz 1897) are provided in (26):

(26) a. [wint] ‘wind’
b. [jɔxt] ‘hunt’

Schatz (1897: 6) describes [j] as a semi-vowel pronounced without any noticeable friction. He also notes that the tongue body for [j] is essentially the same as it is for the corresponding vowel [i]. (“Der Halbvokal j ist ohne wahrnehmbares Reibegeräusch; der Zungenrücken artikuliert sich in derselben Höhe und an der gleichen Stelle wie für ein

[8] The MHG spellings have been regularized as <w> and <j>. In fact, the orthography provided more than one way to render those two sounds. For example, up to the end of the 12th century, <w> was written <uu>, <uv> or <vv>. It was not until the 13th century that the letter <w> came to be used. The way in which [j] was depicted orthographically was similarly quite diverse, the most common being <j>, <i>, <y>, <g> or <gi>; see Paul (2007: 142, 144).

[9] ‘The sign <w> in Middle High German still stood for the bilabial semivowel [w] (like English w), which did not become the labiodental sound [v] until later’.

weites i".)[10] That author provides a similar characterization of [w], which he describes as bilabial and not labiodental (Schatz 1897: 7–8) and is articulated without friction ("Das Reibegeräusch fehlt immer").

Since the two MHG sounds in question are analyzed as glides, the modern realization of those sounds in New High German as [v] (for MHG [w]) and [j̰] (for MHG [j]) implies that the sound change converting glides to fricatives occurred only in certain dialects but not in others.[11]

4.3.2 Middle High German data

The following examples (Seebold 2011) show that MHG [w] occurs in word-initial position before a monophthong (in (27a)) or a diphthong (in (27b)). The items in (27c) indicate that [w] can be preceded by a word-initial obstruent. There are no significant restrictions concerning the type of vowel that can occur after [w] in examples like these; hence, that vowel can be front, back, high, mid, low, rounded or unrounded. The words containing glides discussed below all follow the Germanic pattern noted earlier of initial stress; hence, the vowel following [w] in (27) is stressed. I discuss examples in which [w] is followed by an unstressed vowel below.

(27) MHG [w] in word-initial onset position

a.	wīn	[wiːn]	'wine'
	welt	[welt]	'world'
	wurzel	[wurtsəl]	'root'
	woche	[woxə]	'week'
	wâge	[waːgə]	'scales'
b.	weich	[weɪ̯x]	'soft'
	wuot	[wuo̯t]	'rage
c.	zwec	[tswek]	'purpose'
	quâle	[kwaːlə]	'agony'
	swarz	[swarts]	'black'
	twerc	[twerk]	'dwarf'

The list of onset clusters with [w] as the second member ([tsw kw sw tw]) in (27c) is exhaustive, although [tw] is alternatively realized as [dw] in many words, e.g. [twahən] ~ [dwahən] 'wash'.

In (28) I illustrate the occurrence of [j] in word initial position before a vowel. Again, no significant restrictions hold on the type of (stressed) vowel that can follow [j].

(28) MHG [j] in word-initial position

jeze	[jetsə]	'now'
jugent	[jugənt]	'youth'
jôlen	[joːlə]	'hoot'
joch	[jox]	'yoke'
jagen	[jagən]	'hunt'

[10] 'The semivowel j is without perceptible frication; the tongue body is articulated at the same height as for a broad i'.

[11] Some scholars assume that the sounds represented by <w> and <j> were fricatives in Middle High German because the reflexes of those sounds in New High German are fricatives (e.g. De Boor & Wisniewski 1984: 26–27). Those linguists are apparently unaware of dialects like the one in (26).

An anonymous reviewer points out that it would be possible to assume that original <j> and <w> were fricatives and that the glide pronunciation in (26) reflects a change from those fricatives to glides in onset position. The disadvantage with that approach is that it requires a sound change involving a weakening (fricative > glide) in a context (onset position) that favors strengthening (glide > fricative). The reader is referred to Hall (2014b) for a treatment of glides in Low German (Westphalian) that crucially requires the original sounds to have been glides which then hardened to fricatives.

[j] cannot be preceded by a word-initial obstruent (as in (27c) for [w]) because there were no OHG words of that structure that might have been inherited without change into Middle High German, nor were there any sound changes that produced new instances of consonant plus [j] in word-initial position.

In word-internal position, [w] and [j] occurred in the context after a consonant (liquid) and before a vowel, as in (29). The (unstressed) vowel following the glides in examples like these is restricted to schwa ([ə]) as a consequence of Vowel Reduction.

(29) MHG [w] and [j] in an unstressed syllable

a.	milwe	[mil.wə]	‘mite’
	varwe	[var.wə]	‘color’
b.	verje	[fer.jə]	‘ferryman’
	scherje	[ʃer.jə]	‘myrmidon’

Both [w] and [j] surface intervocalically, as in the following examples.

(30) MHG [w] and [j] in an unstressed syllable

a.	klāwe	[kla:.wə]	‘claw’
	êwic	[e:.wik]	‘eternally’
	lewe	[le.wə]	‘lion’
	riwe	[ri.wə]	‘remorse’
	ieweder	[iə̯.we.dər]	‘every’
b.	kræjen	[kræ:.jən]	‘crow’
	blüejen	[blyə̯.jən]	‘bloom’

The words in (30) are parsed with [w] and [j] in syllable-initial position, as indicated above. This is clearly the case for examples like êwic and *lewe*, in which the [w] surfaces in New High German as [v] in the onset (i.e. [e:.vɪç] and [lø:.və] respectively). The [w] and [j] in the other examples in (30) similarly surfaces as a syllable-initial voiced fricative in modern German dialects like the Southern Bavarian one cited in (26); see also Schirmunski (1962).

The patterning of [w] and [j] in the examples in (27)–(30) is indicative of onset glides (as in (9a)) and not nuclear glides (as in (9b)). First, there are no significant cooccurrence restrictions involving [w] or [j] and the following stressed vowel. Second, [w] can only be preceded by an obstruent but not by a sonorant (recall (27c)). This is an example of a sonority-based constraint, which is taken as evidence that the two sounds in question belong to the same constituent.

The data presented in this section illustrate that MHG [w] and [j] occur in onset position, but not in the coda. The following LICENSING CONDITION accounts for the distribution of those sounds:

(31) LICENSING CONDITION (to be revised): [w] and [j] are only licenced in the onset.

