Dschang Syllable Structure

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1 Introduction

Dschang is one of about ten Bamileke languages,[1] 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 chapter is to give a detailed description of the syllable in Dschang 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.[2]

[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. The name Dschang is pronounced [tʃaŋ]. Data in this chapter comes from the main northern dialect, spoken in Bafou and elsewhere.

[2] In this and subsequent displays, acute and grave accent symbolise high and low tone respectively. The exclamation point symbolises downstep. Final low tones are falling unless marked with a degree symbol. When referring to data in the text, I have avoided use of the // and [] marks in places where the phonemic status of the segments concerned is not at issue, or where I do not want to prejudge the status of the segments ahead of a later discussion.

(1)	*Infinitive*	*Imperative*	*Gloss*
	ŋ́gǐ́k	gì kɨ́ɛ́	*be intelligent*
	ŋ́ghí	ghíɛ́	*fly*
	ń zɛ́̀t	zɛ̀ tɨ́ɛ́	*be heavy*
	ń tshɛ̀́	tshɛ̀ɛ́	*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.

(2)	*Infinitive*	*Imperative*	*Gloss*
	ḿbǐ́	pì ǐ́	*smell*
	ḿbɛ́	píɛ́	*take*

From (1) we would have expected to find *pìɛ́ smell!* and *pɛ́ɛ́ take!* but we find instead that the suffix vowel is raised in *pìǐ́ smell!* while the root vowel is raised in *píɛ́ take!*. From the perspective of (2), the form *tshɛ̀ɛ́ transplant!* now looks odd. Why do we not have *tshìɛ́* 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 chapter is structured as follows. In §2 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 §3 and then the onset §4. Next I demonstrate in §5 how, equipped with an understanding of syllable structure, we can understand the interesting morphophonological behaviour that appears in the imperative construction. Loanword phonology is considered in §6. Finally, the major proposals of previous sections are harmonised in §7.

2 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 affect them.

2.1 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	ɯ̯		

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 structure. 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 have the form (N)OL, where O is an obstruent and L is a 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. Other Bamileke languages also require a palatal series in addition to palatalisation rules (e.g. Fe'fe', Hyman 1972:17,30).

2.2 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 *m̀bhɨ́ dog* and *ǹdhù descendents*. Aspirated nasals, attested in some dialects of Dschang, are rare in Bafou, and only one example has been found: *lənhɨ̀ lay*. Although referred to as aspiration, it is widely noted that aspiration in Bamileke languages often appears as a homorganic fricative.[3] In Dschang, aspiration is realised as

[3]Hyman (1972:23), Nissim (1981:134), Anderson (1982), Haynes (1989:225).

either a voiceless approximant, homorganic with a following high vowel (eg. /mbhʉ/ = [mbu̥ɻ̊ʉ]), or simply by [h], when followed by a low vowel. In either case, when a fricative precedes, a voiceless version of the fricative is coarticulated with the aspiration (eg. /afhʉte/ = [afu̥ɻ̊ʉte]) Consequently, words like *zhíɛ́ give birth!* and *zhɛ́ɛ́ know!* are both pronounced [zsɛ́], but the difference in vowel quality (*i* vs. *ɛ*) is clearly discernable on the *s*. The presence of aspiration reduces the duration of voiceless stops, while leaving voiced stops unchanged. 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*. In all cases, aspiration significantly reduces the length of the following vowel, so that a ChV syllable has similar duration to CVV syllables. Aspiration appears with a variety of vowels, always in open syllables, as shown in (4).[4]

(4) ləphì *sow*, ləphʉ́ *promise*, ləphú *sky*, ləshý *resemble*, ləvhò *sew*, ləzhɛ́ *know*, ləzhɔ̀ *achieve*

It is reasonable to view Dschang aspiration in terms of vowel devoicing. However, unlike other languages having voiceless vowels (such as Japanese), vowel voicing in Dschang is lexically contrastive. Evidence for this is given in (5). The first group of four lines concerns voiceless onsets, and the second group concerns voiced onsets.

(5) **Lexical contrastiveness of aspiration**

Unaspirated		*Aspirated*	
le-piː	*smell*	le-phi	*lose*
le-tuː	*intestines*	le-thu	*extremity*
le-cyː	*take*	le-chy	*grow*
le-kʉː	*flee*	le-khʉ	*trap*
m-biː	*smell*	m-bhi	*lose*
n-dʉː	*raffia string*	n-dhʉ	*stomach ache*
ɲ-ɟuː	*debt*	ɲ-ɟhu	*nut*
ŋ-giː	*fertile ground*	ŋ-ghi	*voice*

[4]The data in (4) contains counterexamples to Anderson's claim that aspiration in Dschang only occurs before short *high* vowels in open syllables (Anderson 1982:63).

