There is no ambisyllabicity
(in German)

Emilie Caratini

'Ambisyllabicity' is often used by phonologists, especially when they deal with the distribution of long and short vowels in German. Even if it is a very convenient concept, it raises a set of problems; and those problems can be solved if ambisyllabics are considered as geminates. Diachronic facts will be provided in order to reveal where those ambisyllabics come from. It will also be shown that German schwa does not behave like other vowels (it does not build open syllables) and that there is a relationship between (vowel) length and (consonantal) voicing in German.

1. Preamble

The work presented here is the synchronic part of a broader study which consists not only of a synchronic but also of a diachronic and dialectological survey of German vowel length distribution. The ultimate goal of this paper is to show that it is possible to account for vowel length distribution in German without the help of ambisyllabicity.

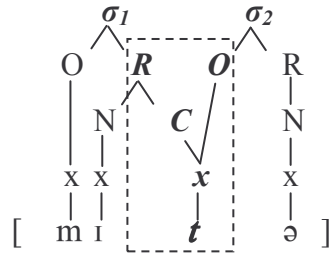
Ambisyllabicity is a rather old concept, which, to my knowledge, has been first imagined by Paul et al. (1998:75-76, 1st edition 1881). It has then been (re-)introduced, quite late, in Generative Phonology (Kahn 1976). But, as far as the phonology of *German* is concerned, its purpose has not changed since Paul et al.

It was well known among Neo-grammarians that, in Modern Standard German, long vs. short vowels occur in open vs. closed syllables respectively. Ambisyllabicity was introduced in their analyses, as well as in modern proposals, in order to explain why some short vowels occur in *a priori* open syllables: ambisyllabicity pushes onset consonants which follow a short vowel into the coda of the preceding syllable. The preceding vowel stands in an (artificially) closed syllable, which provides a reason for its shortness (see Becker 1998, Benware 1986, Hall 2000, Kohler 1977, Meinhold & Stock 1980, Ramers 1991, Vennemann 1990 or Wiese 1996). In the phonology of German, the *only purpose* of ambisyllabicity is to find a way to account for the distribution of long and short vowels.

An ambisyllabic consonant, as shown in (1), is a single intervocalic consonant which belongs *simultaneously* to two syllables. The representation of *Mitte* ['mɪtə] 'middle' – with ambisyllabic /t/ – can be compared to those of *Biene* ['bi:nə] 'bee' (cf. (2)) and *finde* ['fɪndə] 'I find' (cf. (3)), which respectively have a 'standard' open vs. closed syllable.

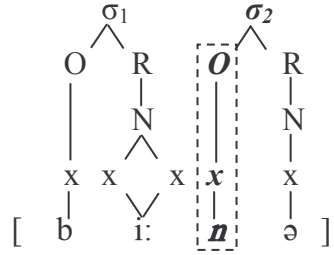
Proceedings of ConSOLE XIV, 2007, 37-60
http://www.sole.leidenuniv.nl

(1) Ambisyllabicity



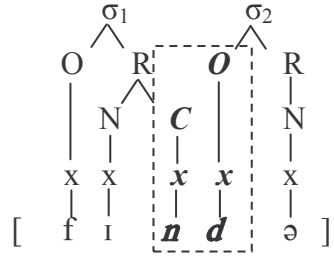
Mitte ‘middle’

(2) Open syllable



Biene ‘bee’

(3) Closed syllable



finde ‘I find’

A structure such as (1), i.e. containing an ambisyllabic consonant (in italics), is very attractive: following any standard syllabification algorithm, an intervocalic simple consonant occupies only *one* x-slot, and is usually associated with the following syllable node *only* (‘onset maximisation’ principle); ambisyllabicity allows the only x-slot of this consonant to be linked – as a coda – to the preceding syllable at the same time (ambisyllabification rules). This way, the preceding vowel stands in a closed syllable. Therefore, it has to be short in order to conform to the ‘rhyme-weight requirement’ that governs the phonology of Standard German (i.e. long vowels occur in open, short vowels in closed syllables; see 2.2).

However, it raises a problem: why are identical intervocalic consonants sometimes ambisyllabic (cf. *kennen* [’kɛnən] ‘(to) know’) and sometimes not (cf. *König* [’kø:nɪç] ‘king’)? The situation is in fact even worse: German exhibits some minimal pairs such as the ‘famous’ *Miete* [’mi:tə] ‘rent’ vs. *Mitte* [’mɪtə] ‘middle’ one. However, these should not exist. Any account of the facts has to provide an explanation for those problematic cases (section 4).

The ‘fight’ against ambisyllabicity is not the only objective of this paper: I want to account for the German facts without the help of ambisyllabicity, and therefore I also have to offer an alternative to the ambisyllabic approach. The analysis, which is provided in part 4, has to rely on two remarkable things; those are stated under (4), and are closely related to the main issue of this article (vowel length).

(4)

a. first of all, 'schwa', i.e. [ə], has a special status in Standard German – as well as in other languages: it does not behave like 'full' vowels. In Standard German, it has (diachronically) triggered the shortness of the preceding vowel;
b. second, there seems to be a link between the length of a vowel and the voice value of the following intervocalic consonant (voiced vs. voiceless consonants respectively are preceded by long vs. short vowels).

(4a) is nothing new, neither for German nor for other languages. The special behaviour of schwa has already been acknowledged for German and for Dutch, concerning the distribution of [ŋg] vs. [ŋ] (cf. Vennemann 1970 for German; Trommelen 1983 or Oostendorp 1995 for Dutch). It has also been identified among Romanists (see Charette 1991 or Anderson 1982), or even among Slavists ('abstract vowels' already exist in Lightner 1965). In German, schwa does obviously not pattern together with other vowels; it seems to be the same as nothing. If it is present, it has the same consequences as if there were no vowel at all:

a. */ɴg/ distribution:* [ŋg] surfaces when it is followed by a full vowel, [ŋ] when the following syllable contains a schwa (cf. *Ingo* [ɪŋgo]'Ingo' vs. *Inge* [ɪŋə]'Inge');

b. *vowel length:* schwa has triggered the shortness of the preceding vowel, whereas full vowels have triggered its length (cf. MHG *künik* 'king' vs. *doner* 'thunder' > NHG *König* [kønɪç] 'king' vs. *Donner* [dɔnɐ] 'thunder').

The idea stated in (4b) was already known among Slavists (see Scheer 2004:522) and Italianists (Baroni 2000): there seems to be a relationship between consonantal voice value and the length of the preceding vowel. In other words, if the vowel is followed by a voiced (intervocalic) consonant, it is long; and if it is followed by a voiceless (intervocalic) consonant, it is short.[1] This second observation is also new for German.

In the following section, I will briefly introduce the data that are going to be used, and I will present the standard generative views concerning vowel length distribution in German. The third part will be devoted to the problems encountered by the analysis discussed in part 2:

a. the (quasi-)total absence of consideration for stress and the role it plays, concerning the distribution of long and short vowels in German
b. the difference between synchronic vowel length distinctions: process vs. lexical property
c. the pre-final consonant context (__ C #), which gives birth to minimal pairs
d. the concept of ambisyllabicity itself and the facts it cannot account for
e. and the synchronic facts which show the existence of a relationship between consonantal voicing and vowel length.

In the fourth section, I will present a concurrent analysis, which is based on the ideas that schwa is different, and that the voicing value of an intervocalic consonant has an effect of the length of the preceding vowel.[2] The last part of the paper will provide concluding remarks.

---

[1] As the reader might notice, I assert that vowel length and consonantal voicing are linked, even though I know of the existence of apparent counter-examples which German speakers will probably notice: *Miete* ['mi:te] 'rent' or *Vater* ['fɑ:tɐ] 'father', which both have a long vowel even though the following obstruent is voiceless. However, those counter-examples can easily be incorporated into the analysis, as has been done in Caratini (2005). I will briefly mention the main kinds of counter-examples that exist in section 4.

[2] I would have liked to show how easily the facts can be integrated into a theory like CVCV, but I did not have enough space to explain the ideas, the data, the problems and the framework, so I chose to make it easy for everybody and to use the well-known concepts: syllables, onsets, rhymes, nuclei and codas.

2. Data and standard analysis

2.1 Data

The data used in this work originate from an electronic corpus which contains 12 210 German words taken from a CD-Rom version of the standard orthography dictionary of German (Duden (Maurer et al. 1996-2000)). This 12 210 words selection, which can be qualified as exhaustive, has been built in the following way.

The dictionary contains some 120 000 entries. In order to simplify the analysis (which otherwise would be quite a hard task), and for the sake of clarity, only monomorphemic words have first been retained. In fact, an examination of the whole German lexicon reveals (see 3.2) that once the length of a (tonic) vowel is defined in a root, it does *never* vary, even in the course of derivation, inflection or composition. It would not only be a foolish but also a 'perilous' idea to use the whole lexicon for the analysis: the words are too numerous, and the addition of any suffix would alter our perception of what the pertinent phonological context is. Considering a root which contains a long vowel such as *leb-* ['le:p] '(to) live', the quantity of the vowel will not be affected by the adjunction of any type of suffix: *leb-en* ['le:ben] '(to) live', *Leb-tag* ['le:ptak] 'life' and *leb-st* ['le:pst] 'you live' all enclose a long [e:]. A look at a form like *Leb-tag* ['le:ptak] 'life' could make one think that long vowels can freely occur in closed syllables, which is of course false: this is possible *only* when the syllable boundary between the two consonants coincides with a morpheme boundary.