Evidence that the LICENSING CONDITION was not simply a static constraint capturing the occurrence of [w] and [j] in (27)–(30), but that it was active in the phonology of Middle High German can be deduced from examples like the ones in (32) from de Boor & Wisniewski (1984: 70). Note that all four nouns illustrate alternations between [w] and zero. There are no parallel examples involving [j]. Similar data involving glide-zero alternations in Moose Cree (Algonquian, Canada) and their relevance for underlying glides are discussed in Levi (2004).

(32) MHG w ~ Ø alternations

	‘lake’	‘knee’	‘dirt’	‘shadow’
NOM. SG	sê	knie	hor	schate
GEN. SG	sêwes	kniewes	horwes	schatewes
DAT. SG	sêwe	kniewe	horwe	schatewe
ACC. SG	sê	knie	hor	schate
NOM. PL	sêwe	kniewe		schatewe
GEN. PL	sêwe	kniewe		schatewe
DAT. PL	sêwen	kniewen		schatewen
ACC. PL	sêwe	kniewe		schatewe

The generalization in (32) is that [w] is realized if it is followed by a vowel-initial suffix, otherwise it does not surface. The reason [w] surfaces in that particular context is that it can be parsed into the onset of the vowel-initial suffix syllable. By contrast, if a suffix is absent, then [w] cannot surface because it does not satisfy the LICENSING CONDITION.

Additional examples of alternations between [w] and zero are provided in (33). The [w] in examples like these can be preceded by either a vowel (in 33a) or a consonant (in (33b)).[12] The items presented here include not only nouns, but also verbs and adjectives. The example *smirte* in (33b) is important because it provides evidence that stem-final [w] is not realized before a consonant-initial suffix. The regularity of these alternations can be deduced on the basis of textual evidence (see Section 6.4).

(33) MHG w ~ Ø alternations

a.	snē	[sneː]	‘snow’
	snēwes	[sneː.wəs]	‘snow, GEN.SG’
	blā	[blaː]	‘blue’
	blāwes	[blaː.wəs]	‘blue, INFL’
	grā	[graː]	‘gray’
	grāwer	[graː.wəs]	‘gray, INFL’
	spē	[speː]	‘spit, PRET’
	spīwen	[spiː.wən]	‘spit’
b.	mel	[mel]	‘flour’
	melwes	[mel.wəs]	‘flour, GEN.SG’
	gel	[gel]	‘yellow’
	gelwes	[gel.wəs]	‘yellow, INFL’
	val	[val]	‘sallow’
	valwes	[val.wəs]	‘sallow, INFL’
	smer	[smer]	‘kidney fat’
	smerwes	[smer.wəs]	‘kidney fat, GEN.SG’
	smirwen	[smir.wən]	‘grease’
	smirte	[smir.tə]	‘grease, PRET’

The following examples illustrate that the [w] in (33) does not belong to the suffix. The words in (34) consist of nouns (in (34a)), verbs (in (34b)) and adjectives (in (34c)) whose stem ends in a liquid and can therefore be compared with the items in (33b). The inflected word in each pair below has the same schwa-initial suffix present in (33b), e.g. [spil] ~ [spi.ləs] in (34a) contrasts with [mel] ~ [mel.wəs] in (33b).

[12] Schirmunski (1962) observes that the <w> in a number of the examples listed in (32) and (33) surfaces as [w] (or as a phonetically-similar sound) in many modern German dialects which directly descended from Middle High German. For example, in Southern Bavarian German in (26) the [w] in <Schnee> in (33a) surfaces without change as [w] before a vowel-initial suffix (e.g. in the infinitive [ʃnaɪ̯.wə]), but it hardens to [b] in the coda (e.g. in [ʃniːb] for <schneite> ‘snowed’; Schatz 1897: 168).

(34) a. spil [spil] ‘game’
spiles [spi.ləs] ‘game, gen. sg.’
tir [tir] ‘animal’
tires [ti.rəs] ‘animal, gen. sg.’

b. hœren [hø:.rən] ‘hear’
hōrte [ho:r.tə] ‘heard’

c. smal [smal] ‘narrow’
smales [sma.ləs] ‘narrow, infl.’

There were apparently no MHG nouns, verbs or adjectives ending in a vowel followed by a vowel-initial (i.e. schwa-initial) suffix that would contrast with the examples in (33a). Evidence that the [w] in those examples does not belong to the suffix can be seen by the modern reflexes. For example, the MHG word [bla:] is realized in NHG as [blaʊ̯]. That type of example shows that the MHG vowel /a:/ coalesced with the /w/ of the stem to form the diphthong [aʊ̯].

There is more than one conceivable way of analyzing w ~ Ø alternations in the synchronic phonology of Middle High German. The analysis in (35a) is the correct one: /w/ is present in all alternating morphemes. That underlying glide surfaces in [mel.wəs] because it is in the onset, but it is not realized in [mel] because it cannot be parsed into the onset. According to the incorrect alternative analysis depicted in (35b), alternating morphemes contain no underlying /w/, and that segment is inserted by epenthesis. However, the epenthesis analysis not possible because a /w/ would incorrectly be inserted after a consonant and before a vowel-initial suffix in words like the final one under (35b).

(35) a. /w/ deletes as consequence of Licensing Condition

/melw/	→	[mel]		‘flour’
/melw-əs/	→	[mel.wəs]		‘flour, GEN.SG’

b. /w/-Epenthesis:

/mel/	→	[mel]		
/mel-əs/	→	[mel.wəs]		
/vil/	→	[vil]		‘many’
/vil-əs/	→	[vi.ləs]	(*[vil.wəs])	‘many, INFL’

A third alternative (not depicted in (35)) postulates that alternating morphemes contain an underlying high vowel /u/ in place of the /w/ in (35a). Thus, instead of /melw/ and /melw-əs/, that approach posits the underlying representations /melu/ and /melu-əs/. This is the treatment one would adopt if one were to deny the existence of underlying glides (as in (4a)). I reject that approach for reasons to be made clear in Section 6.2.[13]

A number of examples presented above have an intervocalic glide parsed in the onset, i.e. [V.GV], e.g. (30), (32), (33). The glide in that type of example is significant because it contrasts with the nuclear glide in prevocalic position ([VG.V]) in words like the ones in (25). The two sets of examples together point to the conclusion that Middle High German had contrasts between [V.GV] and [VG.V].

