Dschang Syllable Structure and Moraic Aspiration

Steven Bird

The University of Edinburgh	SIL-Cameroon
Centre for Cognitive Science	B.P. 1299
2 Buccleuch Place	Yaoundé
Edinburgh EH8 9LW, UK	Cameroon

steven@cogsci.ed.ac.uk

Dschang Syllable Structure
and Moraic Aspiration

Steven Bird

Abstract

The syllable structure of Dschang is interesting for a variety of reasons. Most notable is the aspiration which can appear on most consonant types, including voiced stops. I shall argue that aspiration is best viewed as moraic, contributing to the weight of a syllable. An understanding of the syllable structure also gives valuable insights into the phonemic inventory and the distributional asymmetries, and helps to explain some curious morphophonemic vowel alternations in the imperative construction.

Dschang is one of about ten Bamileke[1] languages, spoken by over 300,000 people in Cameroon (Grimes 1988). The considerable interest in the language has focussed almost solely on tone, stemming from work by Hyman & Tadadjeu (1976). However, the language is also interesting for its syllable structure. The purpose of this paper is to give a detailed description of the syllable in Dschang (Bafou dialect) and show how syllable structure aids the understanding of a diverse range of diachronic, phonotactic and morphophonemic evidence.

A striking property of Dschang syllables is aspiration, which can accompany most segments (including voiced stops) and which, I shall argue, does not occupy a position in the syllable onset. Aspiration behaves in a curious way in the morphophonology of the language, as illustrated in (1). As an aid to the reader, verb roots have been underlined.

(1)

Infinitive	Imperative	Gloss
ŋgík	gìké	be intelligent
ŋghí	ghíé	fly
ńzét	zèté	be heavy
ńtshé	tshèé	transplant

Observe that the nasal prefix which marks the infinitive is not present in the imperative, and instead a low vowel suffix is added. The situation becomes more complex when we examine the CV roots shown in (2). Note that p and b are allophones.

---

[1] Bamileke is a subgroup of Grassfields Bantoid in the Niger-Congo language family (Watters & Leroy 1989:435). The primary difference between Grassfields and Narrow Bantu is that Grassfields languages have a much simpler morphology.

(2)   *Infinitive   Imperative   Gloss*
          ḿb̰ʼí   pḭ̀ʼí   *smell*
          ḿb̰έ   pḭ́έ   *take*

From (1) we would have expected to find pḭ̀έ *smell!* and pέέ *take!* but we find
instead that the suffix vowel is raised in pḭ̀ʼí *smell!* while the root vowel is raised in
pḭ́έ *take!*. From the perspective of (2), the form tshḛ̀έ *transplant!* now looks odd.
Why do we not have tshḭ̀έ instead? In order to address such questions we shall first
study the phonotactics of the language, using synchronic and diachronic evidence
to construct a model of the syllable. Once syllable structure is understood it will be
possible to explain a variety of segmental phenomena that arise in the imperative
construction.

   This article is structured as follows. In §1 I present the segmental inventory
and give an overview of the basic distributional facts of the language, including a
discussion of a range of segmental alternations. With this background we shall be
ready to move on to the structure of the syllable, first with the rhyme in §2 and then
the onset §3. Next I demonstrate in §4 how, equipped with an understanding of syl-
lable structure, we can understand the interesting morphophonological behaviour
that appears in the imperative construction. The article concludes with a look at
loanword phonology in §5, followed by a section on orthographic implications of
the study.

1   Segmental Inventory

This section will give an overview of the inventory of vowels and consonants, along
with some of the phonologically conditioned segmental alternations which effect
them.

1.1   Consonants

Dschang has six series of (phonetic) consonants with six places of articulation, as
shown in (3).

(3)   Plosives   p/b   t/d   c/ɟ   k   q   ʔ
            Fricatives   f/v   s/z   ʃ/ʒ   ɣ   ʁ   h
            Affricates   pf   ts/dz
            Liquids   l/r/ɾ
            Nasals   m   n   ɲ   ŋ
            Glides   w   ɥ   j   ɰ

Not all of these segments are phonemes, and one aim of this article will be to explain
some of the alternations and distributional asymmetries in terms of syllable struc-
ture. The only consonant clusters which occur have the form (N)C(G)(h) where N

is a homorganic nasal and G is a glide, or the form obstruent + liquid, as is characteristic of Niger-Congo languages in general (Maddieson 1981:89). Some complex articulations have not been entered into (3) since they are treated as sequences. The trill r only occurs in loanwords, while the flap ɾ is the intervocalic allophone of t. Unless accompanied by the h segment, voiceless stops are unaspirated. The uvular place of articulation arises only when a velar obstruent follows a low back vowel in the same syllable. Although the palatals ɲ, ʃ, ʒ and ɟ are just palatalised versions of their alveolar counterparts, and the palatal stops are probably palato-alveolar affricates, we still need a palatal series for the sake of c, since it patterns with the stops and not with the affricates. Note that other Bamileke languages also require a palatal series in addition to palatalisation rules (e.g. Fe'fe', Hyman 1972:17,30).

1.2 Aspiration

It is a striking fact about Dschang, and Bamileke languages in general, that all (oral) obstruents can be aspirated. For example, in Dschang we find aspirated voiced stops in the words m̀bhʉ́ *dog* and ǹdhù *descendents*. Aspirated nasals, which are frequent in some dialects of Dschang, are rare in Bafou, and only one example has been found: lə̀nhù *lay*. Although referred to as aspiration, it is widely noted that aspiration in Bamileke languages often appears as a homorganic fricative (Hyman 1972:23, Nissim 1981:134, Anderson 1982, Haynes 1989:225). Accordingly, aspiration on a voiceless fricative appears to lengthen the fricative (while sometimes still leaving a small amount of aspiration), e.g. /əshó/ [əssó] *fish*, versus /əsó/ [əsó] *friend*. Another important property of aspiration is its length, so that a syllable of the form ChV has a similar duration to CVV syllables. Aspiration appears with a variety of vowels, always in open syllables, as shown in (4).[2]

(4)   lə̀phì *sow*, lə̀phʉ́ *promise*, lə̀phú *sky*, lə̀shʲý *resemble*, lə̀vhò *sew*, lə̀zhʲɛ́ *know*, lə̀zhɔ̀ *achieve*

This aspiration is coarticulated with the following vowel. When two vowels follow, in the same syllable, the aspiration totally overlaps with the first vowel. Words like zhíɛ́ *give birth!* and zhɛ́ɛ́ *know!* are both pronounced [zsɛ́], but where the difference in vowel quality (i vs. ɛ) is still discernable on the s.

1.3 Vowels

The vowel inventory contains eight vowels, as displayed in (5). A ninth vowel, the high front rounded vowel y, is also included although it plays a very marginal role.

(5)   i/y   ʉ   u
             ə   o
        ɛ   a   ɔ

Note that the high central unrounded vowel ɨ will everywhere be represented as ʉ, following the orthography and the phonology literature (e.g. Hyman 1985). Similarly, the semi-high back rounded vowel ʊ will be represented as o. In open syllables, the high vowels are often characterised by frication. A regular exception to this is the vowel i which cannot be fricated in some positions (e.g. the verbal suffixes -ni and -ti), an issue still requiring investigation.

Haynes (1989:214), following Anderson (1977:52f), analyses [ʉ] as /iu/. This is an extension of the way that [y] can be analysed as /ui/. This approach has a number of problems. First, /iu/ is already attested in forms such as ləpìú *your liver* and this is distinct from lepʉ *to clear*. Second, treating ʉ on a par with [y] ignores the fact that [y] is in free variation with ǹzỳ (e.g. ǹzỳ~ǹzwì panther), while ʉ is stable.[3] Third, if we set up ʉ as a phoneme then we can show later how palatalisation and aspiration are in complementary distribution. If ʉ is analysed as /iu/ then hʉ becomes the sole case of an aspirated palatalised vowel, and the analysis of aspiration as a kind of palatalisation breaks down.

1.4   Vowel Length

Dschang shows a surface vowel length contrast, as is illustrated by the underlined syllables in (6).