Now that the origin of the data has been cleared, I will give a summary of what the standard synchronic generative analyses propose.

2.2 Standard analysis

Long and short vowels are said to be in complementary distribution in German (see Becker 1998, Benware 1986, Giegerich 1992, Hall 1992, Lenerz 2002, Ramers 1992, Vater 1992, Vennemann 1982): long vowels are found in open and short vowels in closed syllables (cf. (5)). From now on, I will refer to this first assumption, made by the various authors listed above, as 'standard analysis'. This standard analysis gives birth to the 'rhyme-weight requirement' for Standard German: a rhyme has to dominate two squelettal slots (i.e. either a short vowel and a coda consonant, or a long vowel, or a diphthong).[3]

If this statement were reflecting the exact reality, one could not be able to find long vowels in closed syllables and, vice versa, short vowels in open syllables, which is not true as table (6) shows.

[3] According to Wiese (1996) or Hall (1992, 2002), a rhyme can *at least* dominate two units (morae or C/V positions). According to Lenerz (2000, 2002), two is the *exact number* of units a *tonic* (internal or final) rhyme *has to* dominate. However they all agree that, in internal (tonic) syllabes, rhymes dominate exactly two units : either a short vowel and a coda, or a long vowel / diphthong.

(5) Vowel length distribution: first approximation

	a. Long vowels			b. Short vowels		
	German	IPA[4]	Gloss	German	IPA	Gloss
[iː] / [ɪ]	*Biene*	bi*ː*nə	bee	*Spindel*	ʃpɪndəl	spindle
[yː] / [ʏ]	*Bühne*	by*ː*nə	stage	*Münze*	mʏntsə	coin
[uː] / [ʊ]	*Blume*	blu*ː*mə	flower	*Ulme*	ʊlmə	elm
[eː] / [ɛ]	*Beere*	be*ː*rə	berry	*Grenze*	grɛntsə	limit
[øː] / [œ]	*Öde*	(ʔ)ø*ː*də	desert	*Mönch*	mœnç	monk
[oː] / [ɔ]	*Boden*	bo*ː*dən	ground	*Hopfen*	hɔpfən	hop
[ɑː] / [a]	*Name*	nɑ*ː*mə	crumb	*Galgen*	galgən	gallows
[ɛː] / [ɛ]	*hämisch*	hɛ*ː*mɪʃ	aggressive	*ächzen*	ɛçtsən	(to) groan
[aʊ]	*Bau*	baʊ	construction	/	/	/
[aɪ]	*Ei*	(ʔ)aɪ	egg	/	/	/
[ɔɪ]	*Eule*	(ʔ)ɔɪlə	owl	/	/	/
	6 506 (100 %) *In open syllables: 4 066 (62,50 %)* In closed syllables: 2 440 (37,50 %)			5 686 (100 %) In open syllables: 1 700 (29,90 %) *In closed syllables: 3 986 (70,10 %)*		

(6) Vowel length distribution: counter-examples

	a. Long vowels *in closed syllables*			b. Short vowels[5] *in open syllables*		
	German	IPA	Gloss	German	IPA	Gloss
[iː] / [ɪ]	*Kien*	ki*ː*n	shaving(s), cutting(s)	*binnen*	bɪnən	in (time)
[yː] / [ʏ]	*Müesli*	my*ː*sli	müesli	*brüllen*	brʏlən	(to) shout
[uː] / [ʊ]	*husten*	hu*ː*stən	(to) cough	*brummen*	brʊmən	(to) buzz
[eː] / [ɛ]	*Beet*	be*ː*t	patch	*Keller*	kɛlɐ	cave
[øː] / [œ]	*blöd*	blø*ː*ɐt	stupid	*Böller*	bœlɐ	drum
[oː] / [ɔ]	*Mond*	mo*ː*nt	moon	*Sonne*	zɔnə	sun
[ɑː] / [a]	*ahnden*	ɑ*ː*nden	(to) punish	*Hammer*	hamɐ	hammer
[ɛː] / [ɛ]	/	/	/	*fällen*	fɛlən	(to) blow down
[aʊ]	*raunzen*	ʁaʊntsən	(to) moan	/	/	/
[aɪ]	*Leiste*	laɪstə	moulding	/	/	/
[ɔɪ]	*räuspern*	ʁɔɪspɐn	(to) clear one's throat	/	/	/
	=> 2 440 !			***=> 1 700 !***		

[4] All phonetic transcriptions follow the convention of the International Phonetic Association. The abbreviation 'IPA' stands for 'phonetic transcription following the convention of the International Phonetic Alphabet'. In this article, I sometimes use other abbreviations: MHG stands for 'Middle High German', NHG for 'New High German', OHG for 'Old High German', VB for 'verb', ADJ for 'adjective', GEN for 'genitive', SG for 'singular', PL for 'plural', 1ST for 'first person marker', 2ND for 'second person marker', 3RD for 'third person marker', V for 'vowel', C for 'consonant', O for 'onset', R for 'rhyme', N for 'nucleus' and C for 'coda'.

[5] Some of the words under (4) have *graphic* geminates, as in *Sonne* ['zɔnə] 'sun'. This does *not* reflect any phonetic reality in Standard German, since the phonetic system does not include any geminate (however this is not true for the dialects of German: Bavarian, for instance, has real geminates). In Standard German, those double consonants have a pure graphic existence which is *in no way* grounded on the phonetic level. Some authors have argued that this graphic germination is *only* a way to remind the reader of the shortness of the preceding vowel (see Augst 1991 among others).

Table (5) illustrates the general pattern. However, paying attention to the figures at the bottom of table (5) and to the data like those under (6), it will be noticed that German exhibits a large number of counter-examples (precisely 4 140 items, i.e. 33 % of the whole corpus) which can be divided into two groups:

(6a) contains words in which long vowels are followed by at least one tautosyllabic consonant, i.e. stand in closed syllables.

(6b) illustrates a symmetric situation: 1 700 words, in which the tonic vowel occurs in an open syllable, enclose a short vowel (more than 60 % of the (tonic) vowels that occur in an open syllable are short).

How can the standard analysis account for those facts, without giving up the syllable theory? If one does not want to reconsider the initial observation that short vs. long vowels seem to occur in closed vs. open syllables, one has to find a strategy which will for instance force the intervocalic consonants of the words under (6b) into the coda of the first syllable, in order to make it closed and 'allow' the preceding vowel to be short. One also has to find a way to explain why the presence of 'coda' consonants under (6a) does not cause the preceding vowels to be short.

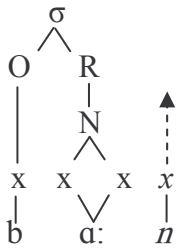
Both situations will be dealt with in the following sections.

2.2.1 Long vowels in closed syllables: extrasyllabicity

The first set mentioned (cf. (6a)) is composed of 2 440 words, which have one property in common: they all exhibit a long vowel which stands in a closed syllable. This set can be divided into three sub-groups: the first one, in which the long vowel precedes a final consonant (2 263 forms, like *Bahn* ['bɑ:n] 'way'); a second one in which the vowel is followed by at least two consonants at the end of the word (91 items, as in *Trost* ['tχo:st] 'comfort'), and another one in which the closed syllable is not final (87 words, as in *husten* ['hu:stən] '(to) cough'). The two last sets form a small group of counter-examples (only 7,3 % of the entire (6a)-Class, i.e. less than 1,46 % of the whole corpus), and this is the reason why I will not examine them in detail here.[6] However, the first group contains a lot of items, and is therefore a bigger problem for the analysis. It is composed of exactly 2 262 words, which exhibit a long vowel, itself followed by only one (simple) final consonant. This can be accounted for thanks to the concept of extrasyllabicity or to the notion of appendix (see for instance Giegerich 1992, where a definition of both concepts is explicitly given). Both can be used in order to postpone the association of the consonant to the syllable structure (as in (7)), and to let the syllable open until the vowel length rule has applied.

[6] Those 178 words, whose existence I cannot explain here, exhibit some peculiar features: some of them are loan words (98 forms, like *Nurse* 'nurse', from the English *nurse*) which are not yet phonologically integrated; others contain a s + C cluster (25 items, as in *Tro**st*** 'comfort'), which is known to regularly exhibit a special behaviour (see for instance Kaye 1992); others contain a diphthong in New High German, or had a diphthong in Middle High German, which appears to be a special object (21 words: MHG *w**uo**st* > NHG *Wust* 'pile') – see Caratini (2005); some others have lost a post-tonic vowel in the course of time – between Middle High and New High German (precisely 20, as in MHG *anelih* > NHG *ähnlich* 'same') – the vowel was however still there during the quantity adjustment which occurred in MHG; eleven of them contain a r + C cluster, in which /r/ is known to have triggered compensatory lengthening as in *za**rt*** ['tsɑ:t] 'mild'. The few forms that still remain unexplained are: *fahnden* ['fɑ:ndən] '(to) search', *ahnden* ['(ʔ)ɑ:ndən] '(to) punish' and *Mond* ['mo:nt] 'moon'. Here tonic vowels are followed by coronal consonants cluster, which are also known to be special objects (see Paradis & Prunet 1991). For more details, I refer the reader to Caratini (2005).