[13] An anonymous referee points out that stem allomorphy is another option. On that approach, the morpheme ‘flour’ is /mel ~ melw/, where /melw/ is subcategorized so that it only occurs before a vowel and /mel/ in the elsewhere case. This option is formally similar to the one I adopt in (35a) because it has an underlying glide. A variant of the stem allomorphy approach is one in which the underlying representation for ‘flour’ is /mel ~ melu/, but that approach suffers for the same reason as the one discussed below in Section 6.2.

4.4 *How regular was the deletion of [w]?*

Bachofer et al. (1984) list eighteen entries for words ending in the letter <w>, e.g. <falw> 'sallow'. If <w> represents [w], then the implication is that there are eighteen exceptions to the LICENCING CONDITION. What is more, that type of word suggests that the alternations between [w] and zero might not be regular.

Bachofer et al. (1984) include material from the entire Middle High German corpus, which spans three centuries (1050–1350) distributed over a broad dialect spectrum. One could therefore speculate that the forms with <w> in word-final position represented [w] for certain dialects but not others, or that they were indicative of a late MHG pronunciation. Thus, it is conceivable that the LICENSING CONDITION and alternations between [w] and zero were very regular – possibly exceptionless – for certain varieties and/or time periods but not for others.

The type of question posed in the preceding paragraph exceeds the goals of the present paper. However, I suggest that an examination of a single (lengthy) text written by a single author has the potential to shed light on the state of the LICENSING CONDITION and the regularity of alternations between [w] and zero. To achieve that end, I consider here *Parzival*, a medieval romance written by the knight and poet Wolfram von Eschenbach (c. 1170–1220) in the first part of the 13th century, which is known as one of the most significant works of MHG literature. The poem consists of approximately 25,000 rhyming verses divided into sixteen books.

I downloaded *Parzival* as sixteen pdf files from Biblioteca Augustana (see online references) and then searched those files for the following combinations of graphemes: <rw>, <lw>, <iw>, <ew>, <æw>, <uw>, <ow> and <aw>.[14] Next, I considered whether or not those morphemes with <w> in a word-internal onset might have an alternate with zero by conducting a search for the morpheme without <w> or the material after that letter. For example, a search for <ew> yielded the inflected word <snēwe> ('snow'). A search for <sne> then uncovered the uninflected form <snē>.

The <w> in virtually all of the hits in the eight sequences <rw>, <lw>, <iw>, <ew>, <æw>, <uw>, <ow> and <aw> occurred in onset position because that <w> is followed by a vowel. For example, the combination <lw> yielded <swalwen> 'swallows' ([swal.wən]), but there were no hits for <lw> in word-final position. That fact alone suggests that the LICENSING CONDITION is a true generalization concerning Wolfram's dialect of Middle High German.

Nine morphemes were found in *Parzival* with regular alternations between [w] (<w>) and zero, which I list in (36). Some, but not all, of those morphemes were presented above in (33). In the first column I present the line from *Parzival* with the alternating word and in the final column I list the corresponding book. I only provide glosses for the boldfaced words. Multiple occurrences of both alternants for all nine morphemes are observable throughout *Parzival*. The selection of examples presented in (36) is representative.

(36) w ~ Ø alternations in *Parzival*

a.	ûf dem **snē** (der was al wîz)	[sneː]	'snow'	(B6)
	von **snēwe** was ein niwe leis	[sneː.wə]	'snow, DAT.SG'	(B6)
	snēwec bluotes zäher drî	[sneː.wək]	'snowy'	(B6)
b.	der was doch swarz unde **grā**	[graː]	'gray'	(B5)
	truogen **grāwe** röcke herte	[graː.wə]	'gray'	(B9)

[14] Those six vocalic graphemes suffice for all seventeen monophthongs of Middle High German. For example, a search for <i> results in both short and long <i> (= [i] and [iː]), and a search for <o> yields letters representing [o] and [oː] as well as [ø] and [øː].

c.	geêrt sî luft unde **tou**	[toʊ̯]	‘dew’	(B15)
	ûf einem **touwec** grüene gras	[toʊ̯.wək]	‘dewy’	(B15)
d.	**frou** Belakâne, sunder twâl	[froʊ̯]	‘woman’	(B1)
	‘manege tunkele **frouwen**	[froʊ̯.wən]	‘woman’	(B1)
e.	und sîn **getruilîch** gedanc	[gə.try:.lix]	‘faithful’	(B2)
	ir kiusche und ir **triuwe**	[try:.wə]	‘belief’	(B1)
f.	vil **niulich** hinnen: mir is leit	[ny:.lix]	‘recently’	(B9)
	des wart if gâbe **niuwe**	[ny:.wə]	‘new, INFL’	(B3)
g.	hât die swarzen **varwe** gar	[var.wə]	‘color’	(B1)
	und wirt och nâch der vinster **var**	[var]	‘color’	(B1)
h.	gefurriert mit **gelwem** zindal	[gel.wəm]	‘yellow, DAT.SG’	(B6)
	gel als ein thopazîus	[gel]	‘color’	(B15)
i.	dâ von mîn grüeniu freude ist **val**	[val]	‘sallow’	(B6)
	oder alse **valwer** leim	[val.wər]	‘faith’	(B4)

The alternations in (36) mirror the data presented in (32) and (33): [w] surfaces in onset position (i.e. before a vowel), otherwise it is deleted.

Three morphemes appear to pose a problem for the LICENCING CONDITION. The first (see (37a)) is a word ending in a sequence of graphemes suggesting that the <w> is in coda position (i.e. [.bu:wn.]). However, the more common spelling for that word in the MHG corpus as a whole (see Lexer 1983) is <bûwen>, which suggests that the <n> for Wolfram was preceded by schwa. In this case, [w] would be in onset position, i.e. [bu:.wən]; cf. also the NHG realization [baʊ̯.ən]. (Wolfram did not always indicate prenasal schwas in the orthography, e.g. <geritn> ‘ride, PAST PART’ (B1), which is phonetically [gə.ri.tən] and not [gə.ritn.]). The second two apparent counterexamples to the LICENCING CONDITION are the words written <varw> ‘color’ and <schouw> ‘look’. Taken at face value, those spellings suggest the pronunciation [varw] and [ʃoʊ̯w], in which case [w] would be parsed into the coda. However, it is noteworthy that the only occurrence of [varw] and [ʃoʊ̯w] in word-final position in *Parzival* is in the context before a vowel-initial word, as indicated in (37b, c).