2.3 Vowels

At least superficially, the vowel inventory contains eight vowels, as displayed in (6). A ninth vowel, the high front rounded vowel *y*, is also included although it plays a very marginal role.

(6)

i/y	ɨ	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 *ɷ* 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. in the verbal suffixes *-ni* and *-ti*), an issue still requiring investigation.

Haynes (1989:214), following Anderson (1977:52f), analyses [ɨ] as /iu/. This is an extension of the way that [y] can be analysed as /ui/. However, treating *y* on a par with *ʉ* ignores the fact that *y* is in free variation with *ui* (e.g. *ǹzỳ*∼*ǹzwì* panther), while *ʉ* is stable.[5] Furthermore, 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.

2.4 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. (As pointed out above, the final vowel of (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*).

[5] This *y*∼*ui* alternation is even apparant from Bamileke French, where 'aujourd'hui' *today* can sometimes be heard as [ozuːdy] and 'sud' *south* may be pronounced [swid].

(7)

	ɛ		a		ɔ	
i	kíɛ́lɛ́	*bow*	lə̀kì à	*plough*	—	
	àkìɛ̀tᵊ	*necklace*	àsᵻ̀ìàknì	*thanks*	—	
ʉ	lə̀kʉ̀ɛ̀	*wear*	—		kʉ̀ɔ̀	*slope*
	lə̀kʉ̀ɛ̀tᵊ	*penis*	—		kə́kʉ́ɔ́k	*thin*
u	àkùɛ́	*bone*	àkùá	*cholera*	àpᵘ́úɔ́	*hunt*
	àkùɛ̀tᵊ	*latrine*	lə̀kᵘ́úáp	*catch*	àpᵘ́úɔ́ʔ	*part*

Observe 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 §3.4 and §4.2.

2.5 Some phonologically conditioned alternations

Since a number of segmental alternations affect 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 (8).

(8)

Infinitive	*Imperative*	*Gloss*
mbᵘ́í	pìᵘ́í	*smell*
nd́í	lí í	*sleep*
ɲɟú	ʒúú	*uproot*
ŋgáp	ɣápá	*be poorly cooked*
ŋgwᵘ́ú	wùᵘ́ú	*rot*
ŋgyá	yáá	*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 (9).

(9)

a. labial voicing $p \rightarrow b \,/\, N\_\_$

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

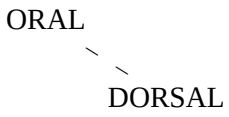
c. despirantisation $ɣ \rightarrow g \,/\, N\_\_$

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

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

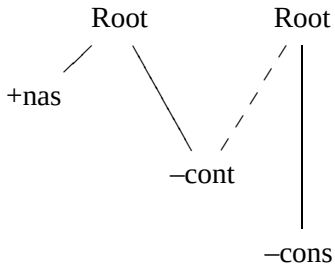
Each of these rules is assimilatory in nature. Rule (9a) involves the spreading of +voice, while the rest all involve the spreading of –cont. Rule (9e) merits further comment. In Dschang it is not possible to attribute the velar place of articulation to the glide as Odden (1996:95) proposes for Kimatuumbi, 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.

(10) *Default Place of Articulation*



Now we can state a completely general version of the intrusive stop formation rule (11), covering (9b-e), using the technique proposed by Clements (1987).

(11) *Intrusive Stop Formation*



Another consonant alternation is witnessed in the context of vowel raising, when *o* raises to *u* and ə raises to ʉ, as shown in (12).

(12)	*Infinitive*	*Imperative*	*Gloss*
	ńzó	ʒúɔ́	*buy*
	ə́sə́	ʃʉ́ɛ́	*desire*

Note that despite this palatalisation, there still remains good evidence for a palatal series, given minimal pairs like *ńzɔ́ insult*, *ɲ́ʒɔ́ see* and *ə́sɔ́ʔ raise*, *ə́ʃɔ́ʔ 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.

3 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.[6] Examples are displayed in Table 1, where numbers indicate the lexical frequency of the rhymes.