(7) Extrasyllabicity



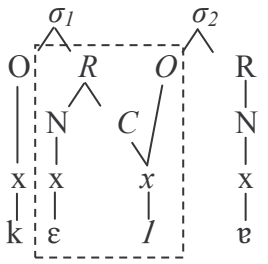
Bahn ‘way’

(7) gives the underlying structure of the word *Bahn* ‘way’. The final consonant /n/ is left unparsed. The preceding syllable is therefore not closed. This allows the vowel to be long, following the theory. However, if one confronts the idea to the data, it appears that both long and short vowels can occur in this context. Why should the /n/ in *Bahn* [’bɑ:n] ‘way’ (2 263 forms) be extrasyllabic contrary to the one in items like *dann* [’dan] ‘then’ (787 words)? On the one hand, if one adopts the extrasyllabicity / appendix solution, more than 6,4 % of the corpus remain unaccounted for; on the other hand, if extrasyllabicity / appendix is not used, 18,3 % of the corpus have to be considered as exceptions. This problem will be detailed below in section 3.3.

2.2.2 Short vowels in open syllables: ambisyllabicity

The counter-examples – under (6b) – have short vowels in open syllables. The strategy which is currently used in order to palliate to the existence of such forms consists in forcing the intervocalic consonant into the coda of the preceding syllable: this is the only use of ambisyllabicity (see Lenerz 2000, Vennemann 1982 and Wiese 1996 among others). All intervocalic consonants of the (6b)-set are analysed as belonging *simultaneously* to two syllables: as a coda to the preceding one, and as an onset to the following one, giving birth to a hybrid structure as the one shown under (8) for *Keller* ‘cave’ (see also the representation of *Mitte* [’mɪtə] ‘middle’ in (1) above).

(8) Ambisyllabicity



Keller ‘cave’

However, as I have already mentioned, this representation also raises a problem. One can easily find words in which the intervocalic consonant, even if standing in a similar environment as those in the words under (6b), is preceded by a long vowel: *König* [’kø:nɪç] ‘king’ has a ‘normal’ /n/ vs. *kennen* [’kɛnən] ‘(to) know’, which is supposed to have an ambisyllabic /n/. The problem is even worse: there are in fact minimal pairs like *Miete* [’mi:tə] ‘rent’ (‘normal’ [t]) vs. *Mitte* [’mɪtə] ‘middle’ (ambisyllabic [t]). For the moment, I only intended to point at the problem, which will be discussed below (3.4).

2.2.3 Summary

The assumption that long vs. short vowels occur in open vs. closed syllables cannot account for all the facts. However, it is a fact that it illustrates quite well the general pattern (only 26 % of the corpus remain unexplained). If one wants to guess the length of a vowel standing either in a final open, or in an internal closed syllable, no problem arises: vowel length can be easily predicted in those two environments. The difficulty arises in final closed or internal open syllables, because in those environments, both short and long vowels can be found: *dann* ['dan] 'then' but *Bahn* ['bɑ:n] 'way'; *Miete* ['mi:tə] 'rent' but *Mitte* ['mɪtə] 'middle'.

In the following section, the five main problems encountered by standard analyses will be discussed. First of all, I will examine the role of stress – in relation to vowel length. I will then mention the two possibilities that arise if one looks at any synchronic complementary distribution: considering it as a synchronic process vs. as a lexical property. I will then come back to the __ C # context (see 3.3), and to ambisyllabicity in section 3.4. The last paragraph will be devoted to an observation which will appear to be fundamental in section 4: the case of voiced ambisyllabic consonants, and their *(quasi-)absence* in German.

3. Problems of the standard analysis

3.1 Stress

The standard assumption that short vowels occur in closed vs. long ones in open syllables discussed above is only a first approximation. Five other elements have to be taken into account in order to predict German vowel length synchronically. The first of them is *stress*. It is a fact that vowel length distinctions in German crucially depend on stress. In other words, stressed vowels can be long or short (depending on the context), but unstressed vowels cannot be long. As table (9) shows, (i) apparent length alternations between the two columns are *systematically* associated with stress differences, and (ii) long vowels cannot show up in unstressed positions[7].

[7] An anonymous reviewer mentioned some words (namely *Herzog* ['he:ʁtsok] 'duke', *Wermut* ['ve:ʁmut] 'vermouth', *Japan* ['jɑ:pan] 'Japan' and *Motor* ['mo:tɔr] 'motor') which, according to him/her, exhibit a long vowel in unstressed position. Wermke & al. (2000) confirm this assertion for *Herzog*, *Wermut* and *Motor*, however they transcribe *Japan* with a short (second) [a]. I have also asked native speakers about their intuitions concerning those four forms. They underlined the fact that the second vowels in *Herz*o*g*, *Werm*u*t*, *Jap*a*n* and *Mot*o*r* are similar in quality to those italicised in *z*o*g* [tso:k] 'pull 1SG Preterit', *M*u*t* [mu:t] 'courage', *M*o*tor* [mo:toʁ] 'motor' or *Mot*o*ren* [mo'to:ʁen] 'motors' and *Jap*a*n* ['ja:pɑn] 'Japan' or *Jap*a*ner* [jɑ'pa:nɐ] 'japanese person'; but that the quantities in both series are definitely different (the examples are not even mine, but were spontaneously proposed by one of my informants). I will finally add that *Herzog* and *Wermut* are respectively derived and composed, and that *Japan* and *Motor* are loan words, which make them all 'dangerous' counter-examples…

(9) Stressed or not stressed?

a. Stressed[8] (long or short vowels)			b. Unstressed[9] (only short vowels)		
German	IPA	Gloss	German	IPA	Gloss
Möbel	’m*ø:*bəl	furniture	*möblieren*	m*ø*’bli:ʁən	(to) furnish
Model	’m*o:*dəl	(cake) tin	*Modell*	m*o*’dɛl	model
übersetzen	’(ʔ)*y:*bɐzɛtsən	(to) cross (river)	*übersetzen*	(ʔ)*y*bɐ’zɛtsən	(to) translate
aktiv	(ʔ)ak’t*i:*f	activ	*aktivieren*	(ʔ)aktɨvi:ʁən	(to) activate
Dosis	’d*o:*zɪs	dose	*dosieren*	d*o*’zi:ʁən	(to) measure

One cannot talk about length distribution in German without taking stress into account: the complementary distribution of long and short vowels holds in stressed syllables *only* (in German, no vowel can be long if it is not stressed). Another illustration for this would be that lots of monosyllabic unstressable prepositions – such as *von* [fɔn] ‘of, by’, *hin* [hɪn] ‘to’ or *bis* [bɪs] ‘to’ – never show up with a long vowel, whatever the context in which the vowel occurs: no length is possible without stress.

3.2 Vowel length distribution: process vs. lexical property?

The second point I would like to draw attention to has to do with the status of German length distinctions. It has been argued (see Wiese 1996:195, for instance) that vowel length in Modern German can be *synchronically* derived. According to such a proposal, every vowel of Modern German is *underlyingly long*; those which are short on the surface *also* derive from underlying long vowels *but have been shortened* because of standing in a closed syllable (‘closed syllable shortening’).

However, vowel length does not vary *at all* in German: no adjunction of suffix (whatever its nature is – derivational, inflectional) or even of a whole word (in composition) is able to influence the length of the root. This is illustrated in (10) below.[10]

[8] Under (9), italicised vowels are stressed in (9a), stressless in (9b).

[9] The quality of the vowel does not vary, however: stressless short vowels under (9b) have the same quality as their stressed counterparts in (9a); the [+/- ATR] value is identical in both columns.

[10] For a larger set of examples, I refer the reader to Caratini (2004:8-9).

(10) Length stability

Root	IPA	Gloss	Suffix	IPA	Gloss	Result	IPA	Gloss
Aas	’(ʔ)*aː*s	carrion	*Geier*	’gaɪɐ	vulture	*Aasgeier*	’(ʔ)*aː*s - gaɪɐ	vulture
			-es	əs	GEN	*Ases*	’(ʔ)*aː*zəs	vulture (GEN)
			-en	ən	VB	*Aasen*	’(ʔ)*aː*zen	(to) waste
leb-	’l*eː*p	live	*Tag*	’taːk	day	*Lebtag*	’l*eː*ptak	life
			-e	ə	1ST.SG	*Lebe*	’l*eː*bə	(I) live
			-st	st	2ND.SG	*Lebst*	’l*eː*pst	(You) live
Bett	’b*ɛ*t	bed	*Decke*	’dɛkə	cover	*Bettdecke*	’b*ɛ*tdɛkə	blanket
			-es	əs	GEN	*Bettes*	’b*ɛ*təs	(of the) bed
			-en	ən	VB	*Betten*	’b*ɛ*tən	(to) put to bed
Eck	’(ʔ)*ɛ*k	corner	*Ball*	’bal	ball	*Eckball*	’(ʔ)*ɛ*kbal	corner (football)
			-e	ə	PL	*Ecke*	’(ʔ)*ɛ*kə	corners
			-ig	ɪç	ADJ	*Eckig*	’(ʔ)*ɛ*kɪç	angular

This generalisation holds for the bigger part of the lexicon; however, I have to admit that there are some exceptions: those are the well-known ‘strong’ paradigms (‘starke Paradigmen’) which exhibit apparent regular length alternations (for instance: *geben* [geːbə’n] ‘(to) give’ vs. gibt [’gɪpt] ‘(he) gives’[11] or *schneiden* [’ʃnaɪdən] ‘(to) cut’ vs. *Schnitt* [’ʃnɪt] ‘(a) cut’). But these form a small subset of the lexicon, and they seem to be fully lexicalised (non-productive morphology).