(37) Apparent exceptions to w-Deletion

a.	müezen **bûwn** und riuten	[bu:.wn̩]	‘live’	(B3)
b.	du hâst verlorn **varw unde** kraft	[var.wun.də]	‘color and’	(B5)
c.	rît her, **schouw ors** und ouch den stein	[ʃoʊ̯.wors]	‘look horse’	(B6)

Recall from (36g) that the morpheme ‘color’ alternates between [w] and zero; hence it has an underlying representation (/varwə/) whose glide is parsed as an onset before the vowel schwa. In (37b) that schwa has been elided and the /w/ is parsed in the onset before the following vowel-initial word. The morpheme ‘look’ in (37c) likewise has an underlying representation with a glide (/ʃouw/), although that morpheme is not attested with a [w]-less alternant in *Parzival*.

I have identified a single morpheme in *Parzival* which Wolfram treats in an inconsistent fashion, namely /tru:w/ (including /gə-tru:w/) ‘have confidence’. A search for <tru> yielded thirty-nine hits in which that sequence belonged to the morpheme /tru:w/. In the context before a vowel-initial suffix, the <w> is written without exception as <w>, indicating the presence of [w] in the onset. Two examples (from a total of sixteen) are provided in (38a). The <w> is predictably absent in word-final position before a consonant in seventeen instances, as in (38b). <w> is not surprisingly present in word-final position if the following word begins with a vowel; see the one attestation in (38c). The reason Wolfram treats /tru:w/ inconsistently is that there are exactly five instances in

Parzival in which <w> is written before a consonant (see (38d)). In the first two examples the <w> is followed by a consonant-initial word and in the final three items <w> is followed by a suffixal consonant.

(38) Realizations of /tru:w/

a.	ich **getrûwe** iu des vil wol	[gə.tru:.wə]	'1SG'	(B1)
	si sprach «hêr, des **trûwe** i'u wol»	[tru:.wə]	'1SG'	(B1)
b.	und Gahmuret ir herzen **trût**	[tru:t]	'PRET'	(B1)
	swenne ir an **trûtscheft** gebrast	[tru:t.ʃeft]	'liaison'	(B1)
c.	ze fuoz **trûw** ich mich wol ernern	[tru:.wix]	'1SG'	(B10)
d.	ich **getrûw** des sîner hende	[gə .tru:w]	'1SG'	(B7)
	ich **getrûw** des iwerr hende	[gə .tru:w]	'1SG'	(B11)
	wîben baz **getrûwt** dan gote	[gə .tru:wt]	'PAST PART'	(B7)
	ich **trûwte** im ander dinge baz	[tru:w.tə]	'PRET'	(B8)
	ich **trûwt** in harte wol ernern	[tru:wt]	'1SG'	(B10)

The data involving /tru:w/ suggest that Wolfram treated that morpheme just as any other /w/-final word 87% of the time (34/39), but that that one morpheme had an exceptional realization with [w] in the coda in the remaining 13% (5/39).

In sum, the philological evidence from *Parzival* strongly supports the LICENCING CONDITION and the regularity of the deletion of /w/ that is unable to be parsed as an onset. The one problematic morpheme (/tru:w/) is written just as it should be in thirty-four instances, but in only five instances the <w> (representing [w]) is exceptionally present in coda position. Given the length of *Parzival* and the sheer number of words containing <w>, Wolfram was remarkably consistent.

5 Analysis

I propose that the second component of the diphthongs is a glide derived from the corresponding vowel but that the onset glides described in Section 4.3 are underlyingly glides and not derived from vowels. The two underlying glides (/w/ and /j/) are [+consonantal] and therefore distinct from [–consonantal] vowels (e.g. /u/ and /i/). The features for vowels (V), glides (G), liquids (L), nasals (N) and obstruents (O) are given in (39). I adopt the feature ordering model proposed in Dresher (2009), although nothing crucial in my treatment of glides depends on this: The five segment classes referred to above are divided into two groups: [+sonorant] and [–sonorant]. The former class is subsequently split into a [–consonantal] group (vowels) and a [+consonantal] group (glides, liquids and nasals). Within the latter category the feature [+nasal] is assigned to the nasals and [–nasal] to liquids and glides. Finally, the feature [±liquid] distinguishes glides from liquids. The feature [±liquid] was proposed by Dixon (1972) and adopted by Walsh Dickey (1997) and Hall (2009). Place features for glides and the corresponding vowels are commented on below.

(39) Features for Middle High German

	V	G	L	N	O
[sonorant]	+	+	+	+	–
[consonantal]	–	+	+	+	
[nasal]		–	–	+	
[liquid]		–	+		

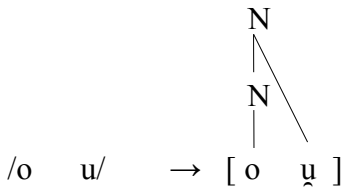
A model in which the contrast between underlying glides is captured with the feature [±vocalic] was commented in on Section 2. That alternative is discussed in Section 6.1.

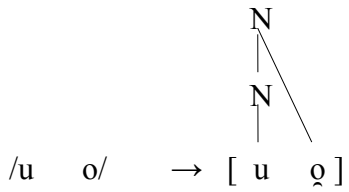
Given the features in (39), the LICENSING CONDITION posited earlier in (31) can now be restated in terms of the features for underlying glides:

(40) LICENSING CONDITION: the feature complex [+son, +cons, –nas, –liq] is only licenced in the onset.

The feature complex referred to in (40) singles out glides (/j/ and /w/) as the only segment type restricted to onset position.

Given the featural analysis of vowels in (39), both components of the diphthongs are analyzed as [+sonorant, –consonantal]. Two representative examples of underlying and surface representations for diphthongs (recall 16) are given in (41). I discuss the way in which nuclei are assigned to underlying strings of [+sonorant, –consonantal] segments below.

(41) a. 

b. 

The second part of the surface diphthongs in (41) is predictably a glide on the basis of its position within the nucleus because it is always the second member of a diphthong that is the glide. The nonsyllabicity of [u̯] and [o̯] in (41) is captured formally by parsing those segments into the second component of a complex nucleus. No segmental feature (e.g. [±syllabic]) is necessary, nor is a rule of Glide Formation required. It is nevertheless correct to refer to the offglides in (41) as derived: they are not interpretable as glides in the underlying representation because there are no nuclei at that representational level, but they are interpretable as glides in the surface structure because they occupy a slot reserved for glides.

Underlying glides and derived glides are featurally distinct. In (42) I illustrate the way in which vowels and glides (both underlying and derived) are marked for [±consonantal] and [+sonorant] as well as place features. The underlying glides in the final column are analyzed as [+consonantal], like consonants, while the derived glides in the penultimate column are [–consonantal], like vowels.