(6)   a.   à f̀ʉ́ʉ́ kɔ́ŋ lép̀ɔ́ŋ   *he will (FUT-4) like a snake*
      b.   á f̱ʉ́ kɔ̀ŋ ̀lépɔ́ŋ   *he will (FUT-5) like a snake*

The extra length in (6a) comes from a separate morpheme. The length cannot be attributed to a phonetic lengthening due to a tone contour, since the FUT-4 marker has the same length when it appears with level tone. If we treated CVː as disyllabic we would also have to treat CVːC as disyllabic, leading to a VC syllable type for which there is only weak independent motivation (7).

(7)   àŋgámbī *papaya tree*, ànṯàˋ *cricket*, àṉd̀ʉ́ɔ́ *bat*, àŋká *monkey*, àŋg̱ɛ́ɛ̀ *mongoose*, àŋgáŋà *bird (sp)*, áŋklɔ̀ *gombo soup*, àm̱bá *abcess*, àm̱bhʉ́ɔ̀ *otter*, àm̱bhʉ̀ɛ́ *prune tree*

Rather, I shall take CVː(C) to be monosyllabic and stipulate that such syllables are not permitted in the (lexical) representation of morphemes. Long monophthongs must then be explained in terms of a ban on words consisting of three light syllables (also claimed for Arabic, cf. McCarthy 1981). This constraint is illustrated in (8), where the lengthened vowel is underlined. In (8a) the first syllable is lengthened, while in (8b) the second syllable is lengthened.

---

[3]This y~ui alternation is even apparant from Bamileke French, where 'aujourd'hui' *today* can sometimes be heard as [oʒuːdy].

(8) a. àsà?à *chief's second advisor*, àpʉɛ̀tì *weak*, àsɔ̀bɔ̀ *firstborn son*, àcýkì *cough*, màkàbà *macabo*

b. àlùtì *elephantitis*, àsìnì *slippery*, àt'ìti *colourful*, mìtì *angina*, ǹdàtì *sweet*, ǹdɛ̀tì *plant (sp.)*, ǹdɔ̀tí *waste*, ŋgɛ̀tì *wicked*

The lengthening illustrated in (8b) is quite systematic, and can also be seen in verbal derivation, one of the few morphological processes operating in the language.[4] The data is given in (9). As before, the lengthened vowel is underlined.

(9)

Unsuffixed		-ni suffix		-ti suffix	
m̄bá	*hide, nail*	m̄bá-nì	*be shorter*	m̄bá-tí	*be second/beside*
m̄b'á	*hate, detest*	m̄b'á-nì	*be in conflict*	m̄b'á-tí	*arrange into piles*

Apart from the words in (8a), the long vowel is found in the penultimate syllable. The case of (8a) would also fit this pattern if the final vowel was treated as extraprosodic. There is independent motivation for this move, since the phonotactic restrictions on rhymes (§2) apply even when a VC rhyme is followed by a single vowel. The identity of the extraprosodic vowel is predictable from the previous vowel, and for another Bamileke language it has been denied phonemic status (Voorhoeve 1965).

1.5 Diphthongs

Dschang allows sequences of two vowels in a single syllable; a high vowel followed by a low vowel. Whether the sequence appears as a diphthong or as a glide-vowel sequence depends on the number of moras available. So the contrast between VV and GV will be treated as a structural property. (Note that, as pointed out above, the final vowel (unsuffixed) disyllabic roots, such as kíɛ́lɛ́, must be treated as extrametrical so that the l is in the coda.) I have written the glides using the IPA vowel symbols, since there is no symbol for the glide which corresponds to IPA [ɨ] (orthographic ʉ).

(10)

	ɛ		a		ɔ	
i	kíɛ́lɛ́	*bow*	làkìà	*plough*	—	
	àkìɛ̀tˤ	*necklace*	às'ìàknì	*thanks*	—	
ʉ	làkʉ̀ɛ̀	*wear*	—		kʉ̀ɔ̀	*slope*
	làkʉ̀ɛ̀tˤ	*penis*	—		kákʉ́ɔ́k	*thin*
u	àkùɛ́	*bone*	àkùá	*cholera*	àp'úɔ́	*hunt*
	àkùɛ̀tˤ	*latrine*	làk'úáp	*catch*	àp'úɔ́?	*part*

Note that there is a curious restriction between the place of articulation of the onset (labial vs non-labial) and the glide-vowel sequences which are allowed. This is explored in more detail in §2.4 and §3.2.

---

[4] This verbal derivation is only semi-productive. It has been described by Harro (1989).

1.6   Some phonologically conditioned alternations

Since a number of segmental alternations effect the transcriptions and may cause confusion, they will be quickly dispensed with here. Other alternations will be treated later on. Consider first the consonantal alternations shown in (11).

(11) | *Infinitive* | *Imperative* | *Gloss* |
|---|---|---|
| m̀bʼí | pìʼí | *smell* |
| ńdí | líí | *sleep* |
| jìɟú | ʒúú | *uproot* |
| ŋgáp | ɣápá | *be poorly cooked* |
| ŋgwʼú | wùʼú | *rot* |
| ŋgɣá | ɣáá | *give* |

I shall not treat this as lenition of voiced stops, as Hyman (1972:22) did for Fe'fe'. Rather, I take the opposite approach, following Odden's analysis of Kimatuumbi, which sets up p/l/w phonemes with rules for voicing of stops, delateralisation of l and post-nasal hardening of w to gw (Odden 1996:90, 89, 94). The fortition rules appear in (12).

(12) a.   labial voicing $p \rightarrow b \ / \ N \_\_$

b.   delateralisation $l \rightarrow d \ / \ N \_\_$

c.   despirantisation $\gamma \rightarrow g \ / \ N \_\_$

d.   intrusive stop formation $\emptyset \rightarrow d \ / \ N \_\_ \left\{ \begin{array}{c} z \\ ʒ \end{array} \right\}$

e.   post-nasal hardening $\emptyset \rightarrow g \ / \ N \_\_ \left\{ \begin{array}{c} w \\ y \end{array} \right\}$

Each of these rules is assimilatory in nature. Rule (12a) involves the spreading of [+voice], while the rest all involve the spreading of [−cont]. Rule (12e) merits further comment. In Dschang it is not possible to attribute the velar place of articulation to the glide as Odden (1996:95) proposes for Kimatuumbi, since this rule applies to y and not just w (as in Kimatuumbi). Rather, we take ŋ to be the default realisation of a coda nasal when the following onset is not specified for place of articulation.

(13)   *Default Place of Articulation*

ORAL

DORSAL

Now we can state a completely general version of the intrusive stop formation rule (14), covering (12b-e), using the technique proposed by Clements (1987).

(14) *Intrusive Stop Formation*

Root   Root

[+nas]
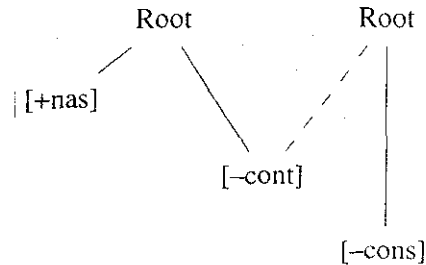
[–cont]

[–cons]

Another consonant alternation is witnessed in the context of vowel raising, when o raises to u and ə raises to ʉ, as shown in (15).

(15)   *Infinitive*   *Imperative*   *Gloss*
      ńzó   ȝúɔ́   *buy*
      ɔ́sɔ́   ʃʉ́ɛ́   *desire*

Note that despite this palatalisation, there still remains good evidence for a palatal series, given minimal pairs like ńz�ɔ́ *insult*, ɲȝɔ́ *see* and ɔ́s̝ɔ́ʔ *raise*, ɔ́ʃɔ́ʔ *peel*. It is striking that the front vowel i does not also condition this palatalisation. However, i does condition the affrication of t to ts, despite the presence of the ts africate in the phonemic inventory. High vowels are strongly spirantised in open syllables. Before u, consonants are rounded.

2   The Structure of the Rhyme

Dschang syllables may be either open, or closed by a single consonant. The coda inventory is p, t, k, ʔ, m, and ŋ. This gives an inventory of 56 possible syllable rhymes.[5] Examples are displayed in Table 1.

