MINISTERE DE LA RECHERCHE SCIENTIFIQUE ET TECHNIQUE

A DESCRIPTION OF MOLOKO PHONOLOGY

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KEY TO SYMBOLISATION OF THE DATA

[....]	phonetic data
/..../	phonemic data
'....'	specific English gloss
('...')	generic English gloss e.g. ('bird') = 'type of bird'
V	vowel
C	consonant
v	epenthetic vowel slot
L	liquid
/ʷ.../	labialised word
/ʸ.../	palatalised word
Cʷ	labialised consonant
~	alternates with (free variation)
→	realised as
+	morpheme boundary
#	word boundary
##	phrase boundary/pause

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1. INTRODUCTION

1.1 Moloko Language and People

1.1.1 Language Classification

Moloko is a Chadic language spoken in the arrondissement of Tokombéré, department of Mayo-Sava, in the Far North Province of the Republic of Cameroon. According to ALCAM (1983:357), the language is classified as follows:

family	Chadic
branch	Centre
sub-branch	Central-West
group	Wandala-Mafa
sub-group	Mafa-South
language	Moloko [154] [1]

In the literature, the language is sometimes referred to as Melokwo, Məlokwo, Molko, Molkwo, Molkoa, and Mokio.

1.1.2 Location and population

There are between 10-12,000 speakers of this language (Starr 1997), mostly in the area surrounding Moloko Mountain, which is situated along the main road, 30km north of Maroua towards Mora. Speakers of the language are also found in and around the city of Maroua, and villages to the north-east, such as Kossewa and Dogba, and there are also small communities of speakers in Kousseri, Toubouro, Pitoa-Garoua, Ngaoundéré and Yaoundé.

Traditionally, the Moloko are believed to have sought refuge on Moloko mountain during the Fulani invasions of the 19th century. Today a few people still live on the mountain itself, though the majority have descended to the surrounding plains in search of water and better farming land. The main crops in the area are millet, peanuts and cotton. Some livestock is kept, mostly sheep, goats, chickens and cattle. There are some merchants, however those with outside employment mostly live in cities outside the area. The low number of primary schools and complete lack of secondary schools in the Moloko area account for the low level of education.

1.1.3 Multilingualism

"Moloko is surrounded by five different languages, all but Fulfuldé belonging to the Mafa language group: Muyang, Mbuko, Mikiri, Giziga and Fulfuldé (counter-clockwise from the north)" (Bradley 1992:1). Many people have some understanding and competence in one or more of these languages depending on the level of contact. Fulfuldé is often used in the church, though very few women speak or understand the language. Moloko people often marry outside the language group, though only the husband's language is spoken in the home.[2]

There are a significant number of loan words in the everyday spoken language, most taken from Fulfuldé, some from French. It is difficult to determine whether some lexical items are cognate with those in related languages such as Giziga and Mandara or are borrowed from them. Loan word phonology is not included in the present work.

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[1] See Bow (1997) for a more detailed analysis of the classification of this language.

[2] See A Starr (1997) for further details about multilingualism, language use and language contact among the Moloko.

1.1.4 Linguistic research

Until 1996 there was very little linguistic information available on this language. Certain researchers made references to it in studies of related languages, such as Rossing (1978),[3] Blama (1980) and de Colombel (1982). The only monograph on Moloko was taken from a sociolinguistic survey led in 1992 by the Survey Department of SIL (Bradley 1992). The aim of that survey was to establish the need for development in this language. The survey confirmed that Moloko is "a homogeneous, distinct speech form" which "appears to be a vital language and in no danger of being replaced in the near future" (Bradley 1992:4-5).

In 1996 an SIL team was assigned to the area to work on linguistic analysis, and establish a written form of the language, with a view to producing and translating vernacular literature.

A more in depth sociolinguistic survey carried out in 1996 (reported in Starr 1997) showed that there are no distinctive dialects of Moloko, although accent differences can serve to indicate which village or area a speaker comes from. The same study reports full intercomprehension between all speakers. This phonology sketch is based on information given by two native speakers of the language, one young man from the village of Mbidémé, at the foot of Moloko Mountain, and one older man from the clan of Ftak, who grew up in the village of Gayak Assideo, one of the villages away from the mountain. The few cases of disagreement between the two speakers will not be considered in this work.

This paper subsumes a previous document entitled "Labialisation and Palatalisation in Moloko" (Bow, 1997), and is expanded to include phonological information not relating to these prosodies.

Research was carried out under the auspices of the Ministry of Scientific and Technical Research of Cameroon between May 1996 and September 1997.[4] Most of the research was done in Maroua, with some information collected also in Moloko villages in the area and in Yaoundé. I am especially grateful to my two language assistants, Oumar Abraham and Molabai, who were untiring in their assistance to me in my research.

1.2 Outline

This paper begins with a description of the syllable structures in Moloko, then examinations of the vowel and consonant systems, and the effects of the prosodies of labialisation and palatalisation. At the level of the word, we will consider the root forms of nouns and verbs, their affixes, and the rules governing the affixation process. The paper concludes with a brief examination of the tone system.

All phonetic symbols used in this paper have their IPA value, however I will follow the conventions of Chadic literature by using [y] to represent the palatal approximant (IPA [j]).

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[3] Rossing's paper is a comparative study of Palasla, Matal, Muyang, Maɗa, Malokwo, Zəlgwa, Giziga-North, and Mafa. His general conclusions as to the phonemes of the language agree with mine.

[4] Research permit No. 080/MINREST/DOO/D20 (May 96-May 97) and No. 076/MINREST/BOO/DOO/D20/D21 (June - October 97).

2. SYLLABLE LEVEL

2.1 Syllable and syllable types

The most basic syllable type in Moloko is CV. It may be reasonable to suppose that all words are made up of CV syllables, since the exceptions to this rule are regular and easily explainable. Closed syllables only occur word-finally and could indicate the loss of a final vowel. We will call these two the basic syllable types, CV and CVC (§2.1.1). The nature of the vowel determines whether the syllable is heavy or light (§2.1.2). Combinations of two consonants will be considered in §2.1.3. Closed syllables with a liquid (/l/ or /r/) involve an optional rule of schwa insertion (§2.1.4). V syllables are most likely to have come from what was once a separate morpheme (see §2.1.5 and 3.4.2). Fast speech phenomena account for some resyllabification (§2.1.6). Words which do not follow the syllabification rules given are mostly loanwords eg. [pɪstʊlɔm] 'torch', poly-morphemic words, eg. [mɔktɔnɔkʷ] 'toad,' and words which include reduplicated elements, such as [mandʊrʊkʷɔ6kʷɔ6ɔ] ('lizard').

2.1.1 Basic syllable types

The basic syllable in Moloko has a consonantal onset, a vocalic nucleus, and an optional consonantal coda:

CV(C)

CV is the most common syllable type, occurring the most frequently in the language, and appearing in any position within the word. CV syllables have no segmental restrictions, allowing any consonant and vowel combination, except in word-final, pre-pausal position, where the vowel must be +Low (see §2.3.4 and 3.3.2).

CVC syllables strictly occur only in word-final position, however word-medial examples (involving liquids) do occur at phonetic level and will be examined in §2.1.4.

There are no restrictions on consonantal onsets in either syllable type, however certain consonants are not found in the coda position. This will be discussed in §2.4.4.

The following chart gives examples of each syllable type in 1 to 3 syllable words:

1)	structure	example	gloss
1 syllable	CV	[ɬa]	'cow'
	CVC	[fat]	'day/sun'
2 syllable	V.CV	[ava]	'arrow'
	V.CVC	[ahar]	'hand/arm'
	CV.CV	[gala]	'yard'
	CV.CVC	[mavad]	'sickle'
3 syllable	V.CV.CV	[adama]	'adultery'
	V.CV.CVC	[adaŋgay]	'stick'
	CV.CV.CV	[manzara]	'termite'
	CV.CV.CVC	[maɬalam]	'sword'

There are examples of 4 and 5 syllable words in the lexicon, however all either contain reduplicated segments (eg. [məgədəgədə] 'praying mantis') or are polymorphemic (eg. [hʊrʊmbʊlɔm] 'God/sky').

2.1.2 Heavy/light syllables

In both CV and CVC syllable types, there is a distinction between heavy and light syllables. Here I will differ somewhat from the standard definitions, taking a comment from Goldsmith (1990:115), who says that heavy & light relates to stress placement, and usually light syllables are CV and heavy are CV: (CVV) and CVC. However he goes on to say that "in many languages the primary distinction between heavy (i.e. stress-attracting) syllables and light syllables involves 'full' versus 'reduced' vowels."[5] This is a useful distinction for syllables in Moloko, and possibly in other Chadic languages.

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[5] In Moloko stress falls on the final syllable in a phrase, which always has a heavy syllable.

The vowel system of Moloko is discussed in detail in §2.3. There are two types of vowels: +Low (which is /a/ and its allophones [ɛ, ɔ and œ], and -Low (which is [ə] and its allophones [i, ɪ, ʊ and u]). We will call heavy syllables those which have +Low vowels, using the notation CV(C), and light syllables those with -Low vowels, using the notation Cv(C). In the underlying form, only +Low vowels will be marked.

In word-final position, before a pause, the final syllable, whether open or closed, must be a heavy syllable. This will be discussed in detail under §2.3.4 and 3.3.2.

The following chart of three-syllable words shows the complete range of possible structures, including the underlying form (UF) and surface form (SF) of each word.

2)		TEMPLATE	UF	SF	GLOSS
V-final		/CvCvCV/	/mdga/	[mədəga]	'older sibling'
		/CvCVCV/	/mndava/	[məndava]	'scar'
		/CVCvCV/	/dagla/	[dagəla]	'basin'
		/CVCVCV/	/manzara/	[manzara]	'termite'
C-final		/CvCvCC/	/ggmy/	[gəgəmay]	'cotton'
		/CvCVCC/	/ttark/	[tətarak]	'shoe'
		/CVCvCC/	/madrs/	[madəras]	'pig'
		/CVCVCC/	/matabɬ/	[matabaɬ]	'cloud'

The absence of a final vowel in the underlying form will be examined in §2.3.4 and 3.3.2, and consonant clusters in the following sections §2.1.3 and §2.1.4.

2.1.3 Ambivalent sequences

Moloko has three sets of sequences which could be interpreted as either a sequence of two consonants (CC) or as single units (C). These are pre-nasalised consonants [mb, nd, ŋg, nz], affricates [ts, dz], and labialised consonants [kʷ, gʷ, hʷ].[6]

In the following examples, these sequences are contrasted with non ambivalent CvC sequences.

3) [məpapar] 'grass fence/sekko'
[mbaɮa] 'white wine' not *[məbaɮa]

[mədəras] 'pig'
[ndərəɮa] 'split peas' not *[nədərəɮa]

4) [pəsakay] 'detach'
[tsahay] 'ask' not *[təsahay]

[gəzamay] 'lose weight'
[dzakay] 'lean' not *[dəzakay]
[nzavar] 'young man' not *[nəzavar]

5) [kuway] 'look for'
[bukʷay] 'second weeding' not *[bukuway]
[kʊsay] 'fog/mist' not *[kʊwʊsay]

Any surface consonant cluster can be reconstructed in slow speech as being separable by schwa. However, since these combinations can not be separated by a vowel, they must be interpreted as single units (C).

In the case of pre-nasalised consonants, the nasal is always homo-organic with the following consonant. In order to leave the exact nature of the nasal unspecified, we will mark the pre-nasal consonant N in the underlying form.[7]

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[6] Labialised consonants will be considered in detail in §2.5.1.

[7] Only voiced consonants are pre-nasalised, there are no cases of [*mp, *nt, *ns or *ŋk].