Table 1 Syllable rhymes

	$	b	d	g	ʔ	m	ŋ
	20	5		10	24	9	32
i	lə̀pˈí	lə̀pˈíp		lə̀pˈík	lə̀pˈíʔ	lə̀pˈím	lə̀pìŋ
	loss	*keep*		*erase*	*water (v)*	*boast*	*return*
	47	9			38	1	9
ʉ	lə̀pʉ̀	lə̀pʉ̀p			lə̀pʉ̀ʔ	lə̀gʉ̀mtì	lə̀kʉ̀ŋ
	clear	*powder (v)*			*compensate*	*crisp*	*pot*
	57	14			60	10	39
u	lə̀wù	lə̀wùp			lə̀wˈúʔ	lə̀pˈúm	lə̀pˈúŋ
	rot	*layer*			*prosper*	*beat*	*be poor*
	33			15		41	75
ə	lə̀pə̀			lə̀pˈə́k		lə̀fˈə́m	lə̀pə̀ŋ
	climb			*spoil*		*choke*	*lick*
	63			31	12		
o	lə̀pò			lə̀pòk	lə̀pfòʔ		
	complete			*soil (v)*	*mortar*		
	27		51		14		
ɛ	lə̀pɛ̀		lə̀pɛ́t		lə̀fɛ̀ʔ		
	take		*heal*		*sacrifice*		
	49	30	1	46	61		76
a	lə̀pˈá	lə̀pàp	lə̀bˈát	lə̀pàk	lə̀pˈáʔ		lə̀pàŋ
	hide	*wing*	*bad*	*break off*	*weave*		*be ripe*
	36	15	1	12	36		49
ɔ	lə̀pˈɔ́	lə̀pɔ̀p	lə̀fˈɔ́t	lə̀pˈɔ́k	lə̀pɔ̀ʔ		lə̀pˈɔ́ŋ
	create	*deceive*	*fail*	*worry*	*gourd*		*possess*

[6]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.

The table also shows that there are many 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 §3.1 and §3.2 I argue that *o* and ɔ 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 §3.3 we see how this approach extends to open syllables. Finally, in §3.4 I discuss the constraints on the rhyme which arise when a syllable contains aspiration.

3.1 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

		Onset Consonant																		
		w	p	pf	b	t	ts	d	c	j	k	g	f	v	s	z	m	n	ŋ	l
Rhyme	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 §4.1). The *pf* and *v* onsets in Table 2 still indicate an *o*∼*u* contrast. The corresponding words are listed in (13).

(13) m̀pfùʔ˚ *blood pact* (m̀pfòʔ)
lə̀pfòʔ˚ *mortar* (lì pfòʔ˚)
m̀vòʔ˚ *space between bed and wall*
àvùʔ˚ *remainder* (àvòʔ)
lə̀vu̍ʔtí *kitchen woodpile* (lì vò̍ʔtí)

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 (13), 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 (14).

(14)

o rhymes		*u rhymes*	
pò˚	*weevil*	àpú	*hand*
lətó	*send*	lətù	*overturn*
ǹdò	*rat*	ǹdù	*stream*
ləkò	*falsely accuse*	ləkù	*snore*
ləkó	*enter*	ləkú	*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 §3.3, we first turn to the case of ə vs ʉ.

3.2 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 *ləgə̀mtì 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 (15).

(15)

ləkə̀ŋ˚	*cooking pot*	ləgə́ŋ	*shore*
ləkə̀ŋnì	*refuse (v)*	ləgə̀ŋnì	*twisted*
ləkə̀ŋtì	*roll (v)*	ləgə̀ŋtì	*skirt around*
ŋkə̀ŋ˚	*peace tree*		

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.

(16) $$*\begin{bmatrix} \text{C} \\ \text{+high} \end{bmatrix}\begin{bmatrix} \text{V} \\ \text{–high} \end{bmatrix}\begin{bmatrix} \text{C} \\ \text{+high} \end{bmatrix}$$

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 (17).

(17)

ə rhymes		*ʉ rhymes*	
lə́pə̀	*climb*	lə́pʉ̀	*clear (v)*
n̄də̀	*vampire*	n̄dʉ̀	*raffia string*
àkə̀	*piece*	lə̀kʉ̀	*flee*
ŋ̀gə́	*pasture*	àgʉ́	*piece of calabash*
lə̀lə́	*say*	lə̀lʉ́	*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.[7]

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[8])
/u/	24	14			59 (oʔ[9])	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.

[7]Note that Haynes (1989:207) sets up ə and ɨ as allophones (of /e/), while retaining ʉ as the realisation of /yu/. However, I do not see the need to distinguish ʉ and ɨ in this way. Nor do I agree that ʉ should be linked with *u*, as explained in §2.3.

[8]except after k/g

[9]after stridents

3.3 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 the final consonant' (Hyman 1972:197). Hyman's reconstructed VC sequences are based on the segments shown in (18).

(18) a. *PBke Vowels*

*i	*ʉ	*u
*e		*o
	*a	

b. *PBke Codas*

*b	*d	*g	*ʔ
*m	*n	*ŋ	

Hyman began his analysis of sound change in Fe'fe' with the assumption that in Proto-Bamileke, any of the vowels in (18a) could appear before any of the consonants in (18b). 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 (19) illustrates this for open syllables with the vowel *o*.