The table also shows that there are many possible VC combinations which are unattested. The purpose of this section is to attempt to explain the gaps and arrive at a fuller understanding of the vowel inventory. In §2.1 and §2.2 I shall argue that o and ə in closed syllables ought to be viewed as allophones of u and ʉ respectively, based on distributional evidence. This accords with Voorhoeve's approach to Bangangte, another Bamileke language, where 'the distinction between closed and half-closed vowels ... is a slight degree of aperture, that might be less distinctive than the distinction between the allophones of the preceding consonants' (Voorhoeve 1965:323). However, my approach (after Hyman 1972) will be to connect this allophony with the following rather than the preceding consonant.

In §2.3 we see how this extends to open syllables. Finally, in §2.4 I discuss the constraints on the rhyme which arise when a syllable contains aspiration.

---

[5]Note that the term *rhyme* is used descriptively to refer to that part of a syllable which excludes the initial consonant(s), rather than to refer to a hierarchical constituent in the onset-rhyme theory, which has usurped the older meaning.

Table 1 Syllable rhymes

	$	b	d	g	ʔ	m	ŋ
i	20 ləp'í *loss*	5 ləp'íp *keep*		10 ləp'ík *erase*	24 ləp'íʔ *water (v)*	9 ləp'ím *boast*	32 ləpìŋ *return*
ʉ	47 ləpʉ̀ *clear*	9 ləpʉ̀p *powder (v)*			38 ləpʉ̀ʔ *compensate*	1 ləgʉ̀mtì *crisp*	9 ləkʉ̀ŋ *pot*
u	57 ləwù *rot*	14 ləwùp *layer*			60 ləw'úʔ *prosper*	10 ləp'úm *beat*	39 ləp'úŋ *be poor*
ə	33 ləpə̀ *climb*			15 ləp'ɔ́k *spoil*		41 ləfə́m *choke*	75 ləpə̀ŋ *lick*
o	63 ləpò *complete*			31 ləpòk *soil (v)*	12 ləpfòʔ *mortar*		
ɛ	27 ləpɛ̀ *take*		51 ləp'ɛ́t *heal*	14 ləfɛ̀ʔ *sacrifice*			
a	49 ləp'á *hide*	30 ləpàp *wing*	1 ləb'át *bad*	46 ləpàk *break off*	61 ləp'áʔ *weave*		76 ləpàŋ *be ripe*
ɔ	36 ləp'ɔ́ *create*	15 ləpɔ̀p *deceive*	1 ləfɔ́t *fail*	12 ləp'ɔ́k *worry*	36 ləpɔ̀ʔ *gourd*		49 ləp'ɔ́ŋ *possess*

2.1   O as an allophone of u

First, consider the rows of Table 1 which correspond to the vowels o and u. We begin by treating [ok] as underlying /uk/. Next we consider cases with glottal stop in coda position.

Table 2 O and U with Glottal Stop

Rhyme		Onset Consonant																
		w	p	pf	b	t	ts	d	c	j	k	g	f	v	s	z	m	n	ŋ	l
	uʔ	6	8	1	1	6		1	6	4	5	3	5	2			4	1	1	5
	oʔ			1			6						1	1	3					

From Table 2 we see that /u/ is realised as [o] after ts, s and z onsets, which we independently know to be phonemically distinct (see §3.1). The pf and v onsets in Table 2 still indicate an o~u contrast. The corresponding words are listed in (16).

(16)　 m̀pfùʔˀ　*blood pact* (m̀pfòʔ)
　　　 ləpfòʔˀ　*mortar* (lìpfòʔ)
　　　 m̀vòʔˀ　*space between bed and wall*
　　　 àvùʔˀ　*remainder* (àvòʔ)
　　　 ləv'ùʔtí　*kitchen woodpile* (lìv'òʔtí)

As we shall see in §6, it turns out that speakers have great difficulty distinguishing o and u in some of these forms when it comes to writing the language. The southern dialect forms, given in parentheses in (16), add to the doubts about the phonemic status of the contrast. We shall leave these exceptional cases for further study and turn to the situation in open syllables, where a stronger case for phonemic contrast between o and u can be made. Some minimal pairs are shown in (17).

(17)　*o rhymes*　　　　　　　*u rhymes*
　　　 pò̞　*weevil*　　　　 àp'ú　*hand*
　　　 lətó　*send*　　　　 lətù　*overturn*
　　　 ǹdò̞　*rat*　　　　　 ǹdù　*stream*
　　　 ləkò　*falsely accuse*　ləkù　*snore*
　　　 lək'ó　*enter*　　　　 lək'ú　*seize*

So we conclude that the only clear case for the o/u contrast is in open syllables. Before attempting an explanation for this in §2.3, we shall first turn to the case of ə vs ʉ.

2.2　ə as an allophone of ʉ

Consider again the data in Table 1, this time focussing on those rows which correspond to the vowels ə and ʉ. Observe that just as ok could be analysed as /uk/, we can treat ək as underlying ʉk. Unlike the case of o/u, for ə/ʉ the nasal codas seem to have a lowering effect. So we have [əm] from /ʉm/, with a single exception ləgʉmtì *crisp*. However, if [əŋ] comes from /ʉŋ/ there are still seven exceptional cases of [ʉŋ] rhymes to account for. All of these occur with a k or g onset, as shown in (18).

(18)　ŋ̀kʉ̀ŋˀ　*peace tree*
　　　 ləkʉ̀ŋˀ　*cooking pot*
　　　 ləkʉ̀ŋnì　*refuse (v)*
　　　 ləkʉ̀ŋtì　*roll (v)*
　　　 ləg'ʉ̀ŋ　*shore*
　　　 ləg'ʉ̀ŋnì　*twisted*
　　　 ləgʉ̀ŋtì　*skirt around*

One way to describe these exceptional forms is with the following constraint on height across a syllable, where velar consonants are taken to be [+high].

$$(19) \quad * \begin{bmatrix} C \\ +high \end{bmatrix} \begin{bmatrix} V \\ -high \end{bmatrix} \begin{bmatrix} C \\ +high \end{bmatrix}$$

It is not clear why velar stops in the coda lower the vowel, but velar stops in the onset raise the vowel (for certain codas).

Again, as with o/u, there is a clear contrast between ə and ʉ in open syllables. Some minimal pairs are shown in (20).

(20)   *ə rhymes*   *ʉ rhymes*

ləpə̀	*climb*	ləpʉ̀	*clear (v)*
ǹdə̀	*vampire*	ǹdʉ̀	*raffia string*
àkə̀	*piece*	ləkʉ̀	*flee*
ŋ́gʼə́	*pasture*	àgʉ́	*piece of calabash*
ləlʼə́	*say*	ləlʼʉ́	*rot*

The discussion of the vowels up to this point has led us to the tentative conclusion that in closed syllables there is only a six-way contrast, involving i, ʉ, u, ɛ, a, ɔ. However, in open syllables there is a full eight-way contrast (with the addition of ə and o). Table 3 summarises the findings so far in the discussion.[6]

Table 3 Syllable rhymes

	$	/b/	/d/	/g/	/ʔ/	/m/	/ŋ/
/i/	20	5		10	24	9	32
/ʉ/	9	9		15 (ək)	39	41 (əm)	73 (əŋ[7])
/u/	24	14			59 (oʔ[8])	10	36
/ə/	26						
/o/	23						
/ɛ/	30		51		14		
/a/	49	30	1	46	61		76
/ɔ/	36	15	1	12	36		49

In the next section we shall turn to the problem of the eight-way contrast in open syllables.

2.3   Analysis of open syllables

According to Hyman, Proto-Bamileke morphemes generally had the structure CVC (Hyman 1972:199). However, 'for quite some time, Bamileke dialects have been modifying final vowels and consonants in VC sequences, often with the loss of

---

[6] Note that Haynes (1989:207) sets up ə and i as allophones (of /e/), while retaining ʉ as the realisation of /yu/. However, I do not see the need to distinguish ʉ and i in this way. Nor do I agree that ʉ should be linked with u, as explained in §1.3.

[7] except after k/g

[8] after stridents

the final consonant' (Hyman 1972:197). Hyman's reconstructed VC sequences are based on the segments shown in (21).