6)	RULE	UF	SF	GLOSS
/Nb/	N → m / _ b	/Nbr/	[mbar]	'heal'
		/aNby/	[ambay]	'manioc'
/Nd/	N → n / _ d	/Ndr/	[ndar]	'weave'
		/daNdy/	[danday]	'intestines'
/Nz/	N → n / _ z	/Nzary/	[nzaray]	'separate'
		/maNzara/	[manzara]	'termite'
/Ng/	N → ŋ / _ g	/Ngary/	[ŋgaray]	'tear'
		/maNgz/	[maŋgaz]	'rust'

2.1.4 Liquids

The liquids (/r/ and /l/) function differently from other consonants with respect to syllabification. In light syllables, the -Low vowel is optional when adjacent to a liquid. This results in free variation with the option of pronouncing the adjacent schwa.[8] This means that a liquid (L) can function:

a) as the nucleus of a syllable: L

7) word-intially   /lvn/   [l.vaŋ] ~ [lə.vaŋ]   'night'

   /lbty/   [l.bə.tay] ~ [lə.bə.tay]   'fold'

   /rɓy/   [r.ɓay] ~ [rə.ɓay]   'be beautiful'

8) word-medially /blgadn/   [bl.ga.daŋ] ~ [bəl.ga.daŋ] ~ [bə.lə.ga.daŋ] [9] 'harmattan'

   /klbawk/   [kl.ba.wak] ~ [kəl.ba.wak] ~ [kə.lə.ba.wak] ('bird')

   /krNbaya/ [kr.mba.ya] ~ [kər.mba.ya] ~ [kə.rə.mba.ya] 'aubergine'

   /Nbrkala/ [mbr.ka.la] ~ [mbər.ka.la] ~ [mbə.rə.ka.la] 'red millet'

b) as the coda of a non-word-final closed syllable:[10] CVL

9) /malgamy/ [mal.ga.may] ~ [ma.lə.ga.may] 'jawbone'

   /palpala/ [pal.pa.la]   ~ [pa.lə.pa.la] 'straw hat'

   /hrky/   [hər.kay]   ~ [hə.rə.kay]   'beg'

   /krpała/   [kər.pa.ła]   ~ [kə.rə.pa.ła] 'wings'

c) as the second component of a consonantal onset: CLV(C)

10)   /kra/   [kra] ~ [kə.ra]   'dog'

   /madrs/   [ma.dras] ~ [ma.də.ras] 'pig'

   /vln/   [vlaŋ] ~ [və.laŋ]   'give'

   /Nblama/ [mbla.ma] ~ [mbə.la.ma] 'hollow wood'

While this appears to extend our inventory of syllable types, in fact it can be seen as minor variations on the basic form:

   L   comes from the form Cv   (when C is a liquid)
   CVL   comes from the form CV.Cv   (when C₂ is a liquid)
   CLV   comes from the form Cv.CV   (when C₂ is a liquid)

2.1.5 V syllable

The V syllable occurs in word-initial position only. The only vowel permitted in this syllable is /a/, which may be realised as [æ] or [ɛ] before a palatalised syllable. This appears to be an old prefix, which will be considered in §3.4.2.

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[8] See also §2.5.3 for discussion of liquids with prosodies.

[9] The third variant in this list is very rare, and would only be heard in very careful speech.

[10] See §2.4.4 for restrictions on word-final syllable codas.

11) [ahar] 'hand/arm'   [alɔkʷɔ] 'fire'   [alɛlɛ] ~ [ælɛlɛ] ~ [ɛlɛlɛ]   'leaf sauce'

    [asak] 'foot/leg'   [agurɔ] 'gold'   [andɛɓ] ~ [ændɛɓ] ~ [ɛndɛɓ] 'brain'

There is also a future/irrealis marker /a/ which lengthens vowels in certain verbal constructions, as in the following examples:

12) [na zaɗ]   'I take'   [naa zaɗ]   'I will take'

    [ka balay]   'you wash'   [kaa balay]   'you will wash'

    [a kʷɔlay]   'it dries'   [aa kʷɔlay]   'it will dry'

The morpheme /a/ can also represent the 3rd person singular subject pronoun (see §3.2.1a and 3.4.1a), and a preposition, used as the associative marker (§3.1.2 and 3.4.3).

2.1.6 Fast speech phenomena

Fast speech phenomena causes the resyllabification of certain words. The schwa nucleus of light syllables may not be inserted, causing consonant clusters to occur.

When two identical consonants appear together in the underlying form, lengthening of the consonant may replace schwa insertion. In careful speech the extra syllable is recoverable.

13)   **SLOW SPEECH**   **FAST SPEECH**

    /ttark/   [tətarak]   ~   [ttarak]   'shoe'

    /ᵖggama/   [gɪgɛmɛ]   ~   [ggɛmɛ]   'chin'

This phenomenon also applies across morpheme boundaries, and will be considered in §3.3.4.

With non-identical consonants, I have not been able to determine any rules governing the non-insertion of schwa, however it mostly applies in poly-syllabic roots, as in the following examples:

14) /ftaɗy/   [fətaɗay]   ~ [ftaɗay]   'sharpen'

    /gdgaly/   [gədəgalay]   ~ [gədgalay]   'put on weight'

    /ptsahy/   [pətsahay]   ~ [ptsahay]   'remove insides'

    /tsfɗy/   [tsəfəɗay]   ~ [tsəfɗay]   'ask'

    /mharm/   [məharam]   ~ [mharam]   'fetish'

    /mpapr/   [məpapar]   ~ [mpapar]   'grass fence/sekko'

These examples indicate that the fast speech form is closer to the underlying form of the morpheme.

2.2 Prosodies

As in many other Chadic languages, particularly in the Central Chadic sub-branch, the processes of labialisation and palatalisation form a significant part of the phonology and morphology of the Moloko language.

Wolff (1981:144) refers to "the notion of 'prosodies' as abstractions apart from the consonant and vowel systems, i.e. 'unplaced' sources of palatalisation and labiovelarisation rather than segmental phonemes within linear structures are assumed to account for vocalic surface realisations other than [ə] and [a]."

Labialisation and palatalisation are morpheme-level prosodies. They spread leftward, and affect all vowels and certain consonants. Any word may be marked with the prosody of either labialisation or palatalisation, which affects each syllable within that word. The prosodies will be represented at the underlying level using superscript symbols: /ʷ/ to represent labialisation and /ʸ/ to represent palatalisation. The following chart shows the range of mono-syllabic mono-morphemic words with and without prosodies.

15)	Ø	GLOSS	LAB	GLOSS	PAL	GLOSS
CV	[ɬa]	'cow'	[lɔ]	'go'	[gɛ]	'do'
	[ma]	'mouth'	[kʷɔ]	'even'	[dɛ]	'cook'
CVC	[fat]	'day/sun'	[hɔr]	'woman'	[dʒɛŋ]	'luck'
	[zay]	'peace'	[zɔm]	'eat'	[vɛr]	'bedroom'

2.2.1 Labialisation

Labialisation is a secondary articulation, characterised phonetically by lip-rounding and raising the back of the tongue towards a velar position (ie. labiovelarisation). It affects the back consonants, causing a secondary labial articulation, for example /k/ → [kʷ] (see §2.5.1). With vowels, the backing and rounding movements of labialisation cause the central vowel phoneme /a/ to be realised as [ɔ], and the epenthetic vowel [ə] to be realised as [u].

2.2.2 Palatalisation

Palatalisation refers to any articulation involving a movement of the tongue towards the hard palate. This prosody affects alveolar fricatives and affricates, causing them to become alveopalatal, for example /s/ → [ʃ] (see §2.5.2). The raising and fronting of palatalisation cause /a/ to be realised as [ɛ], and [ə] to be realised as [ɪ].

2.2.3 Contrasts

The following example gives a paradigm for the verb /mNzar/ 'see.' In its citation form (2nd person singular imperative) it has no prosody. The 2nd person plural imperative form involves a labialisation prosody and the addition of a suffix (/-ʷam/ plural agreement marker, ref.§3.4.1b), while the infinitive form involves a palatalisation prosody, and addition of both a prefix (/m-/ nominaliser) and suffix (/-ʸa/ infinitive marker).

16) UNDERLYING FORM: /mNzar/   'see'
    2 SG IMPERATIVE FORM: [mənzar]   '(you sg) see!'
    2 PL IMPERATIVE FORM: [munzɔrɔm]   '(you pl) see!'
    INFINITIVE FORM: [mɪmɪnʒɛrɛ]   'to see'

This example shows how the vowel /a/ is realised as [ɔ] in labialised forms, and [ɛ] in palatalised forms, while [ə] is realised as [u] in labialised forms and [ɪ] in palatalised forms. This will be discussed in greater detail in the following section.

2.3 Vowels

2.3.1 Introduction

The vowel system of Moloko can be analysed as having one underlying vowel /a/. This gives a two-way system, relying on the presence or absence of this vowel in any position within the word. The absence of a vowel requires an epenthetic vowel to break up consonant clusters (except in cases mentioned in §2.1.3 and 2.1.4), however this epenthetic [ə] is not present in underlying forms. These two central vowels, in turn, can undergo processes of labialisation (§2.2.1) and palatalisation (§2.2.2), as well as certain allophonic rules, (§2.3.6) to create a system of nine surface vowels.

17)	FRONT		CENTRAL	BACK
	-RD	**+RD**		**+RD**
HIGH	i			u
	ɪ			ʊ
MID	ɛ	œ	ə	ɔ
LOW	æ		a	

When both labialisation and palatalisation simultaneously affect /a/, the front rounded vowel [œ] is realised. There is a phonetic gap left by the absence of a high vowel with both palatalisation and labialisation *[ü]. If both prosodies affect [ə], it is realised as [u] or [u]. This will be discussed in §2.3.6.

2.3.2 Features of vowels

These nine surface vowels: [i, ɪ, ɛ, œ, ə, a, ɔ, ʊ, u][11] can be distinguished using four features: the feature of height distinguishes between [a] and [ə] and their realisations (with +/-Low the marked feature since epenthetic [ə] functions as the unmarked vowel), while the feature ATR distinguishes between [i, ɪ] and [u, ʊ]. Palatalisation and labialisation cause the fronting and backing effects already mentioned. This gives us the following feature chart:

18)	i	ɪ	ɛ	œ	ə	a	ɔ	ʊ	u
LOW	-	-	+	+	-	+	+	-	-
ATR	+	-	-	-	-	-	-	-	+
PAL	+	+	+	+	-	-	-	-	-
LAB	-	-	-	+	-	-	+	+	+

2.3.3 Vowel harmony

Throughout the data, there is a clear pattern of vowel harmony.[12] All vowels in any mono-morphemic word will carry the same prosody throughout (either zero, labialisation or palatalisation). It is the final syllable which bears the prosody underlyingly, which then spreads leftwards throughout the word, affecting both underlying and epenthesised vowels. The following examples illustrate the three possible underlying prosody patterns in two and three syllable words (see (15) for examples of one syllable words).

19)	**two**			**three**		
Ø:	/harts/	[harats]	'scorpion'	/matabɫ/	[matabaɫ]	'cloud'
	/dry/	[dəray]	'head'	/ggmy/	[gəgəmay]	'cotton'
LAB:	/ᵂbaɉm/	[boɉɔm]	'cheek'	/ᵂtalaln/	[tɔlɔlɔŋ]	'chest'
	/ᵂskm/	[sʊkᵂɔm]	'buy/sell'	/ᵂmazaNga/	[mɔzɔŋgᵂɔ]	'chameleon'
PAL:	/ʲmahr/	[mɛhɛr]	'forehead'	/ʲmababk/	[mɛbɛbɛk]	'bat'
	/ʲɉga/	[ɉɪgɛ]	'sow'	/ʲtskala/	[tʃɪkɛlɛ]	'price'

The following examples give evidence of contrast between the prosodies:

20) /kra/   [kəra]   'dog'
     /ᵂkra/   [kʊrɔ]   'ten'
     /ʲkra/   [kɪrɛ]   'stake/post'

2.3.4 Vowel slots

The phonetic forms of the examples given in this paper are all in citation form, and therefore show the word as it is pronounced before a pause. In each case, the final syllable (whether open or closed) is always heavy, that is, containing a +Low vowel (§2.1.2). However, in context, when followed by another syllable (be it a morpheme affix or a separate word in an utterance), the final vowel is -Low. This will be discussed in detail in §3.3.2. For transcription purposes, the final vowel will only be given in the underlying form when it is part of an open syllable.