(42) Underlying and surface features

	Vowels /i u/	Glides derived from vowels [i̯ u̯ y̆ e̯ o̯]	Underlying glides /j w/
[sonorant]	+	+	+
[consonantal]	–	–	+

Place features are not depicted in (42). I adopt featural proposal for glides in Hall (2014b) on the basis of the behavior of those segments in the history of Low German (Westphalian). On that approach, underlying glides are complex segments in the sense that /j/ is [coronal, dorsal] and /w/ is [labial, dorsal]. See also Nevins & Chitoran (2008: 12–13) for a similar treatment of the place features for margin glides. In contrast to Nevins & Chitoran (2008) and the treatments referred to in footnote 2 (i.e. Halle 1995; Halle, Vaux & Wolfe 2000) the treatment proposed by Hall (2014b) analyzes the place features for

vowels like /i/ and /u/ as the same as the place features for the corresponding glides; hence, /i/ is [coronal, dorsal] and /u/ is [labial, dorsal]. Since the nuclear glides [i̯ u̯] derive from the corresponding vowels /i u/, the former are expected to show the same place structure as the latter.[15]

I now consider the way in which syllables (in particular, nuclei) are assigned to underlying representations. It is possible to adopt either an Optimality-Theoretic treatment (Prince & Smolensky 2004 and much subsequent work), which views the assignment of syllable structure as the interaction of universal constraints (e.g. peak and margin hierarchies), or a rule-based analysis (e.g. Harris & Kaisse 1999 for Spanish; Nevins & Chitoran 2008; Hall 2014a). I propose a rule-based treatment below, but that analysis is not crucial because the assignment of syllables could also be accomplished in an OT-style approach.

An important aspect of my analysis is that there are no underlying peaks (nuclei); hence, all nuclei in surface representations are derived. As mentioned earlier, the claim that there are no underlying nuclei at all is controversial in theoretical phonology. I present my analysis below and discuss (and reject) a possible alternative to it with underlying peaks in Section 6.2.

Syllabification is presented in (43). The individual steps have been adopted from Hall's (2014a) treatment of Westphalian German, although Harris & Kaisse (1999) propose a similar model. (43a) assigns a nucleus to all underlying vowels. The condition specified in (43a) is necessary to guarantee that all diphthongs are falling. Complex nuclei are created by (43b). That step (as well as (43d, e)) presuppose the model introduced in Section 3.1. The assignment of nuclei via step (43c) is necessary in words where [–consonantal] cannot be made a part of a complex nucleus.

(43) Syllabification
- a. Nucleus Placement: assign a nucleus (N) to each [–cons] segment.
  Condition: this step is blocked from applying to the second of two adjacent [–cons] segments.
- b. Complex Nucleus: assign an unsyllabified [–cons] segment to a second level nucleus (N).
- c. Default Nucleus: assign a nucleus (N) to each unparsed [–cons] segment.
- d. Onset Formation: attach an unsyllabified segment to the left of a nucleus to an onset (N").
- e. Coda Formation: attach an unsyllabified segment to the right of a nucleus to a coda (N').

Syllabification applies in (44) in four representative examples. Here and below, syllable structure parsed at each step is indicated with curly brackets ({}). In the first word there is a single vowel preceded by a phonemic glide /w/, which cannot be affected by (44a–c) because it is [+consonantal]. The second word contains a surface diphthong whose first part is assigned a nucleus by (43a) and a complex nucleus by (43b). Since there is no hiatus involving adjacent short vowels (recall NO HIATUS from (21)), Nucleus Placement and Complex Nucleus together correctly parse all surch sequences under the same nucleus. The third example contains a long vowel plus short vowel sequence. The long vowel receives a nucleus by (43a), but the short vowel cannot be made a part of the nucleus because the language only allowed for short diphthongs (recall the NUCLEUS CONDITION in (19)). In

[15] The reason underlying glides, derived glides and the corresponding vowels are assumed to have the same place structure comes from historical processes in the history of German in which vowels like /u/ are realized as (derived) onset glides and then harden to fricatives. I do not discuss this point further because it is peripheral to the present analysis.

the final example the first two [–consonantal] segments are parsed as a complex nucleus by (43a, b), and the third vowel receives a nucleus via (43c).

(44)

	welt (27a) /welt/	*buoch* (18b) /buox/	*vîant* (24b) /viːɑnt/	*leie* (25) /leiə/
Nucleus Placement:	w{e}lt	b{u}ox	v{iː}ɑnt	l{e}iə
Complex Nucleus:	------	b{uo̯}x	------	l{ei̯}ə
Default Nucleus:	------	------	v{iː}{ɑ}nt	l{ei̯}{ə}
Onset Formation:	{we}lt	{buo̯}x	{viː}{ɑ}nt	{lei̯}{ə}
Coda Formation:	{welt}	{buo̯x}	{viː}{ɑnt}	{lei̯}{ə}
	[welt]	[buo̯x]	[viː.ɑnt]	[lei̯.ə]

In (45) I illustrate how Syllabification applies to four examples containing an underlying glide in postsonorant position:

(45)

	lewe (30a) /lewe/	*mel* (33b) /melw/	*melwes* (33b) /melw-əs/	*snê* (33a) /sneːw/
Syllabification:	{le}{we}	{mel}w	{mel}{wəs}	{sneː}w
Stray Erasure:	---------	{mel}	---------	{sneː}
	[le.wə]	[mel]	[mel.wəs]	[sneː]

The /w/ in the first and third examples is parsed as an onset like any other prevocalic consonant. By contrast, the /w/ in the second and fourth words cannot surface because its parsing as a coda segment in /melw/ or a nucleus in /sneːw/ violates the LICENSING CONDITION in (31). The underlying glides in words like those therefore cannot surface and consequently deletes by Stray Erasure.

The example [le.wə] in (45) and [lei̯.ə] in (44) are important because they represent the contrast between an intervocalic onset glide ([V.GV]) and a prevocalic nuclear glide ([VG.V]). The present treatment correctly parses the glide in [le.wə] into the onset because it is [+consonantal], and it therefore escapes (43a–c). By contrast, the surface glide in [lei̯.ə] is correctly syllabified into the second part of the nucleus by (43b) because it is underlyingly [–consonantal].