(21) a. *PBke Vowels*   b. *PBke Codas*

*i	*ʉ	*u	*b	*d	*g	*ʔ
*e		*o	*m	*n	*ŋ	
	*a					

Hyman began his analysis of sound change in Fe'fe' with the assumption that in Proto-Bamileke, any of the vowels in (21a) could appear before any of the consonants in (21b). Although this assumption is not *a priori* necessary, since Proto-Bamileke may not have had a perfectly symmetrical system, I shall adopt it since it is convenient for the analysis of the observed distribution of segments in Dschang, and it helps in understanding some morphophonological phenomena to be discussed later. Moreover, as Coleman reminds us, 'the desire for system symmetry derives from the usual scientific goal of finding maximally general, exceptionless descriptions of the data ... [and] from the foundation of phonological analyses on combinatorial systems of oppositions or regular correspondences between classes of phonological units, and not just relations betwen isolated pairs of units, and is therefore to be expected, whereas asymmetries stand in need of explanation.' (Coleman 1997).

We can observe the process of coda loss by comparing Dschang forms with certain Proto-Grassfields forms reconstructed by Hyman (1979). Example (22) illustrates this for open syllables with the vowel o.

(22)

word	gloss	Proto Grassfields	Hyman Number
ŋ̀.gó	gun	*ŋgád‵	178
ǹ.d'ó	husband	*lúm‵	206
lə.to	send	*túm‵	252/322
lə.g'ó	ask help	*kó-ti/*gàm-ti	190/191
(nà àthú) ŋ̀.gò	porcupine	*ŋgùm	283
mə̀.k'ó	bean	*kún‵	21
ə̀.kó	bed	*kún´	23
ǹ.dò	rat	*ndùm´	253
lə̀.k'ó	enter	*kún	131
lə̀.pò̃	egg	*bùm´	128

We see that o in open syllables derives from *um and *un. Since um is attested in Dschang, I shall treat o as /un/, though in §4 this will be reanalysed non-segmentally. The same approach works for ə in open syllables. Consider the forms in (23).

(23)

word	gloss	Proto Grassfields	Hyman Number
ǹt'ə́	heart	*tím‵	186
àl'ə́	tongue	*lím‵	392
lə̀p'ə́	breast	*bén‵	50
ŋ̀gə̀	host	*gèn‵	363

Here we see that ə in open syllables may derive from *im or *en. Since im is already attested in Dschang and e is actually absent, I shall take ə in open syllables to be /ʉn/. The syncronic function of n codas will be simply to lower a high vowel, since n is never attested in coda position.[9] Accordingly, we can now create a column for n codas in our table, and drop the rows for ə and o. We have now completely eliminated ə and o, although there are still just as many gaps in the table and the treatment of open syllables is not uniform. However, the process begun with ə and o can equally well be applied to the other vowels in open syllables, although the diachronic and synchronic justification for doing this is weaker. The result is shown in Table 4, where a tick indicates an attested combination, while a blank entry indicates a gap. If there are allophonic changes, these are specified (instead of a simple tick). A point indicates a syllable boundary, to clearly indicate where the open syllables arise.

Table 4 Syllable rhymes

	/b/	/d/	/g/	/ʔ/	/m/	/n/	/ŋ/
/i/	✔	i.	✔	✔	✔	ε.	✔
/ʉ/	✔	ʉ.	ək	✔	əm	ə.	ʉŋ/əŋ
/u/	✔	u.	ok	uʔ/oʔ	✔	o.	✔
/ɛ/		✔		✔			
/a/	✔	✔?	✔	✔	a.?	a.?	✔
/ɔ/	✔	✔?	✔	✔		ɔ.	✔

The open syllable forms are then related to these underlying forms by the rules shown in (24).

(24) a. $d \rightarrow \emptyset /$ __ .

   b. $\begin{bmatrix} V \\ +high \end{bmatrix} \rightarrow -high /$ __ n, $n \rightarrow \emptyset /$ __ .

Two aspects of Table 4 require further comment. First, observe that ε in open syllables is analysed as /in/. The morphophonological ramifications of this will be discussed in §4. Second, observe that the row for ε is almost empty, and that ε might even be an allophone of a. There is only one word with an at rhyme, namely ḿbát *bad*, and it might be a loanword. Moreover, εt is usually found as at in the southern dialect, as the following examples show:

---

[9] There are five words whose orthographic form gives the impression of an n coda. These are làŋènnì *move*, làŋyènnì *be knocked over*, làp'ènnì *be stuck onto*, làpw'ènnì *soften*, làsènnì *spin*. However, this is an orthographic device to make verbs with the phonological form ləCV-ni visually more distinct from verbs with the form ləCVV-ni. Thus, the former are written with a doubled n.

(25) | *Word* | *Gloss* | *Southern Dialect* |
| --- | --- | --- |
| ŋkèt | *mortar* | ŋkàt |
| àmɛ̀t | *boubou* | àmàt |
| làkwɛ̀t | *fight* | lìkwàt |
| vɛ̀t | *wildcat* | vàt |
| mɛ̀tàʔ | *snail* | màtàʔ |

However, ɛ is still attested in the southern dialect, and it would be premature to collapse ɛ with a until the allophony in both dialects has been studied, along with an assessment of the diachronic implications of such a move.

This concludes our discussion of CV syllables and their relationship to CVC syllables. In the following two sections I shall try to incorporate ChV and CVV syllables into the picture.

2.4 Aspiration

There is another kind of open syllable having the form ChV, which resists the approach taken above. Aspiration must properly be thought of as occupying a position in the rhyme rather than the onset for several reasons. First, the presence of aspiration in a syllable forces the syllable to be open. Thus aspiration is in complementary distribution with syllable codas, and we can say that aspiration helps to saturate the rhyme. Second, aspiration does not add to the complexity of the syllable onset. The inventory of onset clusters is not reduced when aspiration is present. Finally, aspirated syllables behave durationally like CVV syllables.

We know that aspiration only occurs in open syllables with short vowels. Phonetically, aspirated syllables appear to be substantially longer than the unaspirated equivalents.

In this section I shall claim that aspiration is moraic, using evidence from the distribution of segments within a syllable in §2.4.1 and evidence from reduplication data in §2.4.2.

2.4.1 Deriving aspiration from a high vowel

Aspiration in Bamileke probably derived historically from a high vowel (Anderson 1982). There is still good evidence for this in the phonotactics of Dschang. The following table is a summary of onset sequences (omitting most of onsets which have just a single consonant, and omitting the labialised onsets). These onset sequences are stops and fricatives, which may be optionally palatalised. Surface forms are given in parentheses where they differ from what we would expect. Where more than one form is given, it is to display allophones of the vowel (selected by the rhyme structure as already discussed). Question marks indicate forms whose position in the table is unclear.

The distributional evidence in Table 5 is the basis for treating most ChV syllables on a par with CVV syllables, where the aspiration in ChV corresponds to

Table 5 Syllable initial clusters with aspiration

	/i/	/ʉ/	/u/	/ɛ/	/a/	/ɔ/
/bi/	1 (phi)	9 (phʉ/(m)bhʉ)	8 (phu/(m)vho)	8 (pʉɛ)	3	7 (puɔ)
/ti/	5 (tshi)	3 (thʉ)	8 (thu/tsho)	2 (tshɛ)	3 (tsia)	3 (tʉɔ)
/li/		1 (lhʉ/(n)dhʉ)	1 (lhu/(n)dhu)	2 (dʉɛ/dhʉɛ?)		2 (dʉɔ)
/si/		3 (ʃhʉ)	2 (sho)	4 (siɛ/shɛ?)	7	2 (ʃʉɔ)
/zi/	1 (zhi)	5 (jhʉ)	3 (zho/jhu?)	8 (ziɛ/zhɛ?)	13	1 (zhɔ)
/ci/		3 (chʉ)	2 (chu)			1 (cʉɔ)
/ki/		4 (khʉ)	2 (khu)	11 (kiɛ/kʉɛ)	6	10 (kʉɔ)
/gi/	7 (ghi)	2 (ghʉ)			2	5 (gʉɔ)

the first vowel of CVV.[10] The distributional similarity will then be accounted for structurally, using the representation in (26).