If one leaves those strong forms apart, there is no real vowel length alternation in Modern German. So, as there is no alternation, why should one posit – like Wiese (1996) for instance – that, underlyingly, all vowels have the same length value (namely long), and that some of them (those which are phonetically short) undergo a shortening process because they stand in closed syllables? I have found no motivation for this.

Vowel length does not vary. If a consonantal suffix like *-st* ‘3RD.SG’ is added to a stem like *leb-* [’leːp] ‘(to) live’ which has a long vowel, the resulting structure still has a long vowel. One could think that long vowels occur freely in open as well as in closed syllables. However this generalisation does not work for monomorphemes, for which vowel length and (syllable) structure are closely related to each other (*finden* [fɪndən] ‘(to) find’ but *[fiːndən]). This is the reason why I have chosen to build a corpus of monomorphemic words, and to exclude – if possible – inflected and derived forms as well as compounds.

3.3 Final simply closed syllable: the __ C # context

I will briefly go back to the dilemma first mentioned in 2.2.1: even though both vowels in *Fuß* [’fuːs] ‘foot’ and *Nuss* [’nʊs] ‘nut’ stand in a closed syllable, they do not have the same length. Why does the final consonant in *Nuss* behave as a ‘real’ coda (i.e. closes the preceding syllable, so that its vowel is short) contrary to the one in *Fuß* which does not trigger the shortness of the preceding vowel?

Everything is trouble-free if one looks at internal closed syllables, which always cause their vowel to be short. Why do final closed syllables behave differently as internal ones?

[11] Some speakers prefer [giːpt] to [gɪpt], indicating that strong forms also obey the main rule.

Table (11) illustrates the four patterns that can be observed in closed syllables: short and long vowels in internal closed syllables, short vs. long vowels in final closed syllables.

(11) Internal vs. final closed syllables: __ C . C vs. __ C #

Syllabe		German	IPA	Gloss	Number	
a. Internal	i. Short	*finden*	’f*ɪ*ndən	(to) find	3198 – 94,73 %	=> rule
		halten	’h*a*ltən	(to) hold		
	ii. Long	*Zierde*	’ts*i:*ɐdə	ornament	178 – 5,27 %	=> exception
		husten	’h*u:*stən	(to) cough		
b. Final	i. Short	*Nuss*	’n*ʊ*s	nut	**787 – 25,8 %**	**=> exception**
		Bett	’b*ɛ*t	bed		
	ii. Long	*Fuß*	’f*u:*s	foot	**2263 – 74,2 %**	**=> rule!**
		Sieg	’z*i:*k	victory		

Long vowels in internal closed syllables seem to be exceptional (only 5,27 % of the items containing a vowel in internal closed syllable). Furthermore, as stated in 2.2.1, forms like *Zierde* exhibit peculiar features which are mentioned in foot-note 6. On the contrary, long vowels in final closed syllables seem to be the normal case (more than 74 %). However, there is a great number of exceptions: 26 % of the words whose vowel precedes a final consonant exhibit a short vowel. One could say that final consonants do not count as codas, as does the extrasyllabic analysis. The remaining 26 %, which represent 787 forms, would count as ‘exceptions’. But these cannot be left unaccounted for: if the /s/ in *Fuß* is extrasyllabic, so has to be the one in *Nuss*. And if the /s/ in *Nuss* is a coda, the final /s/ of *Fuss* also has to be[12]. Phonology has to account for this. Besides, the *a priori* specificity of German is that both patterns (final consonant as a coda vs. something else) seem to co-exist: usually, a given language only exhibits one of the two possibilities (homogeneous behaviour). In German, final consonants are ‘schizophrenic’: sometimes a coda, and sometimes nothing; sometimes triggering the shortness of the preceding vowel, sometimes not…

Furthermore, the reasons why those segments should be extrasyllabic have to be explained; and *if* it turns out that the only motivation for extrasyllabicity in the phonology of German is the need to give an account for vowel length distribution, it will be an obvious case of circularity, since vowel length defines the set of extrasyllabic consonants, which itself defines vowel length…

Final consonants do not generally behave as codas in German: most words (precisely 74,2 %) whose tonic vowel precedes a final consonant exhibit a long vowel.[13] Therefore I claim that (simple) final consonants are not codas in Standard German, and that the (at first sight simple) consonants that trigger the shortness of the preceding vowel are in fact (virtual) geminates.

[12] Otherwise, how can the underlying structure be constructed by an algorithm? The problem is, of course, avoided if the structure is present in the mental lexicon.

[13] In fact, an investigation shows that the exceptions to this generalisation either historically (in MHG or/and OHG) attested a geminate, or belong to the class of unstressable function words (prepositions, conjunctions etc).

3.4 Ambisyllabicity

As I mentioned in 2.2.2, a symmetrical problem exists word internally, in open syllables. As table (12) shows, both long and short vowels are found in this context. The problem is even worse: minimal pairs as those under (13) can be found.

(12) Vowel dilemma before an intervocalic (phonetically simple) consonant

a. Long vowel			b. Short vowel		
German	IPA	Gloss	German	IPA	Gloss
haben	ˈhɑːbən	(to) have	*schrubben*	ˈʃχʊbən	(to) rub
Biene	ˈbiːnə	bee	*können*	ˈkœnən	can
beten	ˈbeːtən	(to) pray	*Ratte*	ˈʁatə	rat
Küken	ˈkyːkən	chick	*backen*	ˈbakən	(to) bake
hören	ˈhøːʁən	(to) hear	*schnorren*	ˈʃnɔʁən	(to) pout
Kugel	ˈkuːgəl	ball, bowl	*Bagger*	ˈbagɐ	excavator
Bogen	ˈboːgən	bow	*eggen*	ˈɛgən	(to) harrow

(13) Minimal pairs

	a. Long vowel			b. Short vowel		
	German	IPA	Gloss	German	IPA	Gloss
1	*bieten*	ˈbiːtən	(to) offer	*bitten*	ˈbɪtən	(to) beg
2	*wider*	ˈviːdɐ	against	*Widder*	ˈvɪdɐ	ram
	wieder	ˈviːdɐ	again			
3	*beten*	ˈbeːtən	pray	*betten*	ˈbɛtən	(to) put to bed
4	*Sehne*	ˈseːnə	rope	*Senne*	ˈsɛnə	alp
5	*stehlen*	ˈʃteːlən	(to) steal	*stellen*	ˈʃtɛlən	(to) place
6	*zählen*	ˈtseːlən	(to) count	*Zellen*	ˈtsɛlən	cell
7	*zehren*	ˈtseːʁən	(to) mine	*zerren*	ˈtsɛʁən	(to) pull
8	*fühlen*	ˈfyːlən	(to) feel	*füllen*	ˈfʏlən	(to) fill
9	*Hüte*	ˈhyːtə	hats	*Hütte*	ˈhʏtə	hut
10	*Höhle*	ˈhøːlə	cave	*Hölle*	ˈhœlə	hell
11	*Buhle*	ˈbuːlə	lover	*Bulle*	ˈbʊlə	bull
12	*spuken*	ˈʃpuːkən	haunt	*spucken*	ˈʃpʊkən	spit
13	*Ofen*	ˈ(ʔ)oːfən	oven	*offen*	ˈ(ʔ)ɔfən	open
14	*Schote*	ˈʃoːtə	pod	*Schotte*	ˈʃɔtə	scottish
15	*wohnen*	ˈvoːnən	(to) live	*Wonnen*	ˈvɔnən	excitement
16	*Ahle*	ˈ(ʔ)aːlə	awl	*alle*	ˈ(ʔ)alə	all
17	*fahre*	ˈfaːʁə	drive (I)	*Farre*	ˈfaʁə	young bull
18	*haaren*	ˈhaːʁən	(to) lose one's hair	*harren*	ˈhaʁən	(to) wait
19	*Haken*	ˈhaːkən	nail	*hacken*	ˈhakən	(to) chop (up)
20	*rate*	ˈʁaːtə	(I) guess	*Ratte*	ˈʁatə	rat

In order to eliminate the problem, it has been argued that the vowels in the words under (12b) and (13b) (but not (12a) and (13a)) are followed by an ambisyllabic consonant (see Hall 1992; Hall 2000; Ramers 1992; Vennemann 1982; Wiese 1986; Wiese 1996). This causes the preceding vowel to stand in a closed syllable, and allows it to be short.

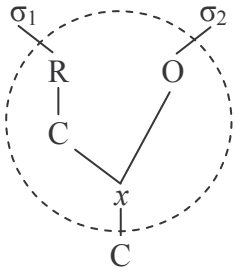
I would now like to underline five things, which suggest that there is no ambisyllabicity in German.

First of all, why should the [t] in *Hütte* [ˈhʏtə] 'hut' be ambisyllabic, contrary to the one in *Hüte* [ˈhy:tə] 'hats'? There is no apparent reason for this, apart from the fact that it provides an explanation for the problem at hand. The difference between both /t/s has nothing to do with phonetics, syllabification, sonority principles or even with phonotactics (apart from vowel length distribution). So how can one know, how a /t/ has to be syllabified? Ambisyllabicity has no external justification: no argument in its favour can be found outside the world of vowel length. So on the one hand, theoretical assumptions concerning vowel length need the concept of ambisyllabicity (if it did not exist, how can the standard analysis in terms of syllable weight account for the words under (13b)?). On the other hand, however, ambisyllabicity is defined in accordance with the length of the preceding vowel. That is a circular analysis (see (15a)). These two remarks seem to indicate that ambisyllabicity is a lexical property; but, syllable structure is the product of an *algorithm*. So, how can it be lexical if it is constructed? The only reason for ambisyllabicity to exist in German is the following: it was the only 'manipulation' one could think of in order to defend / maintain the analysis in terms of syllable weight. But syllable weight in turn defines which segment has to be ambisyllabic. This hypothesis cannot be falsified.