In sum, the analysis proposed above is able to correctly syllabify [–consonantal] segments as either vowels or derived glides and to parse underlying glides as onset segments. Alternations between onset glides and zero (in 45) are accounted for, and derived glides (in words like [buo̯x] from (44)) are correctly predicted not to delete because they are in the nucleus and therefore satisfy the LICENSING CONDITION. The present treatment also correctly predicts that it should not be possible to syllabify a nuclear glide into the onset of a vowel-initial syllable (e.g. in [lei̯.ə] in (44)) because onset glides are [+consonantal].

6 Theoretical discussion

In the present section considers the theoretical ramifications of the present analysis of Middle High German glides. First, I discuss and reject two alternatives to my analysis (Section 6.1–6.2). Both alternatives have been defended in the cross-linguistic literature on glides. Second, I discuss the advantage of the present model of the nucleus over alternatives proposed in the literature (Section 6.3). Third, I situate Middle High German in the theoretical discussion concerning underlying glide languages and underlying peak languages (Section 6.4).

6.1 Glides as [–consonantal, –vocalic]

The analysis of phonemic glides as [+consonantal] is not shared by other linguists who accept underlying glides. Recall that the approach defended by Nevins & Chitoran (2008) summarized in (6) and repeated in (46) sees the feature distinguishing vowels and underlying glides as [±vocalic] and not [±consonantal]. A second difference between the approach in (46) and my own is that in (46) underlying glides and glides in the margin derived from vowels as featurally identical.

(46) Underlying glides as [–vocalic]

	Vowels /i u/	Glides derived from vowels [i̯ u̯]	Underlying glides /j w/
[sonorant]	+	+	+
[consonantal]	–	–	–
[vocalic]	+	–	–

The features in (46) do not pose a problem for the present treatment. Thus, (43a, b, c) could be restated so that they refer not to [–consonantal], but instead to [+vocalic]. Given that reanalysis, the correct nuclear structure is assigned to the examples in (44) and (45). The underlying glide (e.g. /w/ in 44 and 45) is also correctly predicted not to surface in examples like /melw/ if the LICENCING CONDITION is restated so that it refers to the feature complex defining the underlying glide category in (46), i.e. [+sonorant, –consonantal, –vocalic].

Although (46) succeeds in correctly syllabifying the examples in (44) and (45), there is a drawback in the analysis of margin glides derived from vowels as [–vocalic]. No MHG examples involve that type of derived glide (as in (2a, c)), but the issue discussed below holds for many other languages (e.g. New High German; see Hall 2006). Nevins & Chitoran (2008) argue that derived onset glides are underlyingly [+vocalic], which then changes to [–vocalic] in the onset by a universal constraint saying that [+vocalic] is not allowed in a syllable margin (recall Section 2). For example, the /i/ in a hypothetical sequence like /iɑ/ in (2a) is [+vocalic] and when that /i/ is parsed as an onset by Syllabification, it changes into [–vocalic]. The constraint referred to here makes the correct prediction that onset glides are universally [–vocalic] and never [+vocalic], but it nevertheless suffers from the same kind of redundancy present in the SPE view that onset glides are [–syllabic]. Clearly, an onset glide that is [–vocalic] is just as redundant as an onset glide that is [–syllabic]. To wit, Nevins & Chitoran's use of [±vocalic] is strikingly similar to [±syllabic].

A different kind of drawback with (46) involves the analysis of derived nuclear glides (recall (7c, d)), which are not discussed in Nevins & Chitoran (2008). Huang (2014) proposes a treatment of derived nuclear onglides in Squliq Atayal (Austronesian, Taiwan) in the featural framework proposed by Nevins & Chitoran (2008). According to Huang (2014: 816), the derived nuclear onglide in a diphthong like [i̯u] (from /iu/) is [+vocalic], just like the syllabic component of the same diphthong.[16] The problem is that that approach is not able to capture the fact that diphthongs in Squliq Atayal are realized with the glide as the first component (e.g. [i̯u]) and not as the second component (e.g. [iu̯]). The reason is that both parts of the diphthong in question are

[16] Huang transcribes the diphthong in question as [ju]. For the sake of consistency I continue to transcribe derived glides with the nonsyllabic diacritic.

[–consonantal, +vocalic] and they are both situated under a single nucleus node.[17] In Section 6.3 below I return to this and similar theoretical issues regarding the representation of nuclear glides.

6.2 Underlying peaks

An alternative to the present analysis is one in which certain peaks are marked in underlying representations, and all glides are derived (recall 4a). Several linguists have proposed that type of analysis, e.g. Levin (1985: 96) for Usarufa (Trans-New Guinea, Papua New Guinea), Guerssel (1986) for Berber (Afro-Asiatic, North Africa) and Harris & Kaisse (1999) for Argentinian Spanish. No underlying peak analysis of Middle High German is known to me; hence, I attempt below to construct what a possible treatment along those lines might look like. Although straw men analyses are risky because one might not be constructing the right analysis, it is nevertheless instructive to consider the kind of challenges that are posed by a treatment with underlying peaks and no underlying glides. I conclude that any type of underlying peak analysis will fail.

Consider the examples in (47), which contain either a derived nuclear glide (in (47b)) or an underlying glide (in (47a, c, d)). An alternative analysis with underlying peaks would presumably analyze these items as in (48). In the present treatment, the /w/ in (47a) is syllabified into the onset (= [V.GV]), but it is remains to be seen how this is accomplished in a treatment with underlying peaks. Since that alternative analysis eschews underlying glides, my /w/ would have to be reanalyzed as the vowel /u/, but as indicated in (48a) it is not clear where the underlying peak would be; thus, how can one ensure that the /u/ is parsed as an onset and not as the offglide in a diphthong? That problem is made insurmountable in example (47b), which represents the [VG.V] parsing. The present analysis succeeds in parsing the first /i/ in (47b) into the nucleus, but the unparsed /i/ in (48b) cannot be syllabified into the nucleus.

(47) Underlying glides
- a. /lewə/ → [le.wə]
- b. /leiə/ → [leḭ.ə]
- c. /melw-əs/ → [mel.wəs]
- d. /melw/ → [mel]

(48) Underlying peaks
- a. /l{e}uə/, /leu{ə}/ → (*[leu̯.ə])
- b. /l{e}i{ə}/ → ?
- c. /melu-əs/ → (*[meluə̯s])
- d. /melu/ → (*[me.lu])

In the alternative treatment, underlying /w/ would have to be analyzed as the vowel /u/, as in (48c, d). One challenge for the underlying peak approach is that it is not clear how the /u/ in (48c) can successfully be parsed as an onset glide. In that example, (43a) assigns syllable peaks to the /e/ and to the /u/ but not to the schwa because of the condition on (43a). Step (43b) then makes the schwa in that type of example the offglide in a diphthong, thereby creating *[me.luə̯s].[18] An additional problem with that underlying peak analysis is

[17] It is not clear to me what the complete diphthong inventory is for Squliq Atayal and therefore I cannot propose an analysis for derived diphthongs in that language on the basis of the features and nuclear structure proposed in Section 5.