(26)   bhʉ

$$\sigma$$
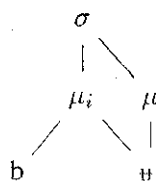
This 'palatal' mora, symbolised μ_i, is introduced to account for the complementary distribution of palatalisation and aspiration, which must in turn be kept distinct from the segment /i/ itself. Further support for this approach will be presented §2.4.2.

Returning to Table 5 again, recall that the alternations t∼ts, u∼o, ʉ∼ə, s∼ʃ and z∼j were dealt with in §1.6. However, if we are going to treat ChV syllables as bimoraic, then there is no coda position available for storing the extra consonant that we need in order for rule (24) to work. In fact, the u∼o alternation in the /u/ column of Table 5 (and Table 6 in §3.1) is best explained in terms of the syllable onset. The vowel /u/ appears as the [o] allophone in an aspirated syllable if and only if the onset contains a fricative or an affricate.

The only other cases to be dealt with are the patterns stated in (27).

(27)   a.   i retraction   i → ɔ / __ ɔ

   b.   i devoicing   i → h / __ $\left\{ \begin{array}{c} i \\ ʉ \\ u? \end{array} \right\}$ \$

---

[10] Note that this approach to aspiration differs from Hyman's approach to aspiration in Fe'fe', which treats aspirated consonants as allophones of plain consonants when they are followed by a short high vowel in an open syllable (Hyman 1972:73).

Note that (27a) does not account for puɔ and will be replaced in §3.2. Also, note that (27b) has the further requirement that the second vowel is syllable final. This is because there are forms involving siɛ and ziɛ which do not undergo devoicing, and this can be attributed to the fact that they are closed. See example (28).

(28) a. ásíɛ́t *squeeze* ńzʲíɛt *club v.*

  b. ásh'ɛ́ *deep* ńzhɛ́ *know*

Possible representations for the open and closed forms are given in (29).

(29) a. sʲɛt   σ   b. shɛ   σ
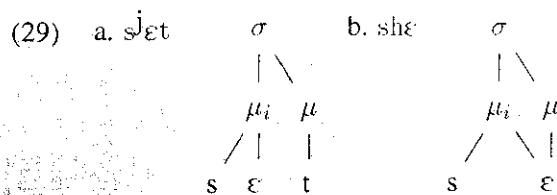
Thus, aspiration and palatalisation as taken to be complementary. This seems to be at odds with Haynes' treatment of aspiration and palatalisation (Haynes 1989:230f). She views the [hʉ] sequence as an aspirated, palatalised /u/. However, in §1.3 I argued that treating ʉ as palatalised u is undesirable and that ʉ should be set up as a phoneme in its own right. Therefore, the fact that Haynes did not take aspiration and palatalisation to be complementary does not lead to problems here.

Another problematic detail in Table 5 is the contrast between kiɛ/kʉɛ. However, the i/ʉ distinction here seems to be subject to free variation.

2.4.2 Aspiration in reduplicated forms

There is an unproductive reduplication pattern which involves the prefixation of the minimal syllable to the word followed by transfer of enough segmental material to satisfy the template. We observe that syllable onsets are fully transferred, but that the rhyme is simplified. In example (30) we see cases which do not involve aspiration. The reduplicated syllable is underlined.

(30) a. sə̀sə̀ *squirrel,* ŋáŋá *bell (ideophone)*

  b. àkə̀kə̀ *statue,* àsỳsý *bleeding,* əs̀ìs'í *abdomen,* àkùkúlừ° *maize cereal*

  c. àkìkìà *ceiling,* àtútùú *bird,* àɲʲìɲìʲá *raven,* sìsìà *long*

  d. àʃùʃùŋ *elephant grass,* ə̀fùfùʔ *scum,* àsə̀sə́ŋ *fern,* àpùp'úm *fruit (sp)*

  e. ŋ̀kùŋkùm *cassava fufu,* m̀bìmbím *cockroach,* m̀bùmbùm *albino,* ǹtùntùɛ̀tʲ *maggots,* ǹtuntuŋ *needle,* ŋ̀kə̀nkə̀ *hideous*

  f. ǹtsíǹtsíŋ *earthworm* àtsə̀tsə̀ŋ *silliness* tsìtsìà *mouse* ɲàɲalɛ *sulphur*

In (30a) we see the simplest pattern involving CV roots. Example (30b) shows that the noun prefix is extraprosodic. The next examples show that the second mora is lost in the transfer; this mora can be a vowel (30c) or consonant (30d). Nasal prefixes, though syllabic, are transferred with the root (30e) as if they were part of a complex onset. Other complex onsets are fully copied in reduplication (30f).

Returning to aspiration now, (31) shows how aspiration is lost in the reduplicative prefix. This would pose a problem if the aspiration formed part of the syllable onset, since up until now we have been able to say that onsets are copied in their entirety. However, since aspiration is analysed as occupying the first mora, we can maintain the idea of full onset copy.

(31) kíkhí *breast of bird,* ɲ̀jùnjhù *sheep,* ŋgʸŋghʸ *condiment,* sʸshʸɛ́ *vegetable (sp),* ʃùʃhù *aubergine,* àcùchù *caterpillar,* àjùjhù *plant (sp),* ajùjhùɛ *plant (sp)*

Recall that the property of aspiration occupies the mora node. Therefore in mapping the segmental content of the root syllable, the existence of aspiration does not enter the picture.

(32) σ_μ+   achʉ   acʉchʉ

This concludes the discussion of the syllable rhyme. I have established that o~u and ə~ʉ are allophones and that aspiration is moraic. We have seen how open syllables are systematically related to closed syllables. These properties of syllable structure go a long way towards explaining the asymmetries in the phonotactics of Dschang. In the next section we shall take a look at the syllable onset, exploring the interactions between it and the following vowel.

3   Onset-Nucleus Sequences

In this section we shall consider three kinds of onset-nucleus interactions. The first concerns fricatives and affricates and the second concerns rounding.

3.1   Fricatives and Affricates

Table 6 shows the inventory of phonemic fricatives and affricates, and shows the alternations which account for the observed forms.

Table 6 Fricative and Affricate Onsets

	/i/	/ʉ/	/u/	/ɛ/	/a/	/ɔ/
/pf/		2	8 (pfu/pfho)	3		2
/f/		2 (fhʉ)	17 (fu/fho)	8	17	8
/v/		4	5 (vu/vo)	5		1
/ts/	10	14	11 (tso)	4	16	8
/dz/		6		1	6	5
/s/	8	14 (sə/ʃʉ)	17 (so/ʃu)	8	21	8
/z/	13	20 (zə/ʒʉ)	20 (zo/ʒʉ)	7	13	11
/c/		5	18			12
/ɣ/	11	24	18	4	26	11

As in Fe'fe', an aspirated fricative is treated as an allophone of a plain fricative when followed by a short high vowel in an open syllable (Hyman 1972:73). We see this in the pf and f rows in Table 6. This is something of a problem for the present analysis, since the aspiration is still required to be moraic.

Observe also how the o~u and ə~ʉ alternations (conditioned by the coda consonant as explained in §2) in turn condition *onset* alternations in the pf, f, s and z rows.

3.2 Rounding

Observing Table 5 again, it will be noticed that [puɔ] is analysed as /piɔ/. In fact, all cases of [uɔ] can be treated this way. By what mechanism does /i/ become [u]? Although we can attribute the backing of the /i/ to the second vowel ɔ, as expressed in (27a), it is less clear where the rounding comes from. Rounding does not come from the following vowel, given the numerous cases of ʉɔ in Table 5. Nor does it come from the labial onset, given the existence of pʉɛ. We could propose a highly specific rule of regressive rounding assimilation in the presence of a labial onset, but this would not account for some other curious properties of labialisation given in (33). Here, a plus in the labiality column indicates a labial consonant or a round vowel.

(33)

	Onset Labiality	V₁ Labiality	V₂ Labiality	Example	Gloss
a.	+	+	+	àp'úɔ	*hunt n.*
b.	+	-	-	àpʉɛnì	*soft*
c.	-	+	-	àkúɛ	*bone*
d.	-	-	+	kʉɔ	*slope*
e.	-	-	-	məŋkʉɛní	*measles*

(33) shows a rather striking pattern of of labialisation across the syllable.[11] Accordingly, we can make the descriptive generalisation in (34). It is not presently clear how such a constraint ought to be formalised.