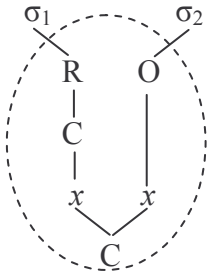
Furthermore, this concept can combine two 'qualities'. It is a very 'practical' tool: as the consonant is linked to only one x-slot, it is phonetically short; on the other side, it belongs simultaneously to two syllables, which makes it structurally dual. Ambisyllabicity is a very convenient concept: it combines a *simple articulation* – which mirrors the phonetic reality – with a *complex structure*. Its complex structure provides a justification for the shortness of the preceding vowel. But if this hybrid object has the effect of two consonants, why don't phonologists simply assume that ambisyllabics are in fact geminates (cf. (14b))? The answer is quite simple: because ambisyllabics *never* surface as *phonetic* geminates; and such an assumption would be considered as very 'abstract' (see (15b)).

(14) Ambisyllabic vs. geminate consonants

a. Ambisyllabic consonant



b. Geminate consonant



A third observation will be that even if ambisyllabics are coda consonants[14], they are not affected by coda processes, such as devoicing, spirantisation or vocalisation. Their presence also prohibits compensatory lengthening (see (15c)). They seem to be immune to coda-processes. Those particular properties will remind the reader of a specificity of geminate consonants, which is known as 'geminate inalterability' or 'geminate integrity' (see Kenstowicz 1973, Hayes 1986, Schein 1986 or Selkirk 1991). This inalterability of ambisyllabic consonants is usually accounted for by a 'Linking Constraint' (as in Kahn 1976, Hayes 1986 or Wiese 1996) in standard analyses: every rule stipulation has to be interpreted as exhaustive, which means that coda processes only apply to consonants which are in coda position and *only in coda position*, i.e. not in onset position ('Linking Constraint', see Hayes 1986, or Hulst 1985). This formulation excludes clearly – and uniquely – ambisyllabic consonants. So why do phonologists not posit that those ambisyllabics are in fact (virtual) geminates – whose integrity is 'famous' – instead of creating a new structure which has no external justification and whose effects (shortness of the preceding vowel) and properties (integrity) are the same as those of geminates?

The fourth argument will be to say that most of the ambisyllabic consonants in New High German come from Middle High German geminates (see (15d)). I do not claim that vowels preceding ambisyllabics are short in NHG because the following consonants were true geminates in MHG. This would make no sense: NHG speakers do not usually speak MHG, so they do not know what MHG looked like. But the fact that those ambisyllabic consonants historically come from MHG geminates is a clue to their real identity: NHG ambisyllabic consonants are in fact virtual geminates (with a structure like the one under (14b)). 'Virtually' means that they are *phonologically* geminates, even if they never surface as such in NHG, at the phonetic level. This is however not surprising, because Modern Standard German does not have any geminate at the phonetic level.[15] They do not themselves reveal their identity (they are not long, contrary to 'standard' geminates), however their structure can be read on the preceding vowel, which is short.

The fifth and last clue to the identity of ambisyllabic consonants come from their graphic representation: every ambisyllabic consonant is written as a geminate (cf. (15e)). This is true for 83,5 % of the forms which contain an ambisyllabic consonant. The last 16,5 %, which do not have a graphic geminate, have something in common: in each item, the intervocalic consonant either is a complex grapheme (like <ch>, <sch>, <chs>), or represents a cluster (like <x> which stands for [ks]), which could be the reason why they are not graphically geminated. Once again, I do not claim that all graphic double consonants have a phonological / cognitive reality in every language; rather, that *in German* graphic forms are giving us clues to the identity of those consonants.

Table (15) provides a summary of the arguments mentioned above, and gives an illustration for each case.

[14] Every ambisyllabic consonant is associated, at its left, with the coda of the preceding syllable, even if the segment is only partly in coda position. Nevertheless it has coda effects on the preceding vowel, therefore it is also supposed to behave like a coda, i.e. to be affected by the four coda-processes mentioned below (cf. Wiese 1996 among others).

[15] The only geminates that German could have would be created by affixation. However, if a prefix like *–ab* /ab/ 'dis-' is added to base like *biegen* ['bi:gən] '(to) bow', the resulting form will be *abbiegen* /ab+bi:gən/ [a***b***i:gən] '(to) turn', with a simple consonant, and not *[a***bb***i:gən].

(15) Five arguments against ambisyllabicity

Observations	Examples	
a. No external motivation	*Miete* [ˈmiːtə] ‘rent’ vs. *Mitte* [ˈmɪtə] ‘middle’	
b. Effect (preceding vowel)	Same effects as clusters (preceding vowel = short)	*finden* [ˈfɪndən] ‘find’ , *halten* [haltn] ‘(to) hold’ *bitten* [ˈbɪtən] ‘(to) please’, *Hammer* [hamɐ] ‘hammer’
c. No sensibility to coda processes	Devoicing:	*Rad* [t] "wheel" vs. *Bagger* [g] "excavator"
	/ʁ/-vocalisation:	*Herr* [ɐ] "Mister" vs. *Herren* [ʁ] "Misters"
	Comp. lengthening:	*Arz*t [ˈaatst]"doctor" vs. *harren* [ʁ]"(to) wait"
	/g/-spirantisation:	*Honig* [ç] "honey" vs. *Knigge* [g] "savoir-vivre manual"
d. Origins	MHG geminates MHG clusters	NHG *Keller* cave’ < MHG *keller* NHG *Zimmer* ‘room’ < MHG *zimber*
e. Graphic form	NHG ambisyllabics are written as geminates	*Stimme* ‘voice’, *Nonne* ‘nun’, *Kasse* ‘cash-box’, *Acker* ‘field’, *Rippe* ‘rib’

Before I start to discuss the relationship that exists between consonantal voicing and vowel length, I would like to draw attention on something interesting.

Let me go back to the ambisyllabic hypothesis. Contrary to the virtual geminate analysis, ambisyllabicity is unable to account for the ambiguous length distribution in final closed syllables. Clearly, ambisyllabicity cannot be used in this context: how could the /ʁ/ in *klar* ‘clear’ or in *narr* ‘dumb’ be ambisyllabic, since the words are isolated and monosyllabic?[16] The final consonant cannot be linked to a following syllable since there is none. However, if ambisyllabics are in fact geminates, they *can* occur *both* word-internally *and* word-finally. The virtual geminate hypothesis consists in saying that:

a. first, short vowels are followed by geminates (coda-onset word-internally, and complex coda clusters word-finally) whereas long ones precede simple consonants (both word-internally and word-finally);

b. second, that final (simple) consonants are *not* codas (in German), but something else (onsets) or even nothing.

c. of course, there is no need of a synchronic ‘gemination rule’: consonants are *lexically* long or short.

d. and consonantal length defines vowel length, not the contrary.

3.5 Voice value and its relationship with the length of the preceding vowel

This (last) part of the section will be devoted to a new comer in German phonology: the relationship that obviously exists between consonantal voicing and vowel length in German. If one considers the (monomorphemic) lexicon of the language, and looks at surface forms only (i.e. in pre-theoretical terms, forgetting the ambisyllabicity hypothesis), the following table can be established:

[16] However, it has been argued that final consonants could be ambisyllabic in Swets (2004). She presents an analysis of Tilburg Dutch in which she includes such a hypothesis, but her ‘final ambisyllabic’ consonants are similar to the virtual geminates I propose for German, i.e. one melodic segment linked to two squelettal slots.

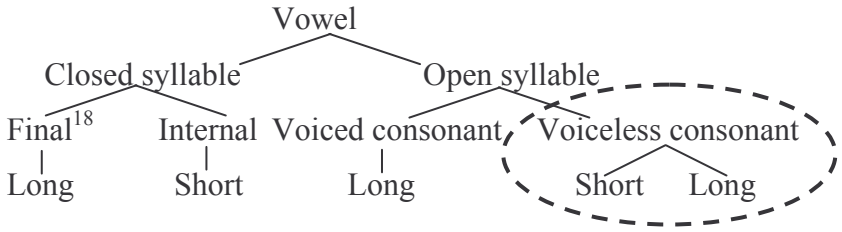
(16) Intervocalic consonants preceded by a short (tonic) vowel

Type of Consonant	Type of word	Words	IPA	Gloss	Number	%
a. Voiced obstruent	Native	*Roggen*	’ʁɔ*g*ən	rye	10 – 8,85 %	0,72
	Loan	*Bagger*	’ba*g*ɐ	excavator	103 – 91,15 %	7,37
b. Voiceless obstruent	Native	*messen*	’mɛ*s*ən	measure	346 – 44,59 %	24,77
	Loan	*Office*	’ɔ*f*is	office	430 – 55,41 %	30,78
c. Sonorant	Native	*Finne*	’fɪ*n*ə	fin	225 – 46,11 %	16,11
	Loan	*Barrel*	’ba*ʁ*əl	barrel	263 – 53,89 %	18,33

As is shown in table (16a), less than 9 % (only 113 forms) of German’s ambisyllabic consonants are voiced obstruents. In addition, most of the items which contain a voiced ambisyllabic obstruent appear to be loan words (103). A closer look at table (16) shows that only 10 of them are native forms. In sum, among all the forms that contain an ambisyllabic consonant, only 0,72 % are native words which exhibit a voiced obstruent. So, if those 10 words are let apart, German does not have any native voiced ambisyllabic obstruent. In other words, only sonorants and voiceless obstruents can be ambisyllabic. Why is that so? If ambisyllabicity is a predictable structure, why cannot voiced obstruents be ambisyllabic? If only voiceless obstruents and sonorants can be ambisyllabic, phonology has to account for it.