(19)

word	*gloss*	*Proto Grassfields*	*Hyman Number*
ŋgó	*gun*	*ŋgád`	178
ǹdʻó	*husband*	*lúm`	206
ləto	*send*	*túm`	252/322
làgʻó	*ask help*	*kó-ti/*gàm-ti	190/191
(nà àthɯ́) ŋ́gò	*porcupine*	*ŋgùm	283
màkʻó	*bean*	*kún`	21
àkó	*bed*	*kún´	23
ǹdò	*rat*	*ndùm´	253
làkʻó	*enter*	*kún	131
làpò°	*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 §5 this will be reanalysed non-segmentally. The same approach works for ə in open syllables. Consider the forms in (20).

(20)

word	*gloss*	*Proto Grassfields*	*Hyman Number*
ǹtʻə́	*heart*	*tím`	186
àlʻə́	*tongue*	*lím`	392
làpʻə́	*breast*	*bén`	50
ŋgə̀	*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 take ə in open syllables to be /ɯn/. The syncronic function of *n* codas will be simply to lower a high vowel, since *n* is never attested in coda position. 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.	✔	✔	✔	ɛ.	✔
/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 (21).

(21) 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 *ɛ* in open syllables is analysed as /in/. The morphophonological ramifications of this will be discussed in §5. Second, observe that the row for *ɛ* is almost empty, and that *ɛ* might even be an allophone of *a*. There is only one word with an *at* rhyme, namely *ḿbát bad*. Moreover, *ɛt* is usually found as *at* in the southern dialect, as the following examples show:

(22)

Word	*Gloss*	*Southern Dialect*
ŋ̀kɛ̀t˚	*mortar*	ŋ̀kàt˚
àmɛ̀t˚	*boubou*	àmàt˚
lə̀kwɛ̀t	*fight*	lì kwàt
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 evidence for such a move.

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

3.4 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, since the inventory of onset clusters is not reduced when aspiration is present. Finally, aspirated syllables behave durationally like CVV syllables.

In this section I shall claim that this aspiration is moraic, using evidence from the distribution of segments within a syllable in §3.4.1 and evidence from reduplication data in §3.4.2.

3.4.1 Deriving aspiration from a high vowel

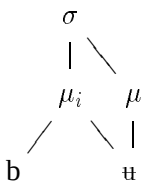
Aspiration in Bamileke probably derived historically from a high vowel (Anderson 1982). There is still good evidence for this in the phonotactics of Dschang. The following table is a summary of onset sequences (omitting most of the onsets which have just a single consonant, and omitting the labialised 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.

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 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 the first vowel of CVV.[10] The distributional similarity will then be accounted for structurally, using the representation in (23).

(23) bhʉ



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 §3.4.2. (It will be generalised in §7 in a manner that avoids the use of a diacritic feature on the mora.)

Returning to Table 5 again, recall that the alternations *t*∼*ts*, *u*∼*o*, *ʉ*∼*ə*, *s*∼*ʃ* and *z*∼*j* were dealt with in §2.5. 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 (21) to work. In fact, the *u*∼*o* alternation in the /u/ column of Table 5 (and Table 6 in §4.1) 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 alternations in Table 5 are dealt with in (24).

(24) a. i retraction $\quad i \rightarrow +back \;/\; \_\_\; ɔ$

b. i devoicing $\quad i \rightarrow h \;/\; \_\_ \left\{ \begin{array}{c} i \\ ʉ \\ u? \end{array} \right\} \$$

Note that (24a) does not account for *puɔ* and will be replaced in §4.2. Also, note that (24b) has the further requirement that the second vowel is

[10] Note that the presence of a nasal (in parentheses) in Table 5 conditions the 'voiced' allophone of the onset consonant, as explained in §2.5. Note also 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).

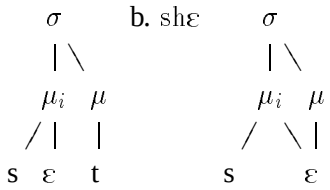
syllable final. This is because there are forms involving *siɛ* and *ziɛ* which do not undergo devoicing, and this can be attributed to the fact that they are closed. See example (25).

(25) a. ə́sʲíɛ́t *squeeze*
ń̩zʲíɛt *club v.*

b. ə́shʲɛ́ *deep*
ń̩zhɛ́ *know*

Possible representations for the open and closed forms are given in (26).

(26) a. sʲɛt



b. shɛ

Thus, aspiration and palatalisation as taken to be complementary.[11]

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.

3.4.2 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 shall see that only segments – and not prosodic structure – are mapped onto the reduplicative prefix. We observe that syllable onsets are fully transferred, but that the rhyme is simplified. In example (27) we see cases which do not involve aspiration. The reduplicated syllable is underlined.