(34)   Labial dissimilation: Unless *every* segment in a syllable is labial, then *at most one* segment is labial.

The only other cases of rounding permitted by (34) in VV sequences are uɛ, ua and uɔ, since all sequences are high-low and the only round vowels are u and ɔ. Recall that uɔ has been analysed as /iɔ/ in Table 5 along with a rule of i retraction (27). However, if we analyse uɔ as /uɔ/ instead, then we get a nearly complete paradigm for rounding in CuV sequences (where C is any consonant and V is any low vowel). Moreover, the highly specific rule (27a) can now be dropped, since uɔ will be subject to the more general dissimilation rule (34).

With this treatment of rounding and the revision to Table 5, the new situation is shown in Table 7. I drop the voicing and vowel height alternations from the entries.

Table 7 Palatalisation and Labialisation

	/ii/	/iʉ/	/iu/	/iɛ/	/ia/	/ui/	/uɛ/	/ua/	/uɔ/
/b/	phi	bhʉ	bhu	puɛ	bia				puɔ
/t/	tshi	thʉ	thu	tshɛ	tsia		tuɛ	tua	tuɔ
/l/		lhʉ	lhu	luɛ		ly	luɛ	lua	luɔ
/s/		ʃhʉ	sho	siɛ	sia	sy	suɛ	sua	ʃuɔ
/z/	zhi	jhʉ	zho	ziɛ	zia	zy	zuɛ	zua	zhɔ
/c/		chʉ	chu			cy	cuɛ	cua	cuɔ
/k/		khʉ	khu	kiɛ	kia	ky	kuɛ	kua	kuɔ
/g/	ghi	ghʉ			gia		guɛ		guɔ
/ŋ/					ŋia		ŋuɛ	ŋua	

Table 7 incorporates a new pattern for the high front rounded vowel y. It uses the ui column, given that y is in free variation with ui (see §1.3). An unresolved problem for this analysis is the set of aspirated forms listed in (35).

(35)   a.   àchʼý *attitude*, ńchý *grow*, ńchʼý *name*

    b.   àshʼý *new*, àshý *resemble*, àshʼý *pull*

    c.   àzhý *kill*

This concludes the discussion of syllable structure, insofar as it is informed by phonological considerations. Next we shall move on to some morphophonological data.

---

[11] Moreover, it may even continue into the coda, since if a CVVC syllable has a labial coda, every other segment in the syllable must also be labial (e.g. m̀búɔ̀p *billygoat*, làp'ùɔ̀pnì *twitter*).

4 Vowel Alternations in the Imperative

In this section we shall examine some verb paradigms involving the imperative construction. These data show some interesting vowel alternations. Consider the data in (36). Each possible root-final vowel is given down the left hand side, after which there are two groups of three columns each, the first involving stops and the second involving fricatives. Vowel alternations to be explained are underlined. We can take the imperative suffix to be an empty mora which receives [+low] by default, and which receives backness and roundness from the previous vowel.

(36)

	Inf	Imp	Gloss	Inf	Imp	Gloss
i	m̀b'í	pì'í	smell	ńz'í	zì'í	begin
ʉ	m̀b'ʉ́	pʉ̀'ʉ́	clear	ʉ́j'ʉ́	ʒʉ̀'ʉ́	steal
ɛ	m̀bɛ́	pɪ́ɛ́	take	ɔ́sɛ́	sɪ́ɛ́	trim
ə	m̀b'ə́	pʉ̀'ɛ́	climb	ɔ́sə́	ʃʉ́ɛ́	desire
a	ńtá	táá	divine	ńzá	záá	be numerous
ɔ	ɔ́fɔ́	fɔ́ɔ́	be greasy	ńz'ɔ́	zɔ̀'ɔ́	insult
o	m̀b'ó	pʉ̀'ɔ́	be complete	ńzó	ʒʉ́ɔ́	buy
u	ńt'ú	tʉ̀'ú	overturn	ʉ́jú	ʒʉ́ú	dig up

Notice the following alternations: o~uɔ, ɛ~iɛ and ə~ʉɛ. Although this looks like glide formation, the raised vowel is not noticeably shorter in the imperative form, as would be expected if the vowel had been devocalised through being moved into the onset. Furthermore, this approach does not explain why ɛ participates in the alternation while ɔ does not.

We have a rather different situation for closed syllables and aspirated syllables, as shown in (37). (Recall from §1.2 that in ChVV syllables the first vowel is coarticulated with the aspiration and appears as a voiceless vowel.)

(37)

	Closed Syllables			Aspirated Syllables		
	Inf	Imp	Gloss	Inf	Imp	Gloss
i	ŋg'ík	gìk'ɛ́	be intelligent	ʉ́ghí	ghíɛ́	fly
ʉ	ńc'ʉ̀ʔ	cʉ̀ʔɛ́	filter	m̀bhʉ́	phʉ́ɛ́	announce news
ɛ	ńz'ɛ́t	zɛ̀t'ɛ́	be heavy	ńtsh'ɛ́	tshɛ̀'ɛ́	transplant
ə	ɔ́fə́m	fə́mɛ́	choke			
a	ŋk'áŋ	kàŋ'á	choose			
ɔ	ńtɔ́ŋ	tɔ́ŋɔ́	read	ńzh'ɔ́	zhɔ̀'ɔ́	achieve
o	ńzók	zókó	pass the day	m̀vh'ó	vhɔ̀'ɔ́	arrange
u	ŋgúp	wúpɔ́	bark	ńth'ú	thʉ̀'ɔ́	season

Observe that for the roots which are closed or aspirated, the root vowel is stable. For the CVC roots this is hardly surprising. Why this should also be the case for aspirated roots is less clear. Note that whereas the imperative of làp'ɛ́ *undress* is pɪ́ɛ́, an aspirated form with the same final vowel such as làtshɛ̀ *transplant* does not have tshì'ɛ́ but tshɛ̀'ɛ́ in the imperative. Nevertheless, the form tshì'ɛ́ would

have been acceptable phonotactically given the existence of parallel forms such as
ghíɛ́ *fly*.

To facilitate the discussion, the vowel patterns of (36) and (37) are tabulated in
(38).

(38)

		Infinitive Type		
		CV	ChV	CVC
	i	ii	hi.ɛ	i.Cɛ
Final Vowel	ʉ	ʉʉ	hʉ.ɛ	ʉ.Cɛ
	ɛ	iɛ	hɛ.ɛ	ɛ.Cɛ
	ə	ʉɛ	—	ə.Cɛ
	a	aa	—	a.Ca
	ɔ	ɔɔ	hɔ.ɔ	ɔ.Cɔ
	o	uɔ	ho.ɔ	o.Co
	u	uu	hu.ɔ	u.Cɔ

Given the account of aspiration as moraic, it is not surprising to see the ChV and
CVC forms patterning together in the above table. Neither ChV nor CVC forms
show evidence of any perturbation of the root vowel. The representation of h employed
in (29b) works here too. Except for the oCo form which remains unexplained, the
suffix vowel remains low and harmonises for backness and roundness. The remain-
ing interesting case concerns the imperative of CV forms. Here we can put the
analysis of Vn codas (§2) to work. The display in (39) is arranged according to
the vowel space. Each cell contains the infinitive followed by the imperative.

(39)

			Backness			
Height	/N-pi/	[mbi]	/N-pʉ/	[mbʉ]	/N-tu/	[ntu]
	/pi-V/	[pii]	/pʉ-V/	[pʉʉ]	/tu-V/	[tuu]
			/N-pʉn/	[mbə]	/N-pun/	[mbo]
			/pʉn-V/	[pʉɛ]	/pun-V/	[puɔ]
	/N-pin/	[mbɛ]	/N-ta/	[nta]	/N-fɔ/	[əfɔ]
	/pin-V/	[piɛ]	/ta-V/	[taa]	/fɔ-V/	[fɔɔ]

Observe that the underlying forms having Vn codas are characterised by a lowered
vowel in the infinitive, and by *a suffix vowel typical of the disyllabic forms for i,*
ʉ and u. Accordingly, the representation of these codas has to incorporate vowel
lowering, and block the vowel height assimilation that would create ii, ʉʉ and uu.
Rather than treating n as a real segment, I propose to represent its vowel lowering
function as a higher level prosodic feature. For present purposes the syllable level
will suffice. We shall adopt the following definition: σ^- is a syllable containing a
[–high] vowel.