The following sets of words have mostly the same segments and prosodies, but differ in whether the final syllable is open or closed. Compare their underlying representations:

21)	Ø:	/hara/	[hara]	'metal'	/harf/	[haraf]	'medicine'
	LAB:	/ᵂkaka/	[kᵂɔkᵂɔ]	'baobab tree'	/ᵂkakr/	[kᵂɔkᵂɔr]	'gourd/cup'
	PAL:	/ʲdada/	[dɛdɛ]	'beetle'	/ʲdadw/	[dɛdɛw]	'morning'

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[11] Since not all speakers distinguish between [a] and [æ] (ref. §2.1.5), this will not be treated here as a distinct allophone.

[12] Exceptions to this general rule will be examined in §3.4.2. Loanwords and polymorphemic words are not required to adhere to the rules of vowel harmony.

Marking the final vowel only in open final syllables prevents ambiguity with an underlying form of /CC/ potentially being interpretable as [CaC] or [CCa].

In non-final position, it is not predictable as to whether a vowel slot will be -Low or +Low.

In the following sets of minimal pairs, the same consonantal skeleton can have two realisations, depending on whether the vowel slot in non-final position is filled with a +Low or -Low vowel.

22) /bly/   [bəlay]   'sea'   /baly/   [balay]   'wash'
    /dry/   [dəray]   'head'   /dary/   [daray]   'plant'
    /Nbɗy/ [mbəɗay]   'change'   /Nbaɗy/   [mbaɗay]   'swear'

2.3.5 Presence vs absence of vowel

Two words can have the same surface representation, while differing in their underlying form. The following verbs have identical surface forms in the second person singular imperative:

23a)   [tsar]   'climb!' (2sg)
       [tsar]   'taste good!' (2sg)

However, when we consider the second person plural conjugations (formed by adding the suffix /ʷ-am/ which has a labialisation prosody, see also §3.4.1), we can see the differences in the underlying form:

23b)   [tsurɔm]   'climb' (2pl)
       [tsɔrɔm]   'taste good' (2pl)

The contrast here is between the -Low [u] and the +Low [ɔ], which tells us that the underlying form of the verbs differ in their vowel slots:

23c)   /tsr/   'climb'
       /tsar/   'taste good'

To identify whether the final vowel slot is unfilled at the underlying level, in certain cases we have access to the external evidence of reduplication.[13]

24) [ɮəkəɮak] 'winged termite'

The reduplicated syllable is underlyingly /ɮk/ with a -Low vowel slot, which is indicated by the presence of [ə] in the first syllable. In the final syllable, pre-pausally, this slot must be filled by the +Low vowel [a]. If the surface form was *[ɮakəɮak], this would indicate the presence of a +Low vowel slot in the reduplicated syllable, as in the following example:

25) [tʃetʃɛ]   /ʸ tsatsa/ 'louse'

where it is clear that the reduplicated syllable is /tsa/ because it has a [+Low] vowel in the first syllable, rather than *[tʃɪtʃɛ] which would come from */ʸ ts tsa/. Other examples of this contrast include:

26)

underlying Vs	UF	SF	gloss
none	/ʸ tsm/	[tʃɪmtʃem]	('tree')
first syllable only	/ʸ kakɓ/	[kɛkɪɓkɛkɛɓ]	'sharp' (IDEOPHONE)
final syllable only	/ʷhvat/	[huvɔthuvɔt]	'softness' (IDEOPHONE)

Without this type of external evidence, there is no way of knowing whether the final vowel slot is underlyingly present or not.

2.3.6 Non-prosodic conditioning of allophones

Besides the prosodies of labialisation and palatalisation, vowel allophones are conditioned by the phonemes /w/ and /y/. These semi-vowels function as consonants in the language, their vocalic counterparts

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[13] In Moloko, a reduplicated syllable is prefixed to the morpheme.

being [i] and [u], which are allophones of schwa, and the +ATR variants of [ɪ] and [ʊ]. The close relationship between the semi-vowels and their vocalic counterparts is maintained through the rules governing the following allophonic processes:

27) [ə]→ [i] / _ y   eg. /kya/   [kiya]   'moon'   /ʸmyk/   [miyɛk]   'deer'
                                                           (no cases of *[yi])

28) [ə]→ [u] / _ w   eg. /ɗwa/   [ɗuwa] 'milk/breast'   /ʸ ɗwr/   [ɗuwɛr]   'sleep'
           / w _   eg. /wɗaky/ [wuɗakay] 'separate/share'

According to these rules, schwa assimilates to the palatal and labial features of the adjacent semi-vowel.

The vowel phoneme /a/ is not affected by semi-vowels, as in the following examples:

29) /yaɗy/   [yaɗay]   'tire'   not *[yɛɗɛy]
     /gnw/   [gənaw]   'animal'   not *[gʊnɔw]

It should be noted that the semi-vowels themselves do not cause morpheme-level palatalisation or labialisation to occur. For example, the presence of the labiovelar semi-vowel /w/ in any position within a word (including word-finally) does not imply that there will be a labialisation prosody across the word. In fact, in my data, I have no examples of words containing /w/ which have a word-level labialisation prosody, though several cases with either zero or palatalisation prosody, as the following examples show:

30) /mawr/   [mawar]   'tamarind'
    /ʸ dadawa/ [dɛdɛwɛ]   ('bird')

Similarly with the palatal semi-vowel, the above examples (from example 29) indicate that the presence of [y] is independent of any palatalisation prosody, although it may occur within a palatalised or labialised word.

31) /ʸ hayw/   [hɛyɛw]   'cricket'
    /ʷsky/   [sʊkʷɔy]   'clan'
    /layw/   [layaw]   'large squash'

As noted above in §2.3.1 there is a phonetic gap, in the absence of a high front rounded vowel *[ü]. It seems that while the full vowel [a] can carry both palatalisation and labialisation (in the realisation [œ]), the epenthetic vowel [ə] cannot, and the vowel [u] fills the slot.

32)   /ʸ mtwz/   'sorrel fruit'   →   [mɪtuwɛʒ]   *[mɪtüwɛʒ]
      /ʸ Nzwalk/   'sorrel plant'   →   [nʒuwɛlɛk]   *[nʒüwɛlɛk][14]

There is therefore no [-Low] variant of the front rounded allophone of /a/. A schwa which bears both palatalisation and labialisation simultaneously is realised as [ʊ] (with a morpheme-level palatalisation prosody) or [u] (adjacent to /y/).

This process across morpheme boundaries will be examined in §3.3.3.

2.4 Consonants

2.4.1 Introduction

Moloko has 30 consonant phonemes. Allophonic variation is established in one of two ways: by a morpheme level prosody (see chart in §2.4.3), and by its position in the word (see §2.4.4). The relationship between consonants and tone will be considered in §4.1.1.

2.4.2 Phonetic chart

The following chart shows place and manner of articulation of all phonetic realisations of consonants in Moloko. The individual phonemes and their allophones will be considered in the following sections.

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[14] I have found no mono-morphemic examples of labialised words with either [yə] or [əy] to see whether the vowel would become [i].

(33)

		BIL	LAB-DEN	ALV	ALV-PAL	PAL	VEL	GLO	LAB-VEL
STOPS	-voice	p		t			k		kʷ
	+voice	b		d			g		gʷ
	nasal	m		n			ŋ		
	pre-nas	mb		nd			ŋg		
	implos	ɓ		ɗ					
AFFRICATES	-voice			ts	tʃ				
	+voice			dz	dʒ				
	pre-nas			nz	nʒ				
FRICATIVES	-voice		f	s	ʃ		x	h	hʷ
	+voice		v	z	ʒ				
LATERAL FRICATIVES	-voice			ɬ					
	+voice			ɮ					
LAT APPROX				l					
APPROXIMANT					y				w
VIBRANT				r					

2.4.3 Evidence for contrasts - prosody

The following table gives evidence for contrasts for each phone with and without prosodies. Each consonant (reading down the chart) is shown in three words, one without any prosody, one with a labialisation and one with a palatalisation prosody.[15]

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[15] My data includes no examples of /nz/ in a labialised word, although this combination is not prohibited by any phonological rules.

34)	Ø	GLOSS	**LAB**	GLOSS	**PAL**	GLOSS
front						
p	[pay]	'open'	[apɔŋgʷɔ]	'mushroom'	[pɛmbɛ3]	'blood'
b	[bay]	'light'	[abɔr]	'lust'	[bɛkɛ]	'slave'
6	[ɓay]	'hit'	[aɓɔlɔ]	'yam'	[ɓɛɓɛŋ]	'count'
m	[may]	'hunger'	[amɔm]	'bee'	[amɛlɛk]	'bracelet'
mb	[mbay]	'follow'	[ambɔlɔ]	'bag'	[mbɛ]	'argue'
f	[far]	'itch'	[fɔkʷay]	'whistle'	[fɛ]	'whistle'
v	[vay]	'winnow'	[avɔlɔm]	'ladle'	[vɛ]	'spend (time)'
central						
t	[tar]	'call'	[atɔs]	'hedgehog'	[tɛ3ɛk]	'boa'
d	[dar]	'burn'	[dɔkʷay]	'arrive'	[dɛ]	'cook'
ɗ	[ɗas]	'weigh'	[ɗɔgʷɔm]	'nape'	[dɛ]	'flourish'
n	[nax]	'ripen'	[sɔnɔ]	'joke'	[anɛŋ]	'snake'
nd	[nday]	'split'	[ndɔɓay]	'explode'	[ndɛ]	'lie down'
s	[sar]	'know'	[sɔnɔ]	'joke'		
ʃ					[ʃɛ]	'drink'
z	[zay]	'peace'	[zɔm]	'eat'		
ʒ					[ʒɛ]	'smell'
ts	[tsar]	'climb'	[tsɔkʷɔr]	'fish net'		
tʃ					[tʃɛ]	'lack'
dz	[dzay]	'speak'	[dzɔgʷɔ]	'hat'		
dʒ					[dʒɛŋ]	'luck'
nz	[nzakay]	'find'				
nʒ					[nʒɛ]	'sit down'
ɬ	[ɬay]	'slit'	[ɬɔkʷɔ]	'earring'	[aɬɛɬɛɗ]	'egg'
ɮ	[ɮaŋ]	'start'	[bɔɮɔm]	'cheek'	[aɮɛrɛ]	'lance'
l	[lay]	'dig'	[lɔ]	'go'	[lɛhɛ]	'bush'
r	[rax]	'satisfy'	[arɔx]	'pus'	[tɛrɛ]	'other'
y	[yam]	'water'	[sʊkʷɔy]	'clan'	[ayɛwɛɗ]	'whip'
back						
k	[kaɬ]	'wait'			[bɛkɛ]	'slave'
g	[gar]	'grow'			[gɛ]	'do'
ŋ						
ŋg	[ŋgay]	'set'			[fɛŋgɛ]	'termite mound'
h	[hay]	'millet'			[mɛhɛr]	'forehead'
x						
lab-vel						
kʷ	[akʷɔ]	'fire'	[kʷɔndɔŋ]	banana	[ayœkʷ]	('grain')
gʷ	[agʷɔɮak]	'cockerel'	[gʷɔrɔ]	kola	[dʒœgʷɛr]	'limp'
hʷ			[hɔr]	woman	[ahʷœɗɛ]	'fingernail'
w	[war]	'child'			[wɛ]	'give birth'

The gaps in this chart indicate that [ʃ, ʒ, tʃ, dʒ, and nʒ] are in complementary distribution with [s, z, ts, dz and nz], with the first group only appearing in palatalised words. Also, back consonants with no labial co-articulation do not appear in labialised words. These phenomena will be discussed in §2.5. The gaps involving [ŋ] and [x] will be considered in §2.4.7.