Going back to the vowels, it means that voiced obstruents always follow a long vowel (and are never preceded by a short vowel), whereas both long and short vowels are allowed before a voiceless consonant: whereas /ʊtV/ and /u:tV/ and /u:d(V)/ are attested (in *Mutter* [’mʊtɐ] ‘mother’, *Stute* [’ʃtu:tə] ‘mare’ and *Bude* [’bu:də]‘hut’), */ʊdV/ is not (* *Mudde* *[’mʊdə]).[17] There seems to be a relationship between the voice value of the consonant and the length of the vowel that precedes it. (17) provides a (provisory) concluding algorithm which can account for vowel length distribution in German (from a synchronic point of view).

(17) Vowel length algorithm (surface forms; synchrony)



[17] As an anonymous reviewer noticed, *Widder* [’wɪdɐ] ‘ram’ exhibits such a pattern: it is one of the 123 exceptions that still survive…

[18] ‘Final consonants’ just refer to simple absolute final consonants. Final geminates pattern together with consonant clusters.

3.6 Conclusion

In this third section, I have listed some problems that exist in the standard analysis of vowel length distribution in German: the role of stress (which is often forgotten), the status of vowel length distinction (process vs. lexical property), the ambiguity of the __ C # context, the problems that arise in the __ C V environment and the relation between voicing and length.

The main problem of this last section was: why do the phonology of German need ambisyllabicity, and what are the limits of this concept? The answer to the first part of the question is not satisfying: ambisyllabicity has been proposed for German in order to explain vowel length distribution without using abstract concepts such as 'phonetically simple (i.e. virtual) geminate', which is also at first sight paradoxal.

As I tried to find out what the limits of this concept were, several things emerged:

(18)

a. Ambisyllabicity has no external motivation (cf. (15a))
b. Ambisyllabic consonants have the same effects as heterosyllabic clusters on the preceding vowel (they trigger its shortness) (cf. (15b))
c. They are *never* affected by coda processes (cf. (15c))
d. They come (most of them) from Middle High German geminates (cf. (15d))
e. They are written as geminates in Modern Standard German (cf. (15e))

All those elements indicate that ambisyllabics are in fact phonological geminates (at least in German). These geminates never surface as such at the phonetic level because they are 'forbidden' in German. This idea – i.e. that ambisyllabic consonants have to be represented as geminate – is not new: it has already been proposed for Dutch for instance, in order to account for a very similar problem (Duch short and long vowels are distributed in the same way as in German, see Van der Hulst 1985, Van der Hulst & Smith 1982). Van der Hulst underlines the fact that ambisyllabicity also involves an 'improper bracketing', which is inconvenient. The intervocalic consonant belongs simultaneously to two syllables: where should the syllable break be placed? He also concedes that if one posits that so-called ambisyllabic consonants are in fact geminates, the only claim one has to make is that geminates do 'not receive the same interpretation in all languages' (p. 61): *phonological* geminates are also *phonetic* geminates in Italian for instance, but it does not have to be the case in German, English and Dutch.

The last point I will repeat before I introduce another way to account for the German data, is that ambisyllabicity is unable to account for the *a priori* curious vowel length distribution in the __ C # context, whereas, as mentioned in 3.4, the geminate alternative can provide an explanation for it.

4. What the facts show – another analysis

Since the ambisyllabic analysis fails to account for German vowel length distribution, one can wonder where the problem precisely is. And the question which has – logically – to be asked,

and whose answer could be the key of the problem, is: where do ambisyllabic consonants come from?

The neo-grammarian approach was to say that modern ambisyllabics have three origins (see Burghauser 1891, Mettke 1993, Paul 1884, Paul et al. 1998). They come either (a) from an OHG / MHG cluster, or (b) from an OHG / MHG geminate, or (c) from simple consonants followed by certain endings (-er, -el, -en, -em), which are supposed to have (diachronically) triggered the shortness of the preceding vowel.[19] Examples are given under (19a.ii).[20]

(19) Ambisyllabicity: the origins

	Type	NHG	MHG	API	Gloss	Structure
a. Expected behaviour	i. NHG long	*du*	*dû*	’d*u:*	You	F OS
		froh	*vrô*	’fχ*o:*	Happy	
		Biene	*bine*	’b*i:*nɐ	Bee	I OS
		Beere	*bere*	’b*e:*ʁə	Berry	
	ii. NHG short	*Zimmer*	*zimber*	’ts*ɪ*mɐ	Room	I CS (cluster)
		Imme	*impe*	’*ɪ*mə	Bee	
		Keller	*keller*	’k*ɛ*lɐ	Cave	I CS (geminate)
		Löffel	*leffel*	’l*œ*fəl	Spoon	
		Koppel	*kopel*	’k*ɔ*pəl	Enclosure	I OS + /-el/
		Zettel	*zetel*	’ts*ɛ*təl	Message	
		Mutter	*muoter*	’m*ʊ*tɐ	Mother	I OS + /-er/
		immer	*iemer*	’*ɪ*mɐ	Always	
		müssen	*müeZen*	’m*ʏ*sən	Must	I OS + /-en/
		Waffe	*wâfen*	’v*a*fə	Weapon	
b. Problems	i. NHG long	*haben*	*haben*	’h*a:*bən	(to) have	I OS + /-en/
		Vater	*vater*	’f*a:*tɐ	Father	I OS + /-er/
		Hagel	*hagel*	’h*a:*gəl	Hail	I OS + /-el/
	ii. NHG short	*Mitte*	*mite*	’m*ɪ*tə	Rent	I OS without any /-er/, /-el/, /-en/, /-em/
		Granne	*grane*	’gʁ*a*nə	Beard	
		Wette	*wete*	’w*ɛ*tə	bet(ting)	

In order to improve this diachronic analysis, I have added historical facts to the initial corpus: whenever possible (i.e. when they were available and for native words only), both Middle High and Old High German forms have been inserted.

It is a fact that most ambisyllabic consonants come from MHG / OHG clusters or geminates (see (19a.ii)). However, it appears that the generalisation (c) does not hold. If -er, -el, -en, and -em had triggered the shortness of the preceding vowel, words with a -er, -el, -en, or -em ending and a long (tonic) vowel should not exist; but they do (cf. (19b.i)). Vice-versa, words having anything but -er, -el, -en or –em in the post-tonic syllable should exhibit long (tonic) vowels, which is not the case either. ((19b.ii) gives a sample of forms whose vowels – short in NHG – were not followed by a syllable containing a relevant -er, -el, -en, or -em in MHG).

[19] ‘Shortness’ refers either to the fact that MHG long vowels have shortened or to the fact that MHG short vowels have not lengthened.

[20] In the last column of table (19), I use the following abbreviations: I stands for ‘internal’, F for ‘final’, CS for ‘closed syllable’ and OS for ‘open syllable’.

I will leave the words in (19b.i) aside for the moment. What do the forms in (19a.ii) and (19b.ii) have in common? The answer is quite simple: in each case, the tonic vowel stands before an open syllable containing a schwa <e> [ə]. So it seems that the context (c) must be extended to the simple presence of schwa. Schwa is not a 'normal' vowel, as it cannot allow the preceding vowel to lengthen / remain long (the preceding vowel is short in NHG). If a tonic vowel stands in an open syllable preceding schwa, it is as if it were standing in a closed syllable. (20) opposes schwa to the other so-called 'full' vowels:

(20) Schwa vs. full vowel[21]

Following vowel	NHG	MHG	IPA	Gloss
a. Full vowel	*Brezel*	*brêzile*	’bʁe:t͡səl	pretzel
	Monat	*mânô*	’mo:nat	month
	Zwiebel	*zwibolle*	’tsvi:bəl	onion
b. Schwa	*immer*	*i(e)mer*	’ɪmɐ	always
	Rippe	*ribe*	’ʁɪpə	rib
	Mutter	*muoter*	’mʊtɐ	mother

(20) illustrates the fact that whereas full vowels allow the preceding vowel to be long in NHG (cf. (20a)), schwa does not (cf. (20b)). Hence the diachronic disjunction under (21): vowels are short in NHG if they were in a closed syllable in MHG, or in an open syllable followed by schwa.

(21) Diachronic disjunction

$$V \,/\, \_\_ \begin{Bmatrix} CC\# \\ \text{C.CV} \\ \text{.C schwa} \end{Bmatrix}$$ [22]

Schwa and nothing are the same. This disjunction has already been identified for German and Dutch, concerning the distribution of the velar nasal (see for instance Vennemann 1970 for German, Oostendorp 1995 and Trommelen 1983 for Dutch).[23]

This idea provides a way to account for (19a.ii) and (19b.ii). However, one problem still exists: what can be done with the (19b.i) class, which exposes words which have a long vowel, even though the following syllable contains a schwa? It appears that the words of this group (almost) all have a voiced intervocalic consonant. This could be pure coincidence. But in fact, the presence of a voiced consonant triggers the length of the preceding vowel (cf. (22)): only the words whose intervocalic consonant is voiceless in MHG can have a short vowel in NHG. To be more explicit, the presence of a voiceless consonant causes the preceding vowel to be short.