[11] This approach seems to be at odds with Haynes' treatment of aspiration and palatalisation in Dschang (Haynes 1989:230f). She views the [hʉ] sequence as an aspirated, palatalised /u/. However, in §2.3 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.

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

b. àkə̀kə̀ *statue*, àsə̀́sə́ *bleeding*, ə̀sə̀́sə́ *abdomen*, àkʉ̀kʉ́lʉ̀ᵒ *maize cereal*

c. àkì̀kì̀à *ceiling*, àtʉ́tʉ̀ʉ́ *bird*, àɲ̀ì̀ɲ̀ì̀á *raven*, sì̀sì̀à *long*

d. àʃʉ̀ʃʉ̀ŋ *elephant grass*, ə̀fʉ̀fʉ̀ʔᵒ *scum*, àsə̀sə́ŋ *fern*, àpʉ̀pʉ́m *fruit (sp)*

e. ŋ̀kʉ̀ŋkʉ̀m *cassava fufu*, m̀̀bì̀mbím *cockroach*, m̀̀bʉ̀mbʉ̀m *albino*, ǹtʉ̀ntʉ̀ɛ̀ᵗᵒ *maggots*, ntuntuŋ *needle*, ŋ̀kə̀nkə̀ *hideous*

f. ǹtsíǹtsíŋ *earthworm* àtsə̀tsə̀ŋ *silliness* tsì̀tsì̀à *mouse* ɲaɲalɛ *sulphur*

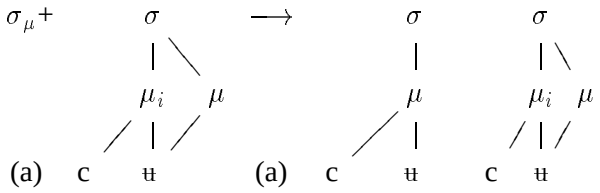
In (27a) we see the simplest pattern involving CV roots. Example (27b) shows that the noun prefix is extraprosodic. The next examples show that the segment of the second mora is lost in the transfer; this segment can be a vowel (27c) or consonant (27d). Nasal prefixes, though syllabic, are transferred with the root (27e) as if they were part of a complex onset. Other complex onsets are fully copied in reduplication (27f).

Returning to aspiration now, (28) shows how aspiration is lost in the reduplicative prefix. If aspiration formed part of the syllable onset then an additional restriction on reduplication would be required, so that it did not map aspiration onto the prefix. However, since aspiration is analysed as a non-segmental property of the first mora, we can maintain the idea of full onset copy.

(28) kíkhí *breast of bird*, ǹjʉ̀njhʉ́ *sheep*, ŋ̀gʉ̀ŋghʉ́ *condiment*, sʉ́́shʉ́ɛ́ *vegetable (sp)*, ʃʉ́ʃhʉ́ *aubergine*, àcʉ̀chʉ̀ *caterpillar*, àjʉ̀jhʉ́ *plant (sp)*, ajʉjhʉɛ *plant (sp)*

An example of the operation of reduplication is shown in (29), where c and ʉ are mapped onto the prefix while the aspiration is left behind.

(29) 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 its interactions with the nucleus.

4 Onset-Nucleus Sequences

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

4.1 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/jʉ)	20 (zo/ʒu)	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 a problem for the present analysis, since there is no clear mechanism whereby the aspirated allophones [pfh] and [fh] can acquire a mora to host the aspiration. The phonetic data shows no clear juncture between the affricate and the *h*, since the *h* is usually fricated (see §2.2). Clarification of this problem must await the results of an ongoing duration study.

Observe also how the *o*∼*u* and ə∼ʉ alternations (conditioned by the coda consonant as explained in §3) in turn condition *onset* alternations in the *pf*, *f*, *s* and *z* rows.

4.2 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 (24a), 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 *p*ʉɛ. 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 (30). Here, a plus in the labiality column indicates a labial consonant or a round vowel.

(30)

	Onset Labiality	V_1 Labiality	V_2 Labiality	*Example*	*Gloss*
a.	+	+	+	àpʲúɔ	*hunt n.*
b.	+	-	-	àpʲʉ̀ɛ̀nì	*soft*
c.	-	+	-	àkùɛ́	*bone*
d.	-	-	+	kʲʉ̀ɔ̀	*slope*
e.	-	-	-	məŋkʲʉ̀ɛ̀ní	*measles*

(30) shows a rather striking pattern of of labialisation across the syllable.[12] Accordingly, we can make the descriptive generalisation in (31). It is not presently clear how such a constraint ought to be formalised.

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

[12] This pattern of labialisation 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. *m̀bʲʉ́ɔ́p billygoat*, *ləpʲʉ̀ɔ̀pnì twitter*).

The only other cases of rounding permitted by (31) in VV sequences are *uɛ*, *ua* and *ʉɔ*, since all sequences are high-low and the only round vowels are *u* and *ɔ*. Recall that *ʉɔ* has been analysed as /iɔ/ in Table 5 along with a rule of *i* retraction (24). However, if we analyse *ʉɔ* 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 (24a) can now be dropped, since /uɔ/ will be subject to the more general dissimilation rule (31). With this treatment of rounding and the revision of Table 5, the new situation is shown in Table 7. Note that I have dropped 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	pʉɛ	bia				puɔ
/t/	tshi	thʉ	thu	tshɛ	tsia		tuɛ	tua	tʉɔ
/l/		lhʉ	lhu	lʉɛ		ly	luɛ	lua	lʉɔ
/s/		ʃhʉ	sho	siɛ	sia	sy	suɛ	sua	ʃʉɔ
/z/	zhi	jhʉ	zho	ziɛ	zia	zy	zuɛ	zua	zhɔ
/c/		chʉ	chu			cy	cuɛ	cua	cʉɔ
/k/		khʉ	khu	kiɛ	kia	ky	kuɛ	kua	kʉɔ
/g/	ghi	ghʉ			gia		guɛ		gʉɔ
/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 §2.3). An unresolved problem for this analysis is the set of aspirated forms listed in (32).

(32) a. àchʲý *attitude*, ńchý *grow*, ńchʲý *name*

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

c. àzhý *kill*

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

5 Vowel Alternations in the Imperative

In this section we shall examine some verb paradigms involving the imperative construction.[13] Consider the data in (33). Each possible root-final vowel is given on the left, after which there are two groups of three columns each, the first group 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.

(33)

	Inf	*Imp*	*Gloss*	*Inf*	*Imp*	*Gloss*
i	ḿbˈí	pìˈí	*smell*	ńzˈí	zìˈí	*begin*
ʉ	ḿbˈʉ́	pʉ̀ˈʉ́	*clear*	ńɟʉ́	ʒʉ̀ˈʉ́	*steal*
ɛ	ḿbɛ́	pɪ́ɛ́	*take*	ə́sɛ́	sɪ́ɛ́	*trim*
ə	ḿbˈə́	pʉ̀ɛ́	*climb*	ə́sə́	ʃʉ́ɛ́	*desire*
a	ńtá	táá	*divine*	ńzá	záá	*be numerous*
ɔ	ə́fɔ́	fɔ́ɔ́	*be greasy*	ńzˈɔ́	zɔ̀ˈɔ́	*insult*
o	ḿbˈó	pʊ̀ˈɔ́	*be complete*	ńzó	ʒúɔ́	*buy*
u	ńtˈú	tʊ̀ˈú	*overturn*	ńjú	ʒúú	*dig up*

Notice the following alternations: *o*∼*u*ɔ, *ɛ*∼*i*ɛ 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 (34). (Recall from §2.2 that in ChVV syllables the first vowel is coarticulated with the aspiration and appears as a voiceless vowel.)

[13] Kouesso (1989) gives an SPE-style treatment of similar alternations in some other grammatical constructions.

(34)

	Closed Syllables			*Aspirated Syllables*		
	Inf	*Imp*	*Gloss*	*Inf*	*Imp*	*Gloss*
i	ŋ́gík	gìkɛ́	*be intelligent*	ŋ́ghí	ghíɛ́	*fly*
ʉ	ń̀cʉ́ʔ	cʉ̀ʔɛ́	*filter*	ḿbhʉ́	phʉ́ɛ́	*announce*
ɛ	ńzɛ́t	zɛ̀tɛ́	*be heavy*	ńtshɛ́	tshɛ̀ɛ́	*transplant*
ə	ə́fə́m	fə́mɛ́	*choke*			
a	ŋ́káŋ	kàŋá	*choose*			
ɔ	ńtɔ́ŋ	tɔ́ŋɔ́	*read*	ńzhɔ́	zhɔ̀ɔ́	*achieve*
o	ńzók	zókó	*pass the day*	ḿvhó	vhò̲ɔ́	*arrange*
u	ŋ́gúp	wúpɔ́	*bark*	ńthú	thʉ̀ɔ́	*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 *ləpɛ́ undress* is *píɛ́*, an aspirated form with the same final vowel such as *lətshɛ̀ transplant* does not have *tshìɛ́* but *tshɛ̀ɛ́* in the imperative. Nevertheless, the form *tshìɛ́* would have been acceptable phonotactically given the existence of parallel forms such as *ghíɛ́ fly*. To facilitate the discussion, the vowel patterns of (33) and (34) are tabulated in (35).

(35)

		Infinitive Type		
		CV	*ChV*	*CVC*
Final Vowel	i	ii	hi.ɛ	i.Cɛ
	ʉ	ʉʉ	hʉ.ɛ	ʉ.Cɛ
	ɛ	i̲ɛ	hɛ.ɛ	ɛ.Cɛ
	ə	ʉ̲ɛ	—	ə.Cɛ
	a	aa	—	a.Ca
	ɔ	ɔɔ	hɔ.ɔ	ɔ.Cɔ
	o	u̲ɔ	ho.ɔ	o.Co̲
	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 (26b) works here too. Except for the oCo form which remains unexplained, the suffix vowel remains low and harmonises for backness and roundness. The remaining interesting case concerns the imperative of CV forms. Here we can put the analysis of /Vn/ codas (§3) to work. The display in (36) is arranged according to the vowel

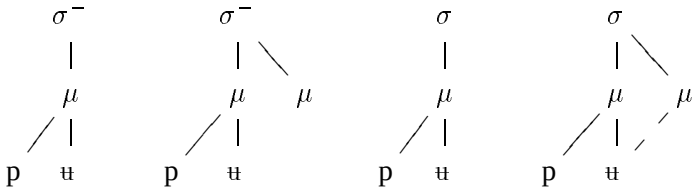
space. Each cell contains the infinitive followed by the imperative. The cells of particular interest contain underlined segments.

(36)

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

Observe that the /CVn/ forms are characterised by a lowered vowel in the infinitive: /in/ = [ɛ], /ʉn/ = [ə] and /un/ = [o]. In the imperative, these forms manifest a suffix vowel identical to imperative suffix for CVC roots (cf. the CVC column in (35)). Accordingly, the representation of these /Vn/ 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. The interpretation of this device is illustrated in (37).

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



The form in (37a) shows the lowering effect, whereby the –high allophone of *ʉ* is selected. In (37b) the –high is manifested as the vowel *ɛ* on the second (empty) mora. How does this happen? By definition, one of the moras of (37b) must be linked to a –high vowel. Recall from §2.4 that no diphthongs involve *ə*, and so the /ʉ/ of (37b) 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 (37b) is *pʉɛ*.

Example (37c) shows the representation of *pʉ* while (37d) gives the corresponding imperative form. In (37d) the suffix mora can be linked to the previous vowel, giving rise to a long syllable. This was not an option in (37b) given the need to have a –high vowel and the non-existence of *əə*.

6 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. *àkàlɔ́ɔ̀t˚carrot*) replacement (*mətítà˚ potato*) or reinterpretation (*məsíìŋ machine*). The English stress is usually preserved in the tone melody of the word (38a), though not always (38b).

(38) a. àkàsʲálà˚ *cassava*, àlʲɛ́sà *razor*, àlʲábà/àlʲɔ́bà *rubber*, kɛ́sìŋ *kitchen*, kápíndà *carpenter*

b. àkàlɔ́ɔ̀t˚ *carrot*, àkàlàtúsì˚ *eucalyptus*, àfrɛ̀pɛ́ɛ̀n *frypan*

Generalising across these two cases, we can observe that high tone is assigned to the penultimate vowel.

Loanwords are responsible for the introduction of a new segment type, the apico-alveolar trill (39a), a new onset cluster (39b), putting r on a par with l, and a new syllable type CV:C (39c).

(39) a. mɛ̀tər̲ásì *mattress*, m̀bər̲ɔ́ɔ̀k˚ *brick*

b. àk̲rátà˚ *grater*, m̀b̲rɛ̀ *bread*, m̀b̲rúsì *brush*, ǹd̲ràpò *flag (Fr: drapeau)*, m̀b̲rɛ̀ *bread*, àf̲rúwà *flower*

c. lɔ́ɔ̀ŋ *long trousers*, máàk *mark (scarification)*, sàlʲáàd *lettuce*, jɔ́ɔ̀k *demijohn*, láàm *lamp*, dɔ́ɔ̀k *debt*, pɛ́ɛ̀n *pan*, lúùm *room*, kúùm *comb*, cɛ́ɛ̀n *chain*

Concerning diphthongs, observe in (40a) 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.

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

b. láà *garlic (Fr: l'ail [laj])*, tɛ́là *tailor*, àkɛ̀nʲú *canoe*

However, we can observe that rising dipthongs cannot be so interpreted, and appear as monophthongs (40b). See also the final three words in (39c).

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 (41a), which might be necessary more than once in the same word (41b).

(41) a. lɛ́sì˚ *rice*, mɛ́tà˚ *mat*, nánásì *pineapple (Fr: ananas)*, tɛ́wɛ̀lɛ̀ *towel*, wásì *watch*, ŋ̀glásì *glass*, ɲ̀jàkásì *jackass*, m̀brúsì˚ *brush*, àsəkúù *school*, m̀básəkù *bicycle*

b. mɛ̀təràsì *mattress*, mɛ̀tísì *match*

c. ŋ̀gòyá *guava (Fr: goyave)*, zíìŋ *zinc*, nùbàtísì *rheumatism*, àplɛ̀ŋgɛ́ *blanket*, ŋ̀gálɛ̀ *garden*, sásá *scissors*, láàm *lamp*, dáàk *debt*, pɔ́kɛ́ *pocket*

d. tɛ́blɛ̀˚ *table*

e. àklɛ̀síìŋ *kerosene*

We can also observe the loss of a final consonant (41c) or its metathesis into onset position (41d). Finally, in (41e) we see the loss of a vowel when a reduced form satisfies the syllable structure of the language, possibly in order to mimic the stress pattern of *kerosene*. We can be certain that the *k* in (41e) is in the onset, since it is not realised as [q] as would be expected in coda position following a low back vowel (cf. §2.1).

Other more marginal observations about loanwords are that the dark *ɬ* is reinterpreted as the vowel *u* (42a), while *n* (which is banned from the coda) is reinterpreted as *ŋ* (42b). This is consistent with the default velar place of articulation claimed in (10).

(42) a. m̀básəkù *bicycle*, ǹdɔ̀kfáwù *duck fowl*, àsəkúù *school*

b. àklɛ̀síìŋ *kerosene*

Another interesting source of information on the syllable structure is found in Bamileke French. In (43a,b) we see coda *r* appearing as *k* (the nearest consonant to ʁ), while in (43b) the nasalised vowel is interpreted as a velar nasal. And in (43c) the final *wi* appears as the high front rounded vowel (see §2.3).

(43) a. merci [mɛksi]

b. version [vɛksjɔŋ]

c. aujourd'hui [oʒuːdy]

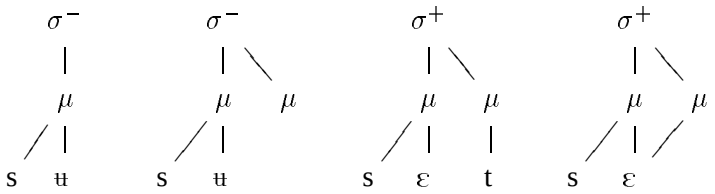
This evidence from the loanword vocabulary and from Bamileke French demonstrates that the constraints on syllable structure (allowable codas, diphthongs, length, etc) are not only part of the diachrony, they are active in the synchrony of the language.

7 Harmonising the Proposals

Recall that 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 §5 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 (44). As before, σ^{-} represents a syllable with a –high feature, which percolates down to the rightmost mora.

(44) a. [sə] b. [sʉɛ] c. [sʲɛt] d. [shɛ]



The mora diacritic for palatalisation and aspiration has now been shifted up to the syllable, leaving the mora as a weight unit pure and simple. 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 §3.4.1 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 (35) 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 §3.4.1 that [ho] is just an allophone of /hu/ after onsets containing a fricative or an affricate. So aspiration and lowering are opposite sides of the same coin.

8 Conclusions

The discussion of Dschang syllable data has shown how diachronic processes, such as the loss of final consonants and the devoicing of high vowels, are still in evidence in the synchronic system of the language. However, while the analysis incorporates insights from the history of the language, it does not recapitulate the historical processes directly. It is simpler to treat the distributional and morphophemic evidence as manifestations of an abstract contrast between two syllable types σ^- and σ^+.

The proposal of a distinctive feature on a non-terminal node (i.e. a *prosodic feature*) is plausible both theoretically and formally. As a theoretical device, it connects with other proposals to decorate the non-terminal nodes of prosodic structure with distinctive features (Vincent 1986, McCarthy 1988, Coleman 1992), and has been heavily exploited outside of phonology in feature-based grammar formalisms (Pollard & Sag 1994). Formal methods for interpreting prosodic features and propagating the associated constraints down to the segments are described in (Bird & Klein 1994, Bird 1995). However, in this chapter the focus has been primarily empirical. I have shown how the use of a prosodic feature at the syllable level is able to explain some phonological and morphophonological phenomena which are manifested in the curious distribution of aspiration, palatalisation and lowering in Dschang.

Acknowledgements

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informant, Blaise-Pascal Kemda, is a male speaker aged 26 who lived in the village until the age of 23 and whose parents grew up in the same neighborhood.

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