[18] One could argue that COMPLEX NUCLEUS in (43b) is blocked because a morpheme boundary intervenes between /u/ and /ə/. Even if COMPLEX NUCLEUS were sensitive to morphological structure, it is not clear how /melu-əs/ is correctly parsed with [u̯] in the onset.

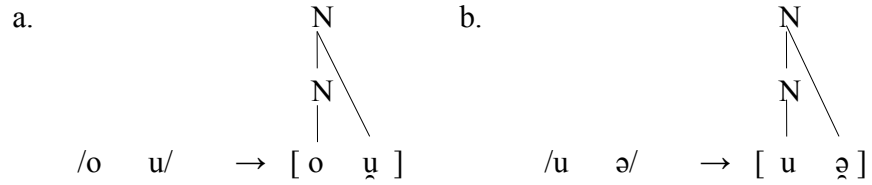
that it has to account for the deletion of /u/ in (48d). The present analysis sees deletion of /w/ in (47d) as a consequence of the LICENSING CONDITION, but the LICENSING CONDITION cannot ensure the desired deletion of /u/ in (48d) because /u/ is not a glide. See also Levi (2004), who discusses a similar problem involving final clusters with rising sonority (e.g. liquid plus glide) in Moose Cree (and other languages). As a vowel, /u/ is syllabifiable as a nucleus, and one would therefore expect an underlying string like /melu/ to be parsed as *[me.lu], just like any other CVCV word.[19] One could write a rule saying that word-final /u/ deletes, but this is a brute force analysis with no explanatory power.[20]

To reiterate, straw man analyses are a risky undertaking because one might not be creating the correct alternative analysis. However, I believe that the burden of proof now lies on the shoulders of linguists who want to uphold some version of an underlying peak analysis for Middle High German.

6.3 Alternative models of the nucleus

The model of the syllable adopted in the present analysis is endowed with an enriched nuclear structure which provides peaks and nonpeaks with their own distinct slots. Two representative examples are presented in (49).

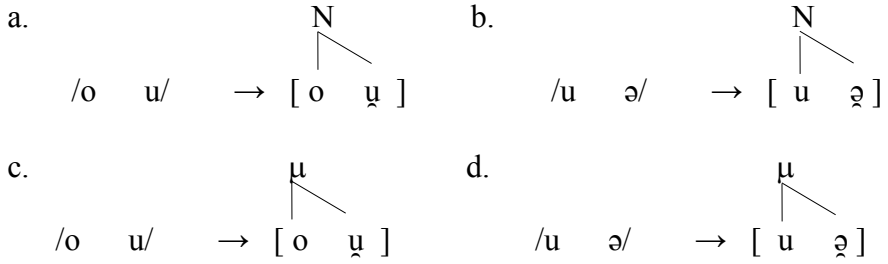
(49)



The advantage of the model in (49) is that it is possible to interpret nuclear peaks from nuclear nonpeaks with phonological units, namely with the two projections of N. The generalization is that the lower N dominates the peak and the upper N the nonpeak. This approach has a clear advantage than one with the much criticized segmental feature [±syllabic] discussed in (1).

Compare the output structures in (49) with the alternative ones in (50). In (50a, b) the complex nuclear structure is replaced with a traditional model with a single instantiation of N, and in (50c, d) both segments are dominated by a mora (Hayes 1989 and much work by later authors). The diphthongs in (50c, d) could be interpreted either as monomoraic (as below) or as bimoraic (not depicted here).

(50)



[19] Vowel Reduction ensured that etymological full vowels (e.g. [u]) were realized as schwa ([ə]) when unstressed. However, the alternative treatment needs to explain why an underlying representation like /melu/ is not repaired to one with schwa, i.e. *[melə].

[20] There is a second approach with underlying peaks that can be considered (and rejected) as well. On this view, all surface peaks bear a nucleus in the underlying representation, while no surface glide does, e.g. /l{e}u{ə}/ from (47a). That approach fails because it cannot succeed in parsing the /u/ in /l{e}u{ə}/ as an onset and the /i/ in /l{e}i{ə}/ as a nucleus.

The drawback with both models in (50) is that they are not able to capture the distinction between peak and nonpeak in terms of phonological units. Since both parts of diphthongs are [+sonorant, –consonantal], there is no way to guarantee that it is the second component in (50) that is the nonpeak and not the first element. For example, the representation for [ou] in (50a) could be interpreted as [o$\underset{\cup}{u}$] or as [$\underset{\cup}{o}$u]; recall my criticisms of the approach taken by Huang (2014) in Section 6.1.[21]

One might argue that either model in (50) is correct and that the interpretation of one of the nuclear sounds as the peak and the other as the nonpeak is made at the level of phonetics but that in the phonology it is not necessary to require a model like the one in (50) which provides distinct representation for peaks and nonpeaks. A response to that criticism goes far beyond the scope of the present article because it deals with a very fundamental issue and might require reference to data from languages not investigated here. One potential problem would be a language with contrastive nuclear glides, e.g. a language with both [i$\underset{\cup}{e}$] and [$\underset{\cup}{i}$e]. A thorough cross-linguistic search clearly needs to be conducted; however, one variety of Low German can be mentioned with that type of contrast. In particular, Niblett (1913) describes a Westphalian variety spoken in and around Osnabrück in the German state of Lower Saxony (Niedersachsen) with both rising and falling diphthongs (see also Niebaum 1974 for the description of a similar dialect and Durrell 1989 on Westphalian in general). For example, [$\underset{\cup}{u}$ɔ] contrasts with [u$\underset{\cup}{o}$] in words like [h$\underset{\cup}{u}$ɔl] 'hollow' (cf. NHG *hohl*) vs. [du$\underset{\cup}{o}$p] 'village' (cf. NHG *Dorf*). Diachronically, [u$\underset{\cup}{o}$] arose from [or], but from the synchronic perspective there is no reason to posit /or/ as the underlying representation for [u$\underset{\cup}{o}$].[22] Thus, [du$\underset{\cup}{o}$p] is /du$\underset{\cup}{o}$p/, and [h$\underset{\cup}{u}$ɔl] is /h$\underset{\cup}{u}$ɔl/. The model in (49) can easily capture that contrast with underlying nuclear structure. However, neither of the two models in (50) is able to express that distinction.

It is also worth considering an example mentioned earlier as a potential drawback of the models in (50). In Section 3.2 it was noted that the rising diphthong [$\underset{\cup}{i}$u] can only be preceded by a noncoronal consonant for many speakers of American English. If the constraint capturing that phonotactic regularity refers to coronality (e.g. $*_{wd}$[coronal] [coronal]), then it succeeds in accounting for the ungrammaticality of words like [t$\underset{\cup}{i}$un] because both the initial consonant ([t]) and the first part of the diphthong ([$\underset{\cup}{i}$]) are [coronal]. However, it is not clear how that treatment accounts for the fact that coronal consonants can be followed by front vowels (e.g. *tea* [tiː]), assuming that front vowels like [iː] are coronal. One might conclude that the (derived) palatal glide in [$\underset{\cup}{i}$u] is [coronal] and that front vowels like the /iː/ in /tiː/ are [dorsal], but that treatment might create more problems than it solves.[23] In the present analysis the constraint in American English can simply be stated as a ban on a [coronal] consonant followed by a nuclear glide (expressed with the model in (49)).

6.4 Underlying glide languages vs. underlying peak languages

I have argued that certain glides in Middle High German are phonemic and not derived and that words containing underlying glides cannot alternatively be reanalyzed by analyzing the vowels adjacent to those glides as underlying peaks. I do not intend for these

[21] The problem described here is independent of the question of whether or not it is possible to predict (e.g. on the basis of the position within the nucleus) whether or not two nuclear [+sonorant, –consonantal] sounds is the peak and which is the nonpeak. In Middle High German (as in many other languages), the generalization is that the peak is the first of two nuclear elements. The problem is that this simple statement cannot be translated into phonological units in either of the models in (50).

[22] As in NHG, the Westphalian dialect referred to here vocalizes /r/ in coda position. However, in Niblett's symbols, the vocalized-r is transcribed as [$\underset{\circ}{r}$] (and not as [$\underset{\cup}{o}$]), e.g. [hø$\underset{\circ}{r}$də] 'hurdle' (cf. NHG *Hürde*).

[23] The problem is that derived glides and the corresponding vowels must be analyzed as featurally distinct, but this is contrary to the usual asusmption, which is adopted in the present study (recall Section 2).

to be universal claims for languages with glides which display an anomalous behavior. In particular, I follow Levi (2004) in positing that there are languages with underlying glides as well as languages with underlying peaks. If this approach is correct, then the question is whether or not it is possible to identify structural properties of underlying glide languages that differentiate them from the properties characterizing underlying peak languages.

The material presented above has isolated one structural property for underlying glide languages, namely the contrastive syllabification of glides. In particular, if a nuclear glide in prevocalic position ([VG.V]) contrasts with a postvocalic onset glide ([V.GV]), then the latter glide must be analyzed as phonemic. It was demonstrated above that it is not possible to adopt an alternative approach with underlying peaks.

The contrastive syllabification of an intervocalic glide represents a cross-linguistically underrepresented diagnostic for underlying glide languages. The literature cited earlier on underlying glides has shown that underlying glide languages possess one or more of the following (Levi 2004): (a) transparency to vowel harmony, (b) triggering of consonant harmony, (c) vowel epenthesis in unsyllabifiable clusters which include glides, (d) expected and unexpected syllabification of vocoids, (e) reverse sonority clusters, (f) blockage of nasal harmony, and (g) consonant gradation. However, no reference is made in Levi (2004) or in any other work to my knowledge to the kind of contrastive syllabification mentioned above involving a consonantal glide in the onset and the offglide in a nuclear diphthong. Middle High German therefore possesses a property that has not been discussed in the cross-linguistic research referred to above on glides. One question open for further research is whether or not there are other languages like Middle High German in the sense that they contrast [VG.V] and [V.GV]. If so, I argue that the present analysis can and should be extended to those languages.

Underlying glide languages like Middle High German are very different from underlying peak languages. In particular, a property characterizing the latter languages is the contrast between prevocalic (nuclear) glides ([GV]) with hiatus sequences ([V.V]). That type of contrast is not possible in an underlying glide language like Middle High German, which lacks short vowels in hiatus. Recall from (4) the contrast in the underlying peak language Argentinian Spanish in words like vic[já]ba ‘s/he vitiated’ vs. vac[i.á]ba ‘s/he emptied’. Additional examples of languages that contrast [GV] with [V.V] include Korean and Berber (see Levi 2004). An underlying peak language not discussed in Levi (2004) is Usarufa (Levin 1985: 96; recall Section 6.2); cf. [a.u.e] ‘it is flesh’ vs. [a.we] ‘wait’.

One question is where the locus of cross-linguistic variation lies. On the one hand, there is the distinction between underlying glide languages and underlying peak languages. But within the former languages the question is how those underlying glides are represented. The present paper has defended an analysis of underlying glides with the feature [+consonantal], but passing reference was made to other alternatives. In particular, some scholars have argued that underlying glides are characterized by a unique set of place features (e.g. Halle 1995; Halle, Vaux & Wolfe 2000). If that type of treatment is correct, then the question is whether or not it is universally the case for underlying glide languages, or if underlying glide languages can vary cross-linguistically along that dimension (i.e. underlying [+consonantal] glide languages vs. underlying glide languages with place features distinct from the corresponding vowels). This is a question that must remain open for further research.

7 Conclusion

The present article has shed light on several issues involving the phonology of glides on the basis of data from Middle High German. First, I argued that Middle High German possessed both underlying glides and derived glides. Second, underlying glides are [+consonantal], while the derived glides are [–consonantal]. Third, words with underlying glides cannot

be reanalyzed by analyzing the vowels flanking the glides as underlyingly nuclear. Fourth, derived glides only surface in the nucleus as the second component of diphthongs, but underlying glides are consistently parsed as onset segments. The restriction to onset position accounts for the fact that underlying postsonorant /w/ only surfaces before a vowel but is otherwise not realized phonetically. Fifth, an enriched model of nuclear structure was adopted which enables one to capture formally which component of the diphthongs is the peak and which is the glide. Finally, the contrastive syllabification of surface glides (i.e. [VG.V] vs. [V.GV]) was shown to be a diagnostic of underlying glide languages that has not been discussed in the literature to date.

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Competing Interests

The author has no competing interests to declare.

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