(40) a. [pə] b. [pʉɛ] c. [pʉ] d. [pʉʉ]

$$
\begin{array}{cccc}
\sigma^- & \sigma^- & \sigma & \sigma \\
| & |\,\backslash & | & |\,\backslash \\
\mu & \mu\ \ \mu & \mu & \mu\ \ \mu \\
\diagup\,| & \diagup\,| & \diagup\,| & \diagup\,|\,\diagup \\
p\ \ \ \ ʉ & p\ \ \ \ ʉ & p\ \ \ \ ʉ & p\ \ \ \ ʉ
\end{array}
$$
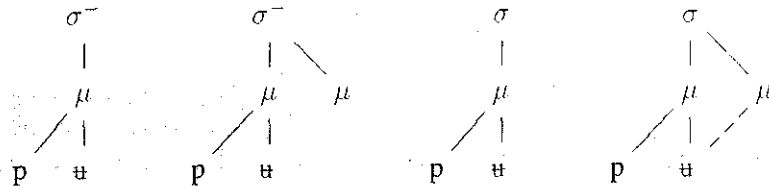
The form in (40a) shows the lowering effect, whereby the [-high] allophone of ʉ is selected. In (40b) the [-high] is manifested as the vowel ɛ on the second (empty) mora. How does this happen? By definition, one of the moras of (40b) must be linked to a [-high] vowel. Recall from §1.5 that no diphthongs involve ə, and so the /ʉ/ of (40b) must be realised as the high allophone ʉ. Given the requirement (stated above) that the imperative suffix must agree in backness and rounding with the preceeding vowel, the only possibility for (40b) is pʉɛ.

Example (40c) shows the representation of pʉ while (40d) gives the corresponding imperative form. In (40d) the suffix mora can be linked to the previous vowel, giving rise to a long syllable. This was not an option in (40b) given the need to have a [-high] vowel and the non-existence of əə.

5 Loanword Phonology

In this section we take a brief look at the phonological readjustments that occur when a word (usually a noun) is borrowed from another language (usually pidgin English). We see the almost ubiquitous addition of a noun class prefix, although there is no particular gender reserved for loanwords. The noun class prefix comes through addition (e.g. àkàlɔ́ɔt *carrot*) replacement (mətítà *potato*) or reinterpretation (məsíìŋ *machine*). The English stress is usually preserved in the tone melody of the word (41a), though not always (41b).

(41) a. àkàs̀álà *cassava*, àl̀ɛ́sà *razor*, àl̀ábà/àl̀ɔ́bà *rubber*, kɛ́sìŋ *kitchen*, kápíndà *carpenter*

   b. àkàlɔ́ɔt *carrot*, àkàlàtúsì *eucalyptus*, àfrɛ̀pɛ́ɛn *frypan*

Loanwords are responsible for the introduction of a new segment type, the apico-alveolar trill (42a), a new onset cluster (42b) putting r on a par with l, and a new syllable type CV:C (42c).

(42) a. mɛ̀tərásì *mattress*, m̀bə̀rə̀ək *brick*

   b. àkrátà *grater*, m̀brɛ̀ *bread*, m̀brúsì *brush*, ǹdràpò *flag (Fr: drapeau)*, m̀brɛ̀ *bread*, àfrúwà *flower*

   c. lɔ́ɔŋ *long trousers*, máàk *mark (scarification)*, sàláàd *lettuce*, jɔ́ɔk *demijohn*, láàm *lamp*, də́ək *debt*, pɛ́ɛn *pan*, lúùm *room*, kúùm *comb*, cɛ́ɛn *chain*

However, the extra length in (42c) may be attributed to the presence of a tone contour which phonetically lengthens vowels. A more noteworthy fact about (42c) is the transformation of rising diphthongs into monophthongs in the final three words, since rising diphthongs are not attested.

Concerning diphthongs, observe in (43a) that diphthongs are still possible in an open syllable, though eə is mapped onto the more extreme ia in order to conform with the phonotactics of the language.

(43) a.   bíà *beer* (RP: biə), píà *avocado pear* (RP: peə)

b.   láà *garlic (Fr: ail [aj]),* télà *tailor,* àkʼènʼú *canoe*

However, we can observe that rising dipthongs cannot be so interpreted, and appear as monophthongs (43b).

We can observe a range of strategies for dealing with illegal coda consonants. First, we see the addition of vowel to allow the consonant to be syllabified into the onset (44a), which might be necessary more than once in the same word (44b).

(44) a.   lɛ́sì *rice,* mɛ́tà *mat,* nənásì *pineapple (Fr: ananas),* téwɛ̀lɛ̀ *towel,* wásì *watch,* ŋglásì *glass,* ɲjàkásì *jackass,* m̀brúsì *brush,* àsəkúù *school,* m̀básəkù *bicycle*

b.   mɛ̀tərásì *mattress,* mɛ̀tísì *match*

c.   ŋgòyá *guava (Fr: goyave),* zíìŋ *zinc,* nùbàtísì *rheumatism,* àplɛ̀ŋgɛ́ *blanket,* ŋgʼálɛ̀ *garden,* səsá *scissors,* láàm *lamp,* dəək *debt,* pɔ́kɛ́ *pocket*

d.   tɛ́blɛ̀ᵉ *table*

e.   àklɛ̀síìŋ *kerosene*

We can also observe the loss of a final consonant (44c) or its metathesis into onset position (44d). Finally, we see the loss of a vowel when a reduced form satisfies the syllable structure (44e), possibly in order to maintain more of the higher level prosodic structure of *kerosene* (i.e. $\sigma_w \sigma_w \sigma_s$). We can be certain that the k in (44e) is in the onset, since it is not realised as [q] as would be expected in coda position following a low back vowel (cf. §1.1).

Other more marginal observations about loanwords are that the dark ł is reinterpreted as the vowel u (45a), while n is reinterpreted as ŋ (45b). Some residual segmental changes are exemplified in (45c).

(45) a.   m̀básəkù *bicycle,* ǹdɔkfáwù *duck fowl,* àsəkúù *school*

b.   àklɛ̀síìŋ *kerosene,* lɔ́ɔŋ *long trousers*

c.   mɛ́lɛ́tíˀ *marriage,* lə.ˈʃán *sign,* kɔ́p *cup,* ɲjʼúnjàˀ *ginger*

Another interesting source of information on the syllable structure is found in Bamileke French. In (46a,b) we see coda r appearing as k (the nearest consonant to ʁ), while in (46b) the nasalised vowel is interpreted as a velar nasal. And in (46c) the final wi appears as the high front rounded vowel (as already discussed in §1.3).

(46) a. merci [mɛksi]

  b. version [vɛksjɔŋ]

  c. aujourd'hui [oʒuːdy]

This evidence from the loanword vocabulary and from Bamileke French demonstrates that the constraints on syllable structure (allowable codas, diphthongs, length, etc) are not only part of the diachrony, they are active in the synchrony of the language.

6 Orthographic Implications

To be true to its historical origins, it is right that a phonological study should make a contribution to resolving some ongoing orthographic problems in a language, especially in cases where the orthography is not set in concrete. There are three principle problems suffered by the present segmental orthography.

The first problem concerns the ə/ʉ and o/u contrasts, which I have taken to be subphonemic. Although these vowels are distinguished in the orthography, speakers sometimes have trouble distinguishing them. For example, two men with several years' experience in using and teaching the current orthography disagree on the spelling of the following words, even though their pronunciation is indistinguishable.

(47) | *Contrast* | *Spelling Options* | *Gloss* |
|---|---|---|
| ə/ʉ | mpfe/mpfʉ | *thick sauce* |
| o/u | lepfoʔ/lepfuʔ | *mortar* |

A second problem is the morphophonemic vowel changes which result in a spelling change, exemplified in the imperative in §4 but found in many other constructions as well. These involve the same vowel contrasts that were singled out in (47). It might be preferrable to avoid representing morphologically conditioned vowel alternations in the orthography. This is not only because the alternations involve a subphonemic contrast, but also because of the need to maintain a *fixed word image* in order to support rapid word identification and fluent reading (cf. Nida 1964:25f, Voorhoeve 1964:130, Venezky 1970:45).