[21] It is however hard to make such a comparison, since NHG does not exhibit a lots of full vowels in stressless positions: in this precise environment, (almost) all vowels have already been reduced to schwa between OHG and MHG.

[22] V stands here for 'short vowel'.

[23] I would have liked to show how it is possible to account for this, but I have no time to do it here.

(22) Voicing and length

	Vowel length	Context	Voiced consonants				
			MHG	NHG	IPA	Gloss	Nber
a. Voiced consonants	i. Long	Final: __ C #	*ra*/d/	*Rad*	’ʁa:t	wheel	90
			bahn	*Bahn*	’ba:n	way	263
		Internal: __ C V	*sagen*	*sagen*	’za:gən	(to) say	397
			hoeren	*hören*	’høʁən	(to) hear	295
	ii. Short	Final: __ C #	*ha*/b/	*Haff*	’haf	lagoon	11
			vol	*voll*	’fɔl	full	53
		Internal: __ C V	*fluoder*	*Flunder*	’flʊndɐ	halibut	31
			teler	*Teller*	’tɛlɐ	plate	90
b. Voiceless consonants	i. Long	Final: __ C #	*ûf*	*auf*	’(ʔ)ɑʊf	on	164
			hof	*Hof*	’ho:f	yard	
		Internal: __ C V	*îtel*	*eitel*	’(ʔ)ɑɪtəl	conceited	224
			floeßen	*flößen*	’fløːsən	(to) carry	
	ii. Short	Final: __ C #	*blat*	*Blatt*	’blat	sheet of paper	123
			vluZ	*Fluss*	’flʊs	river	
		Internal: __ C V	*betelen*	*betteln*	’bɛtəln	(to) beg for	102
			lâZen	*lassen*	’lasən	(to) let	

The items under (19b.i), which have a long vowel followed by a voiceless intervocalic consonant, and which do not conform to the generalisation made above, exhibit some special features. They:

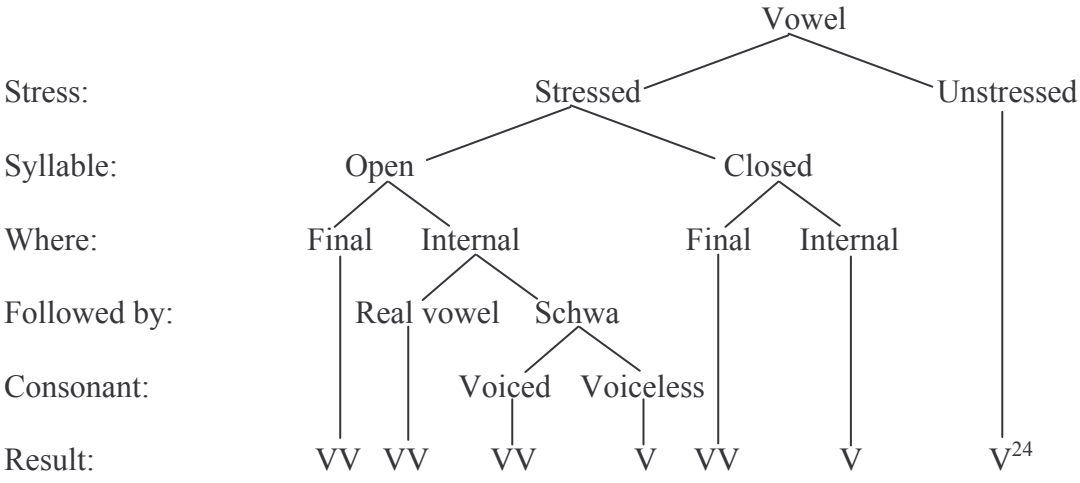
(23)
- a. either contain(ed) a diphthong (in NHG or in MHG), which, as shown in Caratini (2005), has to be treated separately from (long) monophthongs (MHG *îtel*, *koufen*, *miete* > NHG *eitel* [’aɪtəl] ‘conceited’, *kaufen* [’kaʊfən] ‘(to) buy’, *Miete* [’mi:tə] ‘rent’)
- or b. had <h> as intervocalic consonant, but <h> has been lost between MHG and NHG (MHG *truhe* > NHG *Truhe* [’tχu:ə] ‘chest’)
- or c. underwent a voice value change of the intervocalic consonant between MHG and NHG (MHG *kemenade* > NHG *Kemenate* [kemenɑ:tə] ‘attic room’)
- or d. have lost a final schwa, which placed the preceding vowel in a context where it has to be long (__ C #, cf. 3.3): MHD *geroete* > NHD *Gerät* [ge’re:t] ‘equipment’
- e. Words like NHG *Vater* (< MHG *vater*) ‘father’ are not numerous (123, i.e. 3,17 % of the corpus, see Caratini 2005:605 for the complete list), but still have to be considered as exceptions.

The idea that the voicing of a consonant has an influence on the length of the preceding vowel is new in the phonology of German. However, it has already been mentioned in phonological analyses of Polish (see Scheer 2004), of Italian (Baroni & Vanelli 2000), and also, in *phonetic* descriptions of Norwegian, French or German (see Fintoft 1961 and Chen 1970 among

others). In German, if a (tonic) vowel is followed by an intervocalic *voiced* consonant, it will be *long*; otherwise, it will be short.

I have shown that in fact three factors have to be taken into account in order to predict vowel length in German: stress, quality of the syllable (open vs. closed), nature of the post-tonic vowel (full vowel vs. schwa), and the voice value of the intervocalic consonant. Those three factors are grouped in an algorithm under (24):

(24) Vowel length algorithm (diachrony)



5. Concluding remarks

In this paper, I have first of all explained the 'standard analysis' proposed in order to account for the distribution of long and short vowels in Standard German: phonologists have argued that long vs. short vowels occur in open vs. closed syllables. I have then pointed out some flaws of this analysis: the (non-)consideration of the importance of stress; the way ambisyllabicity works, its drawbacks and limits; the problem raised by the extrasyllabic / appendix hypothesis (how can extrasyllabicity be predicted?). I showed in section 3 that the problems caused by the ambisyllabic hypothesis can be solved if ambisyllabics are represented as geminates.

I have also demonstrated that vowel length distribution in modern standard German can be accounted for, without the help of ambisyllabicity or extrasyllabicity / appendix. This analysis only needs to know a few parameters:

[24] Once again, diphthongs behave in a special way: they can also stand in stressless positions, as in *August* [aʊ'gust] 'id.'.

(25) a. The place of stress: stressed vowels can be long but unstressed vowels cannot
b. The structure of the syllable which contains the vowel (open vs. closed)
c. The position of the syllable in the word (final vs. internal)
d. The identity of the following vowel (if applicable): full vowels trigger the length of the preceding vowel whereas schwa triggers its shortness
e. The voice value of the following (intervocalic) consonant (if applicable)[25]

In native items, stress is a lexical property – not something that can be derived synchronically – which alone is able to 'allow' vowels to be long: length is not possible without stress in German. In order to predict vowel length, one also has to know the structure of the (tonic) syllable: in closed syllables, vowels are short, whereas in open (tonic only) syllables vowels are long; length not being a derived but a lexical property of roots. As stated in (25c), one also needs to know the position of the syllable in the word: internal coda consonants are 'real' codas, whereas final (simple) consonants are never codas in German. The next important thing which has to be taken into account is the nature of the following vowel: full vowels allow the preceding vowel to be long, whereas schwa does not (it is always preceded by a short vowel). Of course, the voice value of a post-tonic intervocalic consonant is also very significant, since voicelessness triggers the shortness of the preceding vowel; and symmetrically, voiced obstruents are always preceded by long vowels.

I have to admit that there are still some exceptions to these generalisations, but only 123 items are left unaccounted for (see Caratini 2005:605 for the complete list). And even if they are a very small part of the corpus used in this work, they will have to be explained. I have briefly mentioned that diphthongs are a special object, and that it was the main cause of irregularities (MHG diphthongs never shorten, whatever the context in which they occurred). Therefore, NHG has diphthongs in internal closed syllables (e.g. NHG *seufzen* '(to) sigh'). However, I don't know yet how to account for this, but I assume it must be due to the structural peculiarities of German diphthongs. The most curious thing is that this property is shared by NHG, MHG diphthongs on the one side and by one OHG diphthong on the other (namely <iu>). But OHG <iu> is supposed to correspond to a monophthong in MHG (cf. Paul & Al. 1998, Braune & Reiffenstein 2004). This monophthong seems however to have kept its diphthong 'integrity-property' (resistance to shortening) anyway.

A second point which remains to be explained is: why do voiced consonants have an influence on the length of the preceding vowel, and how does it precisely work? Even if this has already been noticed before, no *phonological* explanation has been given.

The third idea which also has to be studied is the status of schwa, and the representation it has to be conferred, given its special behaviour, in German as well as in other languages (Dutch, French…).

The last, and perhaps the most tempting project, will be to check if the prediction that ambisyllabic consonants are in fact geminates can be confirmed by a study of the dialects of German; and to try to apply this kind of analysis to other languages which exhibit similar length alternations (Dutch, maybe Norwegian, for instance…).