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2.4.4 Evidence for contrasts - position

The following chart shows the distribution of each consonant phone (reading down) in different positions within the word (reading across). The examples given have /a/ vowels unaffected by prosodies,[16] and are mostly verbs (2nd person singular imperative form) except those marked with N which are nouns.

35)	INITIAL		MEDIAL		FINAL	
p	[palay]	'choose'	[kapay]	'roughcast'	[dap]	'fake' N
b	[balay]	'wash'	[mabaf]	('insect') N		
ɓ	[ɓalay]	'build'	[ndaɓay]	'wet/whip'	[haɓ]	'break'
m	[makay]	'leave/let go'	[lamay]	'touch'	[tam]	'save'
mb	[mbahay]	'call'	[hambar]	'skin' N		
f	[fatay]	'descend'	[dafay]	'bump'	[taf]	'spit'
v	[vakay]	'burn'	[ɮavay]	'swim'	[dzav]	'plant'
t	[talay]	'walk'	[fatay]	'descend'	[mat]	'die'
d	[daray]	'snore'	[hadak]	'thorn' N		
ɗ	[ɗakay]	'indicate'	[yaɗay]	'tire'	[zaɗ]	'take'
n	[nax]	'ripen'	[zana]	'fabric/pagne' N		
nd	[ndavay]	'finish'	[danday]	'intestines' N		
s	[sakay]	'sift'	[pasay]	'detatch'	[was]	'farm'
ʃ						
z	[zaɗ]	'take'	[wazay]	'shake'	[baz]	'reap'
ʒ						
ts	[tsahay]	'ask'	[watsay]	'write'	[harats]	'scorpion' N
tʃ						
dz	[dzakay]	'lean'	[dzadzay]	'dawn/light' N		
dʒ						
nz	[nzakay]	'find'	[manzaw]	'beignet' N		
nʒ						
ɬ	[ɬaray]	'slide'	[tsaɬay]	'pierce'	[kaɬ]	'wait'
ɮ	[ɮavay]	'swim'	[daɮay]	'join/tie'	[mbaɮ]	'demolish'
l	[lagay]	'accompany'	[balay]	'wash'	[wal]	'attach'
r	[rax]	'pluck'	[garay]	'command'	[sar]	'know'
y	[yaɗay]	'tire'	[haya]	'grind'	[balay]	'wash'
k	[kapay]	'roughcast'	[makay]	'leave/let go'	[sak]	'multiply'
g	[garay]	'command'	[lagay]	'accompany'		
ŋ					[hadzaŋ]	'tomorrow'N
ŋg	[ŋgaɮay]	'introduce'	[maŋgaɬ]	'fiancée' N		
h	[halay]	'gather'	[mbahay]	'call'		
x					[ɓax]	'sew'
kʷ	[kʊsay]	'fog'	[tʊkʷasay]	'cross/fold'	[ayœkʷ]	('grain')
gʷ	[gʊla]	'son'	[dʒœgʷɛr]	'limp' N		
ŋgʷ	[ŋgʊdaɬay]	'simmer'	[aŋgʊrɮa]	'sparrow' N		
hʷ	[hʊɮay]	'rot'	[tʃœhʷɛl]	'stalk' N	[agʷɔxʷ]	'viper' N
w	[watsay]	'write'	[ɮaway]	'fear'	[mahaw]	('snake') N

This chart indicates that there are no restrictions on consonants word-initially or word-medially (ie. syllable-initially), except for the following cases:

---

[16] I could find no examples in my data of /gʷ/ or /hʷ/ appearing in words unaffected by prosodies, therefore these examples are both from palatalised words.

a) alveopalatal fricatives and affricates are not found at all in non-palatalised words.

b) voiced stops and pre-nasalised consonants don't appear in word-final position,[17]
    ie. [b, mb, d, nd, dz, nz, g, ŋg, gʷ, ŋgʷ].

c) [h] and [n] realise allophones in word-final position (see §2.4.7).

2.4.5 Chart of consonant phonemes

From the above contrasts, the following phonemes can be distinguished:

36)	FRONT	CENTRE	BACK	LABIO-VELAR
STOPS	p b Nb ɓ	t d Nd ɗ	k g Ng	kʷ gʷ Ngʷ
AFFRICATES		ts dz Nz		
FRICATIVES	f v	s z ɬ ɮ	h	hʷ
LIQUIDS		l r		
APPROXIMANTS		y		w
NASALS	m	n		

2.4.6 Phonetic description

All sounds are made with egressive lung air except where otherwise stated.

/p/	[p]	voiceless bilabial unaspirated stop	
/b/	[b]	voiced biliabial stop	
/Nb/	[mb]	pre-nasalised voiced bilabial stop	
/m/	[m]	bilabial nasal	
/ɓ/	[ɓ]	voiced bilabial stop with ingressive pharynx air (implosive)	
/f/	[f]	voiceless labio-dental fricative	
/v/	[v]	voiced labio-dental fricative	
/t/	[t]	voiceless alveolar unaspirated stop	
/d/	[d]	voiced alveolar stop	
/n/	[n]	voiced alveolar nasal	
	[ŋ]	voiced velar nasal	occurs word-finally, pre-pausally
/Nd/	[nd]	pre-nasalised voiced alveolar stop	
/ɗ/	[ɗ]	voiced alveolar stop with ingressive pharynx air (implosive)	
/ts/	[ts]	voiceless alveolar affricate	occurs in unpalatalised syllables
	[tʃ]	voiceless alveopalatal affricate	occurs in palatalised syllables
/dz/	[dz]	voiced alveolar affricate	occurs in unpalatalised syllables
	[dʒ]	voiced alveopalatal affricate	occurs in palatalised syllables
/s/	[s]	voiceless alveolar fricative	occurs in unpalatalised syllables
	[ʃ]	voiceless alveopalatal fricative	occurs in palatalised syllables
/z/	[z]	voiced alveolar fricative	occurs in unpalatalised syllables
	[ʒ]	voiced alveopalatal fricative	occurs in palatalised syllables
/Nz/	[nz]	pre-nasalised voiced alveolar nasal	occurs in unpalatalised syllables
	[nʒ]	pre-nasalised voiced alveopalatal nasal	occurs in unpalatalised syllables
/ɬ/	[ɬ]	voiceless alveolar lateral fricative	
/ɮ/	[ɮ]	voiced alveolar lateral fricative	
/l/	[l]	voiced alveolar lateral approximant	
/r/	[r]	voiced alveolar trill	
/y/	[y]	voiced alveo-palatal semi-vowel	

[17] The only cases in my data where /p/ is found word-finally are all ideophones, eg: [tɪp tɛp] 'very dark,' [dap] 'fake.'

	[i]	high front unrounded +ATR vowel	
/k/	[k]	voiceless velar unaspirated stop	occurs in unlabialised syllables
	[kʷ]	voiceless labialised velar stop	occurs in labialised syllables
/g/	[g]	voiced velar stop	occurs in unlabialised syllables
	[gʷ]	voiced labialised velar stop	occurs in labialised syllables
/Ng/	[ŋg]	pre-nasalised voiced velar stop	occurs in unlabialised syllables
	[ŋgʷ]	voiced pre-nasalised labialised velar stop	occurs in labialised syllables
/h/	[h]	voiceless glottal fricative	occurs non-pre-pausally
	[x]	voiceless velar fricative	occurs pre-pausally ref §2.4.7
/kʷ/	[kʷ]	voiceless labialised velar stop	
/gʷ/	[gʷ]	voiced labialised velar stop	
/hʷ/	[hʷ]	voiceless labialised glottal fricative	
/w/	[w]	voiced labio-velar semi-vowel	
	[u]	high back rounded +ATR vowel	

Rules governing realisations of allophones will be discussed in the following sections §2.4.7 and §2.5.

2.4.7 Conditioned variation

Two phonemes /n/ and /h/ have allophonic realisations according to their position in the word.

a) the phoneme /n/[18]

[ŋ] is an allophone of /n/ with the following distribution:

37) n → ŋ / _ #

These two phones are found in the following complementary distribution:

38) INITIAL		MEDIAL		FINAL	
[nax]	'ripen'	[gənaw]	'animal'	[ɓaŋ]	'hit'
[nama]	'at the time'	[aɟəna]	'but'	[gəlaŋ]	'threshing area'
[nɛfɛtɛtɛ]	'powdery'	[mɪtɛnɛŋ]	'bottom'	[ɓərɟaŋ]	'mountain'

The following example shows how the alternation is realised in three different contexts.

39) a) before a pause: /na bn/ → [na baŋ] 'I hit'
    b) before a consonant: /na bn ʷhda/ → [na baŋ hudɔ] 'I hit the wall'
    c) before a vowel: /na bn ahr/ → [na ban ahar] 'I clap' (lit 'I hit hand')

In polysyllabic words, word-final [ŋ] is deleted when a suffix is added, ie. before a morpheme boundary.

40) ŋ → ∅ / _ +

UF	example	gloss	+ PLURAL	[-ahay]	+ PREPOSITION	
/ɓrɟn/	[ɓərɟaŋ]	'mountain'	[ɓərɟahay]	'mountains'	[ka ɓərɟa ka]	'on the mountain'
/gln/	[gəlaŋ]	'threshing area'	[gəlahay]	'threshing areas'	[a gəla va]	'in the threshing area'

b) the phoneme /h/

[x] and [h] are in complementary distribution:

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[18] /n/ is rarely found in word-initial position. It appears in some bound morphemes (eg. [na] which has various functions, some ideophones ([napəknapak] 'tasteless,' [nɛfɛtɛtɛ] 'powdery'), the 2nd person singular emphatic pronoun [nɔkʷ], and one verb [nax] 'ripen.'

41)	INITIAL		MEDIAL		FINAL	
[har]	'make'	[ahar]	'hand'	[rax]	'satisfy'
[hʊdɔ]	'wall'	[tɔhɔr]	'cheek'	[hɔmbɔx]	'pardon'
[hɛrɛɓ]	'heat'	[mɛhɛr]	'forehead'	[tɛʒɛx]	'boa'

[x] is an allophone of /h/ with the following distribution:

42) h → x / _ #

The following examples show how the alternation is realised in context:

43) [gəvax]   'field'   /gvh   atta/   →   [gəvahatəta]
                          'field' (3PL POSS)   'their field'

   [ɓax]   'sew'   /a-   ɓh   - aw/   →   [a ɓahaw]
                     (3SG SUBJECT) 'sew' (1SG OBJECT)   'he/she sews for me'

See also §3.3.1 for examples across word boundaries.

/h/ is often deleted between vowels in polymorphemic words, as in the following examples:

44) /bahy   aʷlaka/[19]   →   [bayalɔkʷɔ]
    'chief' (1PL INC POSS)   'our chief'

    /zɗ   ahn/   →   [zaɗaŋ] ~ [zaɗahaŋ]
    'take' (3SG OBJECT)   'take for him/her'

2.5 Consonants and Prosodies

2.5.1 Labialisation

Labialisation as a word-level prosody has already been discussed in relation to its effect on vowels (ref: §2.2.1). In regard to consonants, its effect is restricted to the back consonants. There is however a second possible source of labialisation within a word, which is the case of underlyingly labialised consonants.

a) Word-level labialisation

The effect of labialisation is only fully realised on the velar consonants, causing /k/ to be realised as [kʷ], /g/ → [gʷ] and /ng/ → [ŋgʷ] [20] adjacent to low back vowels.[21]

45)   UF   SF   GLOSS
      /ʷgara/   →   [gʷɔrɔ]   'kola'
      /ʷmazaNga/   →   [mɔzɔŋgʷɔ]   'chameleon'
      /ʷmagadk/   →   [mɔgʷɔdɔkʷ]   'large hawk'

Although a back consonant, /h/ does not manifest the labial co-articulation as clearly as the velars,[22] except when followed by a non-labialised vowel.

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[19] See §3.4.3 for further discussion on possessive pronouns and prosodic spreading.

[20] As discussed in §2.4.7 above, there is no phoneme */ŋ/. Therefore the final consonant of words such as [kʷɔndɔŋ] is not *[ŋʷ] but rather /ʷkandn/.

[21] With high back vowels it is more difficult to identify any explicit lip-rounding on the preceding velar consonant, as phonetically there is little difference between [kʷɔ] and [kʊ]. For this reason I will not mark *[Cʷʊ] in this data.

[22] In collecting data I transcribed the word for 'back' at different times as [hʊlɛŋ] [həlɛŋ] [hɔlɛŋ] and [hœlɛŋ]. This could be free variation or regional/ideolectal differences.

46) [tɔhɔr] 'cheek' [hɔmbɔx] 'pardon'

[tɔhʷay] (2SG IMP) [mɛɫœhʷɛ] (INF) 'sneak away'

b) Underlyingly labialised consonants

There are several examples of words with labialised segments which do not have a labialisation prosody across the word. The following examples do not fit neatly into the system of vowel harmony in Moloko (§2.3.3).

47a) [gʊdɛdɛk] 'frog' [tʊkʊrak] 'partridge' [agʷɔɮak] 'rooster'

[kʊtʃɛɫ] 'viper' [mɛtʃœkʷɛcɟ] 'maggot' [pɛcɟœkʷ] 'blade'

If the prosody (or absence of prosody) applied across the whole word, one would expect the following results:

50b) [gʊdɛdɛk] 'frog' → *[gɪdɛdɛk] or *[gʊdɔdɔkʷ]

[tʊkʊrak] 'partridge' → *[tɔkərak] or *[tʊkʊrɔkʷ]

[agʷɔɮak] 'rooster' → *[agaɮak] or *[agʷɔɮɔkʷ]

In each case, the focus of the problem is the labialisation feature which seems to attach itself to certain velar consonants. In the case of 'partridge' the first and second syllables are labialised, but not the third; therefore it cannot be a case of a word-level labialisation prosody spreading leftwards from the end of the word.

To account for these cases, it seems to be necessary to posit the existence of distinct 'underlyingly labialised' consonants.

In the following pair of words, the first example does not manifest consistent vowel harmony across the whole word, while the second does. Therefore only the second example carries a labialisation prosody across the whole word. Their underlying forms must differ in the following way:

48) /dgʷaly/ [dʊgʷɔlay] 'thigh' /ʷggara/ [gʊgʷɔrɔ] 'ram'

Consider also the following minimal pairs, which are distinguished only by the contrast between the underlyingly labialised and non-labialised velars.

49) **WORD-LEVEL PROSODY** **LABIALISED CONSONANT**

/ʷslk/ [ʃɪlɛk] 'jealousy' /ʷslkʷ/ [ʃɪlœkʷ] 'broom'

/ʷgla/ [gʊlɔ] 'left' /gʷla/ [gʊla] 'son'

Having established the existence of four distinct consonant phonemes (ie. [g, gʷ, k, kʷ]) among the velar stops, we should also consider the other back consonants.

In the case of /Ng/, the only example I have which would indicate the presence of a separate labialised consonant is the following:

50) /ʸmadalaNgʷaz/ [mɛdɛlɛŋgʷɛʒ]~ [mɛdɛlœngʷɛʒ] 'leopard/panther'

Since the majority of Moloko mono-morphemic words are 3 syllables or less, the length of this example suggests it could be a compound. The morpheme that includes [ŋgʷ] could therefore carry a labialisation prosody. In Mbuko, the word for panther is 'luŋgo' (Mbuagbaw: 1995) which supports this idea. However, without further examples, /ŋgʷ/ will not be considered a separate phoneme in this paper.

Although /h/ does not manifest explicit lip-rounding as clearly as the other back consonants at a phonetic level, the following examples suggest that there are also two consonants /h/ and /hʷ/ at phonemic level.

51)

no prosody			labialisation prosody			labialised consonant		
UF	SF	gloss	UF	SF	gloss	UF	SF	gloss
/hacɟa/	[hacɟa]	'much'	/ʷhacɟa/	[hɔcɟɔ]	'wall'	/hʷacɟa/	[hɔcɟa]	'dregs'

Without an underlyingly labialised /hʷ/, the word for 'dregs' would be homophonous with either 'wall' (with a word-level labialisation prosody) or 'much' (with no prosody). The final [a] of [hɔcɟa] indicates that

there must be a different source of the rounding of the first vowel. This can only be explained by positing two separate phonemes.

There is some free variation with the phoneme /hʷ/. In words with a palatalisation prosody, the combination [hʷɛ] may vary with [hœ], as in the following examples:

52) /a-ʸhʷaɖa/   [ahʷɛɖɛ] ~ [ahœɖɛ]   'fingernail/claw'

/ʸmadahʷr/   [mɛdœhʷɛr] ~ [mɛdœhœr]   'old age'

Underlyingly labialised consonants cause any adjacent vowel to become rounded, whether +/-Low, with one exception. In words with a palatalisation prosody, the labialised consonant only affects the preceding vowel.[23] The domain of influence therefore is asymmetrical, as the following chart shows.

53)		V Cʷ		Cʷ V	
PROSODY	VOWEL	input	result	input	result
∅	-Low	əCʷ	ʊCʷ	Cʷə	C ʊ
	+Low	aCʷ	-	Cʷa	Cʷɔ
PAL	+Low [24]	ʸaCʷ	œCʷ	ʸCʷa	Cʷɛ

The following example demonstrates the domain of the labialised consonants' influence.

54) [gʷœgʷɛʒ] 'red'

Since both vowels are palatalised, there must be a palatalisation prosody across the whole word. If both velars were /g/, the surface form would be *[gɛgɛʒ]. If the surface form was *[gʷœgʷœʒ], this would suggest that two prosodies were affecting the whole word. The domain chart above indicates that the second velar consonant is underlyingly labialised, since the preceding vowel is round. The first velar could be either /g/ or /gʷ/. The former option is more likely, since otherwise this would be the only example in the data of two labialised consonants appearing in the same word without a labialisation prosody, and secondly if C₁ was /gʷ/ then the rounding of the following vowel is redundant. Therefore the underlying form of this word is most likely to be /ʸ gagʷz/.

At the surface phonetic level, therefore, a surface [Cʷ] can have two possible sources, either a labialisation prosody across the whole word, or the presence of an underlyingly labialised consonant.

55) labialisation across whole word: /ʷdzgr/   [dzʊgʷɔr]   'stake'

56) labialised velar consonant: /ʸdzagʷr/   [dʒœgʷɛr]   'limp'

The way to identify whether labialisation is consistent across the whole word, or merely attached to one velar consonant is to examine other vowels in the same word at surface level. If they do not follow the vowel harmony patterns, (not counting poly-morphemic cases) then a separate labialised consonant provides the source of the labialisation.

There are several cases in the data where it is impossible to tell whether the consonant is underlyingly labialised or there is a labialisation prosody across the word, as in the following examples:

57) /skʷm/ ~ /ʷskm/   [sʊkʷɔm]   'buy/sell'

/magʷm/ ~ /ʷmagm/   [mɔgʷɔm]   'home'

To decide on the underlying form of these types of word would require certain grammatical contexts or phonological environments which would produce alternations. Further research is required to determine such contexts.

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[23] In fast speech however, both adjacent vowels may become labialised, resulting in free variation, as in example 56, which may be pronounced [dʒœgʷɛr] or [dʒœgʷœr].

[24] There are no examples in the data of -Low vowels with labialised consonants in palatalised words.

2.5.2 Palatalisation

Palatalisation on consonants causes a raising and slight backing movement on alveolar sibilants - causing /s/ → [ʃ], /z/ → [ʒ], /ts/ → [tʃ], /dz/ → [dʒ], including the prenasalised /nz/ → [nʒ].

The following pairs of words show the contrast between palatalised and non palatalised forms:

58) NON-PALATALISED   PALATALISED

/dzn/	[dzaŋ]	'prick'	/ʲdzn/	[dʒɛŋ]	'chance'
/mtsapr/	[mətsapar]	'multiple'	/ʲmtsapa/	[mɪtʃɛpɛ]	'to drape'
/Nzavr/	[nzavar]	'young man'	/ʲNzamr/	[nʒɛmɛr]	'artery'

2.5.3 Liquids and prosodies

As the insertion of schwa is optional adjacent to liquids (see §2.1.4), similarly the prosodic effects on this epenthetic vowel are optional when adjacent to a liquid in the case of words with either a labialisation or palatalisation prosody.

59) **LAB:**   /ʷdlv/   [dlɔv] ~ [dəlɔv] ~ [dʊlɔv]   'lake'

               /ʷhrgv/   [hrgʷɔv] ~ [hərgʷɔv] ~ [hʊrgʷɔv] ~ [hrʊgʷɔv]   'monkey'

     PAL: /ʲklf/   [klɛf] ~ [kəlɛf] ~ [kɪlɛf]   'fish'

               /ʲhrddm/   [hrdɪdɛm] ~ [hərdɪdɛm] ~ [hɪrdɪdɛm] etc.   'knee'

3. WORD LEVEL

The phonological word in Moloko is made up of a root with the optional addition of affixes. Words are marked by potential pause before and after, while affixes cannot stand alone. In this section we will examine roots of the two main grammatical categories, nouns and verbs, then examine the phonological processes involved in affixation.

3.1 Noun Morphology

3.1.1 Noun roots

Noun roots are made up of syllables, with or without a prosody spreading from the right edge leftwards through the whole word (see §2.1.5 and 3.4.2 for one exception). The following chart shows examples of one to three syllable words of each syllable type, with and without prosodies.

60)	Ø	gloss	LAB	gloss	PAL	gloss
CV	[ɬa]	'cow'	[lɔ]	'go'	[gɛ]	'do'
CVC	[fat]	'day/sun'	[hɔd]	'stomach'	[dʒɛŋ]	'chance'
V.CV	[ava]	'arrow'	[akʷɔ]	'fire'	[alɛ]	'eye'
V.CVC	[ahar]	'hand/arm'	[atɔs]	'hedgehog'	[anɛŋ]	('snake')
CV.CV	[gala]	'yard'	[sɔnɔ]	'joke'	[dʒɛrɛ]	'truth'
CV.CVC	[mavad]	'sickle'	[tɔhɔr]	'cheek'	[pɛmbɛʒ]	'blood'
V.CV.CV	[adama]	'adultery'	[aɓɔlɔ]	'yam'	[atɛmɛ]	'onion'
V.CV.CVC	[adaŋgay]	'stick'	[ambɔdɔts]	'sugar cane'	[amɛlɛk]	'bracelet'
CV.CV.CV	[manzara]	'termite'	[mɔzɔŋgʷɔ]	'chameleon'	[ʒɛtɛnɛ]	'salt'
CV.CV.CVC	[maɬalam]	'sword'	[dɔlɔkʷɔy]	'syphillis'	[dɛbɛʒɛm]	'jawbone'

3.1.2 Noun affixes

The following list of the various morphemes which can be attached to noun roots includes two examples of each, one following an open syllable and one following a closed syllable. The rules governing affixation will be considered in §3.3.

- plural marker [-ahay] suffixed to a noun root or noun phrase [25]

61) [ahar] 'hand/arm' [ahərahay] 'hands/arms'

  [baba] 'father' [babahay] 'fathers'

- adjective marker [-ga] suffixed to a noun root

62) [tʃɪdʒɛ] 'illness' [tʃɪdʒɪga] 'ill'

  [ʃɪlɛk] 'jealousy' [ʃɪlɪkəga] 'jealous'

- focus marker [-na] suffixed to a noun root (see also example in §3.3.3)

63) [mɔgʷɔm] 'house' [mɔgʊmɔna] 'the house (in focus)'
  [gala] 'yard' [galana] 'the yard (in focus)'

- [a-] prefix on certain nouns (ref. §2.1.5 and 3.4.2)

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[25] The only cases I have found where suffixation modifies the root is in the following exceptional plural forms, which all relate to people: /ˈmza/ [mɪʒɛ] 'person' [məzahay] 'people'

  /ˈhr/ [hɔr] 'woman' [hawərahay] 'women'

  /zr/ [zar] 'man' [zawərahay] 'men'

  /wr/ [war] 'child' [bɔbzahay] 'children'

- possessive pronouns - suffixed to nouns [26] (see also §3.4.3)

64)

	1sg	2sg	3sg	1pl inc	1pl exc	2pl	3pl
SF	[ʊla]	[ɔŋgʷɔ][27]	[ahaŋ]	[alɔkʷɔ]	[almɛ]	[alʊkʷiyɛ]	[atəta]
UF	/wla/	/ʷaNga/	/a hn/	/a ʷlaka/	/a ʸlma/	/a ʸlkʷya/	/a tta/

The following example shows how the suffixes attach to nouns with closed final syllables (/wr/ 'child') and open final syllables (/ɬala/ 'village'):

65)

	singular	plural	singular	plural
1st inc		[wuralɔkʷɔ]		[ɬalalɔkʷɔ]
1st exc	[wurʊla]	[wuralmɛ]	[ɬalʊla]	[ɬalalmɛ]
2nd	[wurɔŋgʷɔ]	[wuralʊkʷiyɛ]	[ɬalɔŋgʷɔ]	[ɬalalʊkʷiyɛ]
3rd	[wurahaŋ]	[wuratəta]	[ɬalahaŋ]	[ɬalatəta]

It should be noted that some of the suffixes have a prosody: labialisation on 2sg and 1pl inc, and palatalisation on 1pl exc and 2pl. 1sg has no prosody, even though the first vowel is labialised. I have posited the underlying form /wla/ to account for this. Also 2pl does not have a labialisation prosody, rather it contains a labialised consonant /kʷ/ (refer §2.5.1) which causes the epenthesised vowel to be realised as [ʊ].

Most of the suffixes begin with /a/, which is also the associative marker in non-pronominal possessive constructions. Compare these two examples:

66) /wr a ʸlkʷya/ → [wuralʊkʷiyɛ] 'your (pl) child' literally 'the child of you (pl)'

/wr a ʷhr/ → [wurahɔr] 'the woman's child' literally 'the child of the woman'

3.2 Verb Morphology

The Moloko verb is made up of a root plus affixes. The subject pronoun (SP) is prefixed to the root, followed by irrealis (IRR) marker if required. Plural agreement markers (PL) and object pronouns (OP) are suffixed, followed by tense/aspect markers (T/A) if required.[28] The following chart gives a schema with three examples of verbal constructions with different affixes.

67)

(SP) -	(IRR) -	ROOT	-(PL)	-(OP)	-(T/A)		
/a- 3rd		bal 'wash'			-ay/ NON-PAST	→	[abalay] 'he/she washes'
/n- 1st-		bal 'wash'	-ʷam - PL		-va / - PAST	→	[nubɔlɔməva] 'we (exc) washed'
/k- 2nd -	-a- IRR -	bal 'wash'		-atta / 3pl		→	[kaabalatəta] 'you (sg) will wash them'

The present tense is constructed as follows, using the verb /bal/ 'wash':

68)

	SINGULAR	PLURAL
1st inc		[mubɔlɔkʷ]
1st exc	[nə balay]	[nubɔlɔm]
2nd	[kə balay]	[kubɔlɔm]
3rd	[a balay]	[tə balay]

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[26] Moloko does not distinguish between alienable and inalienable possession.

[27] Some speakers have a closed final syllable on this suffix [-ɔŋgɔkʷ], however the open syllable is more common.

[28] More research is required to determine the functions and meanings of each of these affixes, as well as rules governing the order of affixation in very complex structures.

The 1st and 2nd persons plural are marked by a labialised suffix, which then spreads leftwards through the verb root to the pronominal prefix, causing each vowel to become rounded. This will be considered further in §3.4.1b.

3.2.1 Verb roots

The verb root in Moloko is made up of the following components:

a) initial vowels - zero or one
b) consonants - 1,2,3, or 4
c) internal vowels - zero or one
d) prosody - zero or one

These roots are a purely abstract form; their realisation in speech depends on the tense/aspect required by the context. The 2nd person singular imperative form is used most frequently in the examples given in this paper, as it has no pronoun markers or tense/aspect markers except for the addition of suffixes ([-ay], [-ɛ] and [-ŋ]) in certain cases (see §3.2.2).

a) Initial /a-/

Some verbs have a vowel at the beginning in the underlying form.[29] Its presence or absence can only be detected in non-imperative forms of the verb. Any prefix, such as subject pronoun or nominaliser, will indicate the presence or absence of initial /a-/ in the underlying form. If there is no initial vowel then an epenthetic schwa must be inserted. 3rd person singular however is consistently /a-/ despite the initial vowel slot. Any prosody which affects the verb (eg. labialisation of 1st and 2nd person plural forms, ref. §3.4.1b) also affects this vowel slot.

69)

	With initial a-	**Without initial a-**
1sg	[na-]	[nə-]
2sg	[ka-]	[kə-]
3sg	[a-]	[a-]
1pl inc	[mɔ-]	[mu-]
1pl exc	[nɔ-]	[nu-]
2pl	[kʷɔ-]	[ku-]
3pl	[ta]	[tə-]

The following minimal pair is distinguished by the presence or absence of the initial /a-/.

70)

UF	2nd sg imp	gloss	2nd sg indicative	gloss
/Ndaw/	[ndaw-ay]	'swallow!'	[kə ndaway]	'you (sg.) swallow'
/a-Ndaw/	[ndaw-ay]	'insult!'	[ka ndaway]	'you (sg.) insult'

Since there seems to be no obvious relation between the meaning of these two words, the initial /a/ is posited as part of the underlying form, as no explicit morphemic value can be attributed to it.

On one syllable verbs (with UF of either C, CC, or CVC), the 1st & 2nd persons singular always show a +Low vowel in the prefix, however the other conjugations remain consistent following the rule. In the following example, the first horizontal row shows a one syllable verb in 1st person indicative singular and plural, the second row shows a poly-syllabic verb. Neither of the underlying forms have an initial vowel, yet they vary in 1st person singular forms.

71)

UF	GLOSS	1SG IND	1PL (INC) IND
/ɓah/	'sew'	[na ɓax]	[muɓɔhɔkʷ]
/bal/	'wash'	[nə balay]	[mubɔlɔkʷ]

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[29] This is completely distinct from the V-initial nouns referred to in §2.1.5 and 3.4.2.

Similarly, one consonant verbs have a +Low vowel slot in the 1ˢᵗ & 2ⁿᵈ person plural conjugations, even where there is no initial /a-/ in the underlying form. The next example contrasts two mono-consonantal verbs (with no initial vowel in the underlying form, but have [a] in 1pl form[30]) with a polyconsonantal example (which has no initial vowel in any form).

72)

UF	GLOSS	1SG IND	1PL (INC) IND	cf.
/b/	'light'	[na bay]	[mabɔkʷ] ~ [mɔbɔkʷ]	*[mʊbɔkʷ]
/d/	'cook'	[nɛ dɛ]	[madɔk] ~ [mɔdɔkʷ]	*[mʊdɔkʷ]

cf.

/bal/	'wash'	[nɔ balay]	[mɔbalɔkʷ] ~ [mʊbɔlɔkʷ]	

In these cases, the present tense or imperative form will not indicate the presence or absence of the initial vowel. Evidence will come from another conjugational form.

The following chart shows four pairs of verbs which are distinguished by presence or absence of the initial vowel. The vertical columns show the vowel slot unaffected by prosody (1sg present), affected by labialisation (1pl inc present) and affected by palatalisation (infinitive form).[31]

73)

UF	gloss	1sg present	1pl inc present	infinitive
/ɟr/	'pierce'	[na ɟar]	[mʊɟʊrɔkʷ]	[mɪɟɪrɛ]
/a-ɟr/	'kick'	[na ɟar]	[mɔɟʊrɔkʷ]	[meɟɪrɛ]
/tsah/	'ask'	[nɔ tsahay	[mʊtsɔhɔkʷ]	[mɪtʃɛhɛ]
/a- tsah/	'scar'	[na tsahay]	[mɔtsɔhɔkʷ]	[metʃɛhɛ]
/law/	'hang'	[nɔ laway]	[mʊlɔwɔkʷ]	[mɪlɛwɛ]
/a- law/	'mate'	[na laway]	[mɔlɔwɔkʷ]	[melɛwɛ]
/kw/	'get drunk'	[nɔ kuway]	[mʊkuwɔkʷ]	[mɪkuwɛ]
/a- kw/	'search'	[na kuway]	[mɔkuwɔkʷ]	[mekuwɛ]

b) Consonants

Up to 4 consonants can be found in a verb root. The following chart gives examples of each type.

74)

	UF	Surface form	gloss
1 cons	/g/	[gɛ]	'do'
	/d/	[dɛ]	'cook'
	/l/	[lɔ]	'go'
	/b/	[bay]	'light'
2 cons	/gs/	[gas]	'catch'
	/bah/	[bax]	'pour'
	/ɓɬ/	[ɓɔɬay]	'cough'
	/gal/	[galay]	'chase'
3 cons	/dbn/	[dɔbɔnay]	'learn'
	/gzam/	[gɔzamay]	'lose weight'
	/ʷtsɗak/	[tsʊɗɔkʷay]	'crouch'
	/gʷrts/	[gʊrtsay]	'sniff'
4 cons	/gdgal/	[gɔdɔgalay]	'fatten'
	/brkaɗ/	[bɔrkaɗay]	'collect'
	/hdzgaɗ/	[hɔdzɔgaɗay]	'limp'

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[30] See §3.4.1b for explanation of the free variation in these examples.

[31] There are tonal differences which also distinguish these pairs.

It should be noted that the number of consonants does not necessarily correspond to the number of syllables, as liquids do not require epenthetic schwas (§2.1.4), therefore 4 consonant roots may have either 3 or 4 syllables.

c) Internal vowels

Within a verb root, there can be a maximum of one vowel phoneme. Consonant clusters are broken up with epenthetic schwa.

The following chart shows three pairs of words with the same consonantal skeleton (reading horizontally), which differ by the presence or absence of an internal vowel.

75)

Without internal vowel			With internal vowel		
UF	Surface	gloss	UF	Surface	gloss
/ml/	[məl-ay]	'enjoy'	/mal/	[mal-ay]	'leave/let go'
/gr/	[gər-ay]	'tremble'	/gar/	[gar-ay]	'own'
/Nbɗ/	[mbəɗ-ay]	'change (position)'	/Nbaɗ/	[mbaɗ-ay]	'swear'

In §3.2.2 we will look at a sub-class of verbs which don't take a suffix; in these forms, the presence or absence of an internal vowel cannot be identified in the 2nd person singular imperative. Like the initial /a-/ morpheme (§3.1.2a), a plural conjugation will confirm its presence or absence, as the following examples show:

76)

VOWELS	UF	GLOSS	2 SG IMP	1PL (INC) IMP
1	/gdzah/	'pull'	[gədzax]	[gʊdzɔhʷɔkʷ]
1	/mNzar/	'see'	[mənzar]	[mʊnzɔrɔkʷ]
0	/tkm/	'taste'	[təkam]	[tʊkʊmɔkʷ]
0	/hrɗ/	'jump'	[hərad]	[hʊrʊɗɔkʷ]

Although these internal vowels are phonemic, they sometimes act like epenthetic vowels, with variation between the +Low and -Low vowels. This is only evident in cases without suffixes, where the final +Low vowel will be neutralised to -Low when followed by another word. Compare the following examples with and without internal vowels in non-pre-pausal position:

77) no internal vowel: /tkm/   [təkam] 'taste'   [nə təkəm hay] 'I taste millet'
     one internal vowel: /mNzar/ [mənzar] 'see'   [nə mənzər hay] 'I see millet'

Earlier we stated that the final vowel of a closed final syllable would not be included in the underlying form, because it was fully predictable (§2.3.4, see also 3.3.2). However, this rule does not apply as fully to verb roots, as the presence or absence of the internal vowel is distinctive.

d) Prosody

Some verbs have a labialisation prosody on the root. As expected, this prosody will be realised on all vowels and velar consonants.

The following three pairs of verbs are distinguished by the presence or absence of the prosody:

78)

Ø prosody		gloss	LAB prosody		gloss
/a-sak/	[sak-ay]	'sift'	/a-ʷsak/	[sɔkʷ-ay]	'whisper'
/ɓar/	[ɓar-ay]	'sway'	/a-ʷɓar/	[ɓɔr-ay]	'mount'
/tah/	[tah-ay]	'reach'	/a-ʷtah/	[tɔhʷ-ay]	'trace'

Some words (mostly those with bilabial consonants) can optionally take labialisation, eg.

79) /a-bat/   [bat-ay] ~ [bɔt-ay]   'evaporate'
    /a-pam/   [pam-ay] ~ [pɔm-ay]   'chase'

It seems likely that labialisation once had a semantic effect, which has since been lost.

There are no cases of palatal prosody in verb roots, however palatal suffixes will be considered in the following section.

3.2.2 Verb affixes

- adjective marker [-ga] suffixed to a nominalised / infinitive verb

80) [mɛkʷœlɛ]   'to dry'   [mɛkʷœlɪga]   'dry'
    [mɪdɪʃɛ]   'to weigh'   [mɪdɪʃɪga]   'heavy'

- verbal extensions such as [-la], [-lay] suffixed to a verb root

81) [həmay]   'run!' (2sg imp.)
    [həmala]   'run towards me!'
    [həmalay]   'run away (from me)!'

- subject pronouns - prefixed to verb roots (see §3.2.1a)
- future/irrealis [a-] prefixed to a verb root (see §2.1.5)
- nominaliser [m-] prefixed to verb roots

82) [ŋgala] 'come back'   [məŋgala]   'the return'
    [rəɓay] 'be beautiful' [mɪɪɓɛ]   'beauty'

- plural agreement markers - suffixed to verb roots in present tense (ref. §3.4.1b)
- object pronouns - suffixed to verb roots

83)	1sg	2sg	3sg	1pl inc	1pl exc	2pl	3pl
SF	[-aw]	[-ɔkʷ]	[-aŋ]	[alɔkʷɔ]	[alɪmɛ]	[alʊkʷiyɛ]	[atəta]
UF	/aw/	/ʷak/	/an/	/aʷlaka/	/aʸlma/	/aʸlkʷya/	/a tta/

The following example gives the present tense conjugation of the reflexive verb /wal/ 'hurt.'

84)

	SINGULAR	GLOSS	PLURAL	GLOSS
1ˢᵗ inc			[awalalɔkʷɔ]	'it hurts us (inc)'
1ˢᵗ exc	[awalaw]	'it hurts me'	[awalalɪmɛ]	'it hurts us (exc)'
2ⁿᵈ	[awalɔkʷ]	'it hurts you (sg)'	[awalalʊkʷiyɛ]	'it hurts you (pl)'
3ʳᵈ	[awalaŋ]	'it hurts him/her'	[awalatəta]	'it hurts them'

- [-ɛŋ] suffixed to verb roots

85) [nzɛrɛŋ] 'groan (in childbirth)'
    [mbɛʃɛŋ] 'rest/live'

- focus marker [-na] suffixed to verbs

86) [a mənzar] 'he/she sees' [a mənzərna] 'he/she sees (focus)'
    [nə balay] 'I wash'   [nə balina]   'I wash (focus)'

- tense/aspect markers such as [-ay], [-va], [-la] etc. suffixed to a verb root

87) /bal/   [nə balay]   'I wash'   [nə balva]   'I washed'
    /mNzar/   [kə mənzar]   'you (sg) see' [kə mənzarla] 'I just saw'

Tense/aspect markers are suffixed to verb roots. Further research needs to be done on the tense/aspect system of Moloko to determine the meaning of each of these suffixes. The phonological rules applying to their affixation will be discussed in the following section. Here we will consider only those suffixes which are present in citation forms (ie. 2ⁿᵈ person singular imperative).

There appear to be two basic verb classes, consisting of those which take a suffix and those which don't. Slightly over 70% of the verbs in my data (250 out of 350) take the suffix /-y/ in non-past forms (realised as [-ay] in citation form). The meaning of this suffix is uncertain, however it could be related to an earlier system of pluractional forms of verbs which has been lost in Moloko.

This suffix is attached to all persons in the singular and only the 3rd person in the plural. The other plural persons take a labialised suffix as presented above in example 68). These two suffixes are in complementary distribution in the class of verbs with /-y/ suffix.

Although the following pairs of words have the same consonantal skeleton, they differ in their internal vowel,[32] and the presence or absence of the /-y/ suffix.

88) NON-SUFFIXING   SUFFIXING

/dr/	[dar]	'draw back'	/a-dar/	[dar-ay]	'plant'
/dk/	[dak]	'block'	/dak/	[dak-ay]	'indicate/show'
/fd/	[fad]	'put'	/fad/	[fad-ay]	'fold'
/ft/	[fat]	'grow' (plant)	/fat/	[fat-ay]	'descend/lower'
/gr/	[gar]	'grow' (human)	/gar/	[gar-ay]	'own'
/h6/	[ha6]	'break'	/ha6/	[ha6-ay]	'dance'
/kd/	[kad]	'hit/kill'	/a-kad/	[kad-ay]	'prune'
/łr/	[łar]	'send'	/a-łar/	[łar-ay]	'slide'
/Nbd/	[mbad]	'change'	/Nbad/	[mbad-ay]	'swear'
/Ngr/	[ŋgar]	'hinder'	/a-Ngar/	[ŋgar-ay]	'tear'
/sk/	[sak]	'multiply'	/a-sak/	[sak-ay]	'sift'
/wl/	[wal]	'attach'	/wal/	[wal-ay]	'dismantle'

There does not appear to be any clear semantic link between these pairs of verbs.

Roots consisting of just one consonant require a suffix in the surface form. Some take the /-ay/ suffix, others take a palatalised vowel.[33] Compare the following examples:

89) /-y/ suffix   pal suffix

[mbay]	'follow'	[mbɛ]	'argue'
[nday]	'chop'	[ndɛ]	'lie down'
[vay]	'winnow'	[vɛ]	'spend (time)'

3.2.3 Summary of verb morphology

The following chart summarises the above explanation of the components of a verb root. The first column gives the template of each type of root, the following columns indicate the presence or absence or the number of components (initial vowel, consonants, internal vowel and prosody). The suffix is included to realise the surface form in 1st person singular indicative form. From a database of 350 verb roots, the number of cases of each type and the percentage of total are given in the following columns, and finally one example of each type, and its gloss.

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[32] The only example in my data where the internal vowel is the same is /tsar/ [tsar] 'taste good' and /tsar-y/ [tsar-ay] 'tear'

[33] There is one example of a single consonant root taking a labialised suffix: [lɔ] 'go' (cf. [lay] 'dig').

90)

TEMPLATE	INITIAL V	Cs	INT. V	PROS.	SUFF.	NO.	%	EXAMPLE	GLOSS
ʸC	-	1	-	y		13	4	[dɛ]	'cook'
C-n	-	1	-	-	n	4	1	[ɠaŋ]	'start'
C-y	-	1	-	-	y	8	2	[lay]	'dig'
CC	-	2	-	-	-	44	13	[ɗas]	'weigh'
CVC	-	2	+	-	-	12	3.5	[bax]	'pour'
a-CC	+	2	-	-	-	4	1	[baz]	'harvest'
CC-y	-	2	-	-	y	16	4.5	[həmay]	'run'
a-CC-y	+	2	-	-	y	11	3	[bəɠay]	'weed'
CVC-y	-	2	+	-	y	58	17	[balay]	'wash'
a-CVC-y	+	2	+	-	y	38	11	[daray]	'plant'
ʷCC-y	-	2	-	w	y	3	1	[gʊtsay]	'throw'
ʷa-CC-y	+	2	-	w	y	8	2	[kʊray]	'mount'
ʷCVC-y	-	2	+	w	y	5	1.5	[ndɔɠay]	'explode'
ʷa-CVC-y	+	2	+	w	y	22	6	[dɔkʷay]	'arrive'
ʸCC	-	2	-	y		3	1	[tʃɪkɛ]	'stand up'
ʸCVC-n	-	2	+	y	n	5	1.5	[ɓɛɠɛŋ]	'count'
CCC	-	3	-	-	-	2	0.5	[həraɗ]	'jump'
CCVC	-	3	+	-	-	5	1.5	[gədzax]	'pull'
ʷCCC	-	3	-	w	-	2	0.5	[sʊkʷɔm]	'buy/sell'
ʷCCC-y	-	3	-	w	y	11	3	[kʊrsay]	'sweep'
CCC-y	-	3	-	-	y	29	8	[dəbənay]	'learn'
CCVC-y	-	3	+	-	y	31	9	[gəzamay]	'lose weight'
ʷCCVC-y	-	3	+	w	y	5	1.5	[kʊmbɔhay]	'wrap'
CCCVC-y	-	4	+	-	y	11	3	[bədzəgamay]	'crawl'

The next charts give numerical and percentage figures for each element in the verb from the database of 350 verbs.

91)

	INITIAL A	%	INTERNAL A	%	PROSODY	%
+	83	23.5	189	54	51	14.5
-	267	76.5	161	46	299	85.4
total	350	100	350	100	350	100

92)

CONS	NO.	%	SUFFIX	NO.	%
1	26	7	-ay	253	72.5
2	231	66	-e	17	5
3	83	24	-en	8	2
4	10	3	-an	4	1
			∅	68	19.5
total	350	100	total	350	100

29

3.3 Morphophonology

This section examines the morphophonological rules governing affixation in Moloko. In §3.4 we will consider the processes involving intersection of prosodies.

Affixation is the most straightforward when a V-final root suffixes a C-initial morpheme, or a C-final root suffixes a V-initial morpheme, as this maintains the basic syllable structure of the language. When two consonants meet across a morpheme boundary (ie. C-final plus C-initial), a schwa must be epenthesised (ref. §3.3.4), except if the final consonant of the root is /n/ (see §3.3.1). Where two vowels come together, only one is realised (see §3.4.3).

3.3.1 Allophonic realisation

As referred to in §2.4.7 /h/ has the allophonic realisation [x] in word-final position. Therefore, when a suffix is added, the consonant retains its phonemic form. The following examples (with and without prosodies) are given in underlying form, surface form (with allophonic realisation), and suffixed form.

93)	UF	SF	gloss	+suffix	gloss
Ø	/gvh/	[gəvax]	'field'	[gəvəhʊla]	'my field'
LAB	/ʷhambh/	[hɔmbɔx]	'forgiveness'	[hɔmbʊhʊla]	'my forgiveness'
PAL	/ʲtazh/	[tɛʒɛx]	('snake')	[tɛʒɪhʊla]	'my snake'

The word-final allophone of /n/ disappears when a suffix is added (§2.4.7), such as the plural marker /-ahy/.

94)	UF	SF	gloss	+suffix	gloss
Ø	/gsn/	[gəsaŋ]	'bull'	[gəsahay]	'bulls'
LAB	/ʷtlaln/	[tʊlɔlɔŋ]	'heart'	[tʊlɔlɔhay]	'hearts'
PAL	/ʲdadn/	[dɛdɛŋ]	'truth'	[dɛdɛhay]	'truths'

3.3.2 Final vowel

As stated in §2.3.4, the citation or pre-pausal forms of words always have a +Low vowel in final position. In context however, when followed by another syllable (be it a morpheme affix or a separate word in an utterance), this vowel is always realised as -Low.

95)	CITATION FORM:	[ɗaf]	'food'	
	CONTEXT FORM:	[ɗəf-ʊla]	'my food'	(morpheme boundary)
	CONTEXT FORM:	[ɗɔf atsar]	'(the) food is good'	(word boundary)
	PRE-PAUSAL:	[na zʊm ɗaf]	'I eat food'	(phrase final)

Therefore it is necessary to posit the underlying form of this word as /ɗf/, which requires the epenthesis of [ə], and write a rule which states that pre-pausally, the final vowel in a word must become +Low.

96) V -> [+Low] / _ C +

Since we regard the absence of a vowel in final position as the underlying form in closed syllables (§2.3.4), the vowel is not included in the transcription of the underlying form, ie. /ɗf/ rather than */ɗaf/.

In word-final open syllables however, the vowel will be written in the underlying form, as its absence would indicate a closed syllable. Compare the following examples, which contrast two pairs of words with the same consonantal skeleton, differing only in their final syllable:

97)	UF	SF	gloss	+ plural suffix [-ahay]
	/ʷbangr/	[bɔŋgʷɔr]	'mane'	[bɔŋgʊrahay]
	/ʷbangara/	[bɔŋgʷɔrɔ]	'machete'	[bɔŋgʷɔrɔhay]
	/dagl/	[dagal]	('name of village')	[dagəlahay]
	/dagla/	[dagəla]	'basin'	[dagəlahay]

If we say then that this final vowel exists in the underlying form, we need to account for the fact that in certain cases, +Low becomes - Low.

If the final syllable of a word root is open, this vowel will become -Low when a consonant-initial suffix is added. The -Low vowel will retain any prosody present in the word.

98) Ø   /a lala by/   →   [alaləbay]   'he/she doesn't come'

   LAB   /a-ʷlaka ga/   →   [alɔkuga]   'wooden'

   PAL   /ˠga ˠlmas/   →   [gɪlmɛʃ]   'sing!' (lit: 'do the song' 2sg imperative)

This neutralisation does not occur if the suffix added begins with a vowel, even if this vowel is elided. Take the following examples where the plural suffix [-ahay] is added to vowel-final roots:

99) Ø   /baba ahy/   →   [babahay]   'fathers'   not *[babəhay]

   LAB   /ˠgza ahy/   →   [guzɔhay]   'kidneys'   not *[guzuhay]

   PAL   /ˠhtsa ahy/   →   [hɪtʃɛhay]   'calabashes'   not *[hɪtʃɪhay]

The following chart summarises the affect of adding a suffix (in this case the plural marker /-ahy/) to a noun root, including both vowel-final and consonant-final roots, and each of the prosodies

100)

	sg	gloss	pl
Ø	[gula]	'son'	[gulahay]
	[asak]	'leg/foot'	[asəkahay]
PAL	[hɪtʃe]	'calabash'	[hɪtʃɛhay]
	[tʃɪvɛd]	'track/path'	[tʃɪvɪdahay]
LAB	[guzɔ]	'hip/kidney'	[guzɔhay]
	[bɔꞡɔm]	'cheek'	[bɔꞡumahay]

There is a small number of nouns which end in a labialised consonant and have a palatalisation prosody. This causes the final vowel to be realised as [œ], as in the following examples:

101) /ˠslkʷ/   [ʃɪlœkʷ]   'broom'
      /ˠpadkʷ/   [pedœkʷ]   'blade'

When a suffix is attached to these roots, the final vowel is realised as [u] (ref. §2.3.6).

102) [ʃɪlukʷahay]   'brooms'
     [pedukʷahay]   'blades'

3.3.3 Semi-vowel assimilation

In Moloko the semi-vowels /y/ and /w/ are realised by their vocalic counterparts [i] and [u] in certain environments (§2.3.6). If a root ending in a semi-vowel attaches a suffix beginning with a consonant, an assimilation process takes place.

The following examples show the complete derivation:

103) COMPONENT MORPHEMES: /daly/   'girl' (N)   /ga/   ('ADJECTIVE MARKER')
     EPENTHETIC VOWEL INSERTION: [daləy ga]
     ASSIMILATION TO SEMI-VOWEL: [daliy ga]
     SEMI-VOWEL DELETION: [dali ga]
     SURFACE FORM: [daliga]   'female' (ADJ)

104) COMPONENT MORPHEMES: /mahw/   ('snake') (N)   /na/   ('FOCUS MARKER')
     EPENTHETIC VOWEL INSERTION: [mahəw na]
     ASSIMILATION TO SEMI-VOWEL: [mahuw na]
     SEMI-VOWEL DELETION: [mahu na]
     SURFACE FORM: [mahuna]   'that snake (in focus)'

Without the semi-vowel rule, a second epenthetic vowel would be required between the semi-vowel and the following consonant, creating an extra syllable, as in *[daləyəga] and *[mahəwəna].

If the semi-vowel final root attaches a vowel-initial suffix, then it functions as a regular consonant, requiring an assimilation rule (§2.3.6) but no deletion rule, as in the following examples:

105) /daly ahy/ → [daliyahay] 'girls'
      /mahw ahy/ → [mahuwahay] 'snakes'

The assimilation rule also applies when there is a prosody on the root, as in the following examples:

106) /ʷsky/ [sʊkʷɔy] 'clan'   [sʊkʷiyahay] 'clans'
      /ʷhayw/ [hɛyɛw] 'cricket'   [hɛyuwahay]   'crickets'

3.3.4 Epenthesis

When two consonants come together through a process of affixation, an epenthetic schwa is normally inserted to break up the consonant cluster.[34]

As mentioned in §2.1.6, schwa and its variants are often not inserted in fast speech, creating consonant clusters exceptional to those listed in §2.1.1. This creates a resyllabification of words, including word-medial closed syllables. Across morpheme and word boundaries this is not restricted to liquids, as in the following examples:

107) /babɗ   ga/   → [babəɗɔga] ~ [babəɗga]
      'whiteness' ('ADJ')   'white'

      /ɗ   na/   → [dəfəna]   ~ [dəfna]
      'boule' ('FOCUS MARKER')   'the boule (in focus)'

Identical consonants are often joined together to form geminates. This happens at all three levels (see §2.1.6):

108) word-internally: /ttark/   → [tətarak] ~ [ttarak]   'shoe'
                             /ʷggama/   → [gɪgɛmɛ] ~ [ggɛmɛ]   'chin'

109) across morpheme boundaries: /6rv ava/ → [6ərəvava] ~ [6ərəvva]
                                  'heart' 'in'   'in the heart'

                                  /hy   tta/ → [hiyatəta] ~ [hiyatta]
                                  'millet' '3PL POSS'   'their millet'

110) across word-boundaries: /a tsn   aʸngla/ → [a tʃɛŋ aŋglɛ] ~ [atʃɛŋglɛ]
                             '3sg' 'understand' 'English'   'he/she understands English'

3.4 Prosodic spreading

Having stated (§2.2) that prosodies spread leftwards from the right edge of a word, it is necessary to examine what happens when morphemes with different prosodies combine to form a word. There are certain circumstances in which the prosody of one will spread to another (§3.4.1), and some cases in which the prosody does not spread (§3.4.2). In §3.4.3 we will consider the paradigm of possessive suffixing, which has various rules governing spreading.

3.4.1 Spreading

If the morpheme which carries a prosody has only one syllable, the prosody will spread leftwards to the root. The two cases we will examine here are that of a pronoun being prefixed to a monosyllabic verb, and the case of plural agreement markers suffixed to verb roots.

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[34] It would be expected that this epenthetic schwa would take on any prosodic features of the suffixed morpheme, however in my data I have not found any cases on which to test this, ie. suffixes with prosody which require epenthetic schwa.

a) pronoun + verb

111)

Underlying form	Surface form	gloss
/na ʷla/	[nɔ lɔ]	'I go'
/na ʷzm/	[nɔ zɔm]	'I eat'
/ka ʸga/	[kɛ gɛ]	'you (sg) do'
/ka ts -n/	[kɛ tʃɛŋ]	'you (sg) understand'

This rule only applies to 1ˢᵗ and 2ⁿᵈ singular forms. In the 3ʳᵈ person singular the vowel is not affected by prosodies.[35]

112) /a ʷla/   [a lɔ]   'he/she goes'

      /a ʸga/   [a gɛ]   'he/she does'

b) plural agreement markers

The first and second plural forms of the verb carry a labialised mono-syllabic suffix.

113) 1ˢᵀ PERSON PLURAL INCLUSIVE: /ʷak/   [-ɔkʷ]

      1ˢᵀ PERSON PLURAL EXCLUSIVE: /ʷam/   [-ɔm]

      2ᴺᴰ PERSON PLURAL: /ʷam/   [-ɔm]

This labialisation prosody optionally spreads leftwards through the whole word, affecting all vowels and any velar consonants. There appears to be free variation between the labialised and non-labialised forms:

114)

UF	SF	gloss	free variants		gloss
/d/	[dɛ]	'cook'	[madɔkʷ] ~ [mɔdɔkʷ]		'we (inc.) cook'
/a-dar/	[daray]	'plant'	[madarɔkʷ] ~ [mɔdɔrɔkʷ]		'we (inc.) plant'
/dak/	[dakay]	'show'	[mədakʷɔkʷ] ~ [mʊdɔkʷɔkʷ]		'we (inc.) show'
/brwad/	[bərwaday]	'drive'	[məbərwadɔkʷ] ~ [mʊbʊrwɔdɔkʷ]		'we (inc.) drive'

3.4.2 Non-spreading

There is a sub-class of vowel-initial nouns (referred to in §2.1.5) which does not consistently follow the rule of vowel harmony (§2.3.3). Consider the following examples:

115) **PAL:**   [alɛ]   'eye'   [atɛmɛ]   'onion'   [alɛlɛd]   'egg'

      LAB: [amɔm] 'bee'   [azʊŋgʷɔ] 'donkey'   [ambɔdɔts] 'sugar cane'

In each of these cases, the initial vowel usually remains [a] despite whatever prosody spreads over the remainder of the word. However some speakers have the allophone [æ] in palatalised words, and in some cases the fully palatalised [ɛ] (see §2.1.5). So far I have not come across the same affect in labialised words.

It seems most probable that this /a/ was once a separate morpheme, whose function has now been lost.

Most of the words which carry this initial [a] are very common, everyday words in the language, (eg. [ahar] 'arm/hand', [asak] 'leg, foot', [adiyɛŋ] 'bird') which would therefore be less susceptible to change. Other external evidence comes from comparing words in the closely-related neighbouring language Mbuko (Mbuagbaw: 1995):

116)   **Moloko**   **Mbuko**

      'onion'   [atɛmɛ]   [teme]

      'donkey'   [azʊŋgʷɔ]   [zuŋgo]

The underlying form of these types of words will be given as /a-ʸtama/ and /a-ʷznga/ for example.

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[35] Compare §3.1.2a where 3sg was also unaffected by the initial /a-/ vowel.

3.4.3 Vowel elision

The paradigm of the possessive pronoun suffixes in associative constructions gives a good overview of prosody spreading, as it