Finally, the writing of the vowels in the northern and southern dialects is incompatible for historical reasons, so that words which are pronounced the same are spelled differently. This makes the dialects appear more different than they are in reality. The vowels concerned are given in (48), along with their orthographic representations in the two dialects.

(48) | Sound: | ə | ɛ | ɔ | u/o |
|---|---|---|---|---|
| Northern Grapheme: | e | ɛ | ɔ | u/o |
| Southern Grapheme: | ə | e | o | u |

My solution to these three problems is to do away with the orthographic distinction between ə/ʉ and o/u. Where there is a following consonant, it generally selects the allophone. Where the syllable is open, I do not suggest that the distinction be represented using a diacritic segment (cf. §2.3) but simply underrepresented, so that the minimal pairs shown in (17) and (20) are not distinguished orthographically. Given the meanings of these words, I suspect that the ambiguity will be resolved by context, and so this underrepresentation of a phonemic contrast will not lead to problems in practice.

An elaborated form of this solution will be put to a general meeting of the language community to take place in early 1997, in order to standardise the orthography before the first edition of the Dschang dictionary is published in mid 1997.

7   Conclusion

This analysis of the structure of the syllable in Dschang has shown how diachronic processes, such as the loss of final consonants and the devoicing of high vowels to produce aspiration, are still in evidence in the synchronic system of the language. This was demonstrated for the verb, in the imperative construction. It also shows up in certain noun constructions (the possessive and associative), which were not discussed here.

Aspiration was argued to be moraic because: (i) it does not contribute to the complexity of onsets; (ii) it is not copied along with the onset in reduplication; (iii) it restricts the possibilities for the rhyme, only permitting short vowels and open syllables; (iv) it originates from a high vowel; and (v) aspirated syllables pattern with bimoraic syllables in the imperative construction. So what is, phonetically, a voiceless fricative is best treated phonologically as a (devoiced) vowel. It is represented as a diacritic feature on the first mora node.

Another prosodic diacritic was proposed in §4 to account for the vowel height alternations in the imperative construction. This diacritic was represented on the syllable node as σ^-. It is possible to harmonise these proposals for representing aspiration and vowel height, as shown in (49). As before, σ^- represents a syllable with a [−high] feature, which percolates down to the rightmost mora.

(49)   a.   [sə]   b.   [sʉɛ]   c.   [sʲɛt]   d.   [shɛ]
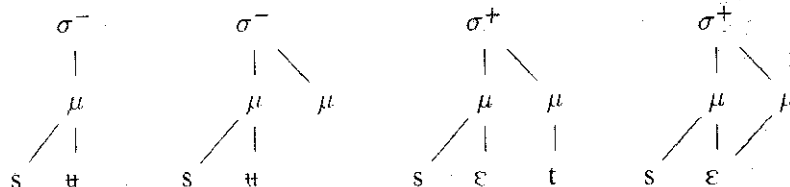
The mora diacritic for palatalisation and aspiration has now been shifted up to the syllable. The symbol σ^+ represents a syllable with a [+high] feature which percolates down to the leftmost mora. Apart from producing a more symmetrical system, this puts the two properties in complementary distribution with each other. This is a substantive claim which we can check.

Now σ^+ represents both aspiration and palatalisation, and we know from §2.4.1 that these are in complementary distribution. How does the distribution of aspiration and palatalisation compare with that of lowering? Are there any cases of overlap? Table 5 demonstrates that palatalisation and lowering never cooccur; palatalisation only appears on the syllables with ɛ and a, while lowering only relates to ʉ and u. We must also consider aspiration vs. lowering. Where does aspiration cooccur with ə or o? Observe in (38) that while there is a gap for hə, the ho form is actually attested. This would be a counterexample, since we would simultaneously have σ^- and σ^+, a contradiction. But recall from §2.4.1 that [ho] is just an allophone of [hu] after onsets containing a fricative or an affricate. So aspiration and lowering are in complementary distribution. This lends support to the tentative proposal to identify aspiration/palatalisation and lowering as opposite sides of the same coin. Although we can *represent* this behaviour using a prosodic feature at the syllable level, a convincing *explanation* for the relationship between aspiration, palatalisation and lowering has yet to be provided.

Acknowledgements

References

Anderson, S. C. (1977).   A phonology of Ngyembɔɔn-Bamileke.   Unpublished manuscript.

Anderson, S. C. (1982).   From semivowels to aspiration to long consonants in Ngyembɔɔn-Bamileke. *Journal of West African Languages, 12*, 58–68.

Bird, S. (1996a).   The HyperLexicon: A Powerful Weapon in Phonological Research. Technical report, University of Edinburgh, Centre for Cognitive Science.

Bird, S. (1996b).   *Petit Dictionnaire Yemba-Français (Dschang-French Dictionary)*. Cameroon: SIL. Experimental edition.

Clements, G. N. (1987). Phonological feature representation and the description of intrusive stops. In *23rd Annual Regional Meeting of the Chicago Linguistic Society. Part Two: Parassession on Autosegmental and Metrical Phonology*, (pp. 29–50). Chicago Linguistic Society.

Coleman, J. S. (1997). *Phonological Representations — their names, forms and powers*. Cambridge Studies in Linguistics. Cambridge University Press.

Grimes, B. F. (Ed.). (1988). *Ethnologue — Languages of the World*. Summer Institute of Linguistics.

Harro, G. (1989). Extensions verbales en Yemba (Bamileke-Dschang). In D. Barreteau & R. Hedinger (Eds.), *Descriptions de Langues Camerounaises* (pp. 239–69). Paris: ACCT/ORSTOM.

Haynes, N. (1989).   Esquisse phonologique du Yemba.   In D. Barreteau & R. Hedinger (Eds.), *Descriptions de Langues Camerounaises* (pp. 179–238). Paris: ACCT/ORSTOM.

Hyman, L. M. (1972). A phonological study of Feʔfeʔ-Bamileke. *Studies in African Linguistics*, (Supplement 4).

Hyman, L. M. (1979).   Index of Proto-Grassfields Bantu Roots.   Unpublished manuscript.

Hyman, L. M. (1985). Word domains and downstep in Bamileke-Dschang. *Phonology Yearbook, 2*, 45–83.

Hyman, L. M. & Tadadjeu, M. (1976). Floating tones in Mbam-Nkam. In L. M. Hyman (Ed.), *Studies in Bantu Tonology*. University of Southern California. Occasional Papers in Linguistics, Volume 3.

Maddieson, I. (1981). Unusual consonant clusters and complex segments in Eggon. In Leben, W. R. (Ed.), *Précis from the 12th Conference on African Linguistics*, Studies in African Linguistics, Supplement 8.

McCarthy, J. (1981). A prosodic theory of non-concatenative morphology. *Linguistic Inquiry, 12*, 373–418.

Nida, E. A. ([1954] 1964). Practical limitations to a phonemic alphabet. In W. Smalley (Ed.), *Orthography Studies: Articles on New Writing Systems* (pp. 22–30). London: United Bible Societies. Originally appeared in *The Bible Translator* 5, 1954.

Nissim, G. M. (1981). *Le bamiléké-ghomálá' (parler de Bandjoun Cameroon): Phonologie – Morphologie nominale – Comparison avec des parlers voisins*, volume 45 of *Tradition Orale*. Paris: SELAF.

Odden, D. (1996). *The Phonology and Morphology of Kimatuumbi*. The Phonology of the World's Languages. Oxford University Press.

Venezky, R. L. (1970). Principles for the design of practical writing systems. *Anthropological Linguistics*, *12*, 256–70. page references to reprinted version.

Voorhoeve, J. (1964). Some problems in writing tone. In W. Smalley (Ed.), *Orthography Studies: Articles on New Writing Systems* (pp. 127–31). London: United Bible Societies.

Voorhoeve, J. (1965). The structure of the morpheme in Bamileke (Bangangté dialect). *Lingua*, *13*, 319–34.

Watters, J. R. & Leroy, J. (1989). Southern Bantoid. In J. Bendor-Samuel (Ed.), *The Niger-Congo Languages* (pp. 430–49). University Press of America.