---

[25] It is for instance a fact that, in German, the behaviour of strong verbs of the I and II classes can be accounted for using this voice-length correlation. Classes Ia and IIa exhibit a short vowel followed by a voiceless consonant (cf. reiten [aɪ] – ritt [ɪ] – geritten [ɪ] '(to) ride' – 'rode' – 'riden' and fließen [i:] – floss [ɔ] – geflossen [ɔ] '(to) run (water)' – 'ran' – 'run') in preterit forms and for the past participle, whereas verbs of the Ib and IIb class have a voiced consonant preceded by a long vowel (cf. bleiben [aɪ] – blieb [i:] – geblieben [i:] '(to) stay' – 'stayed' – 'stayed (past participle)' and biegen [i:] – bog [o:] – gebogen [o:] '(to) bend' – 'bent' – 'bent (past participle)').

Acknowledgments

I would like to thank my supervisor, Tobias Scheer, who helped me to build my first oral conference-presentation, and who gave me some advice concerning scientific as well as 'layout' advice. I am also grateful to those with whom (as speakers of German or phonologists, or even both) either the data or the associated reasoning has been discussed: Sylvia Blaho, Gorka Elordieta, Berit Gehrke, Remus Gergel, Roland Pfau, Björn Rothstein and two anonymous reviewers. I would like to express my gratitude to Christiane Kaden – to whom I am now indebted – for her precious help and time. I finally thank the (local and non-local) organisers, who managed to create a great scientific and social atmosphere during the conference…

The author

Emilie Caratini
University of Nice – France / University of Leipzig – Germany
Emilie.Caratini@unice.fr

References

Anderson, S. R. (1982). The analysis of french schwa: or, how to get something for nothing. W. Bright & Al. (Ed.), *Language - Journal of the Linguistic Society of America* 58:3, pp. 534-573.

Augst, G. (1991). Alternative Regeln zur graphischen Kennzeichnung des kurzen Vokals im Deutschen - ein historischer Vergleich. G. Augst, O. Ehrismann & H. Ramge (Eds.), *Festschrift für Heinz Engels zum 65. Geburtstag* pp. 320-344.

Baroni, M. & L. Vanelli (2000). The relationship between vowel length and consonantal voicing in friulian. L. Repetti (Ed.), *Phonological theory and the dialects of Italy* pp. 14-44.

Becker, T. (1998). *Das Vokalsystem der deutschen Standardsprache*. P. Lang, Frankfurt am Main.

Benware, W. A. (1986). *Phonetics and phonology of Modern German - An introduction*. Georgetown University Press, Washington D.C.

Braune, W. & I. Reiffenstein (2004). *Althochdeutsche Grammatik*. 15. Auflage, Niemeyer, Tübingen.

Burghauser, G. (1891). Zur neuhochdeutschen Lautgeschichte. *ZÖG* 42, pp. 289-294.

Caratini, E. (2004). *Le concept d'ambisyllabicité en phonologie: son champ empirique, sa raison d'être et son articulation*. Mémoire de Maîtrise, Université de Nice.

Caratini, E. (2005). *Les fondements diachroniques de l'ambisyllabicité et ses conséquences sur la longueur vocalique en allemand moderne*. Master Thesis, Université de Nice. http://www.unice.fr/dsl/tobias.htm

Charette, M. (1991). *Conditions on phonological government*. Cambridge University Press, Cambridge.

Chen, M. (1970). Vowel length variation as a function of the voicing of the consonant environment. *Phonetica* 22, pp. 129-159.

Fintoft, K. (1961). The duration of some Norwegian speech sounds. *Phonetica* 7, pp. 19-36.

Giegerich, H. J. (1992). Onset maximisation in German: the case against resyllabification rules. P. Eisenberg, K. H. Ramers & H. Vater (Eds.), *Silbenphonologie des Deutschen - Studien zur Deutschen Grammatik* 42, pp. 134-171.

Hall, T. A. (1992). *Syllable structure and syllable-related processes in german*. Niemeyer, Tübingen.

Hall, T. A. (2000). *Phonologie: eine Einführung*. W. de Gruyter, Leipzig.

Hall, T. A. (2002). The distribution of superheavy syllables in German. *The Linguistic Review* 19, pp. 377-420.

Hayes, B. (1986). Inalterability in CV-phonology. *Language - Journal of the Linguistic Society of America* 62, pp. 321-351.

Hulst, H. van der (1985). Ambisyllabicity in Dutch. H. Bennis & F. Beukma (Eds.), *Linguistics in the Netherlands* 1985, pp. 57-67. http://www.dbnl.org/tekst/huls009ambi01/

Hulst, H. van der & N. Smith (1982). An overvieuw on autosegmental and metrical phonology. H. van der Hulst & N. Smith (Eds.), *The structure of phonological representations* Part 1, pp. 1-45.

Kahn, D. (1976). *Syllable-based generalisations in English phonology*, Diss. Cambridge, Massachusetts.
Kaye, J. D. (1992). Do you believe in magic? The story of s+C sequences. *SOAS Working Papers in Linguistics and Phonetics* 2, pp. 293-313. http://www.unice.fr/dsl/tobias/htm
Kenstowicz, M. & C. Pyle (1973). On the phonological integrity of geminate clusters. M. Kenstowicz & C. Kisseberth (Eds.), *Issues in phonological theory* pp. 27-43.
Kohler, K. J. (1977). *Einführung in die Phonetik des Deutschen*. E. Schmidt Verlag, Berlin.
Lenerz, J. (2000). Zur sogenannten Vokalopposition im Deutschen. Vandenhoeck & Ruprecht (Eds.), *Zeitschrift für Sprachwissenschaft* 19.1, pp. 167-209.
Lenerz, J. (2002). Silbenstruktur und Silbenschnitt. P. Auer & Al., *Silbenschnitt und Tonakzente - Linguistische Arbeiten* 463, pp. 67-86.
Lightner, T. M. (1965). *Segmental phonology of Contemporary Standard Russian*, Diss. MIT Press.
Maurer, D. S. Mitter & H. Mülner (1996-2000). *Duden - Die deutsche Rechtschreibung*. Bibliographisches Institut & F.A. Brockhaus AG, Mannheim.
Meinhold, G. & E. Stock (1982). *Phonologie der deutschen Gegenwartsprache*. VEB Bibliographisches Institut Leipzig, Leipzig.
Mettke, H. (1993). *Mittelhochdeutsche Grammatik*. 7. Auflage, Niemeyer, Tübingen.
Oostendorp, M. van (1995). *Vowel quality and syllable projection*, Diss. Tilburg. http://roa.rutgers.edu
Paradis, C. & J.-F. Prunet (Eds.) (1991). *Phonetics and Phonology - The special Status of Coronals. Internal and External Evidence*. 2, Academic, New York.
Paul, H. (1884). Beiträge zur Geschichte der Lautentwicklung und Formenassoziation - 11. Vokaldehnung und Vokalverkürzung im Neuhochdeutschen. T. Frings & Al. (Eds.), *Beiträge zur Geschichte der Deutschen Sprache und Literatur* 9, pp. 101-134.
Paul, H., P. Wiehl & S. Grosse (1998). *Mittelhochdeutsche Grammatik*. 23. Auflage, Niemeyer, Tübingen.
Ramers, K.-H. (1992). Ambisilbische Konsonanten im Deutschen. P. Eisenberg, K. H. Ramers & H. Vater (Eds.), *Silbenphonologie des Deutschen - Studien zur Deutschen Grammatik* 42, pp. 246-283.
Scheer, T. (2004). *A lateral theory of phonology; Volume 1: What is CVCV and why should it be?* M. de Gruyter, Berlin.
Schein, B. & D. Steriade (1986). On geminates. *Linguistic Inquiry* 17.4, pp. 691-744.
Selkirk, E. O. (1991). On the inalterability of geminates. P. M. Bertinetto, M. Kenstowicz & M. Loporcaro (Eds.), *Certamen Phonologicum* II, pp. 187-209.
Swets, F. H. C. (2004). *The phonological word in Tilburg Dutch: Government Phonology and a city dialect of Dutch*, Diss. Utrecht. http://www.lotpublications.nl
Trommelen, M. T. G. (1983). *The syllable in Dutch, with special reference to diminutive formation*, Diss. Dordrecht.
Vater, H. (1992). Zum Silben-Nukleus im Deutschen. P. Eisenberg, K. H. Ramers & H. Vater (Eds.), *Silbenphonologie des Deutschen - Studien zur Deutschen Grammatik* 42, pp. 100-133.
Vennemann, T. (1970). The German velar nasal. *Phonetica* 22, pp. 65-81.
Vennemann, T. (1982). Zur Silbenstruktur der deutschen Standardsprache. T. Vennemann (Ed.), *Silben, Segmente, Akzente* pp. 261-305.
Vennemann, T. (1990). Syllable structure and syllable cut prosodies in Modern Standard German. P. M. Bertinetto, M. Kenstowicz & M. Loporcaro, *Certamen Phonologicum* II, pp. 211-243.
Wermke, M., K. Kunkel-Razum & W. Scholze-Stubenrecht (2000). *Duden - Das Aussprachewörterbuch*. 5. Auflage, Dudenverlag, Mannheim / Leipzig / Wien / Zürich.
Wiese, R. (1986). Zur Theorie der Silbe. *Studium Linguistik* 20, pp. 1-15.
Wiese, R. (1996). *The phonology of German*. Oxford University Press Inc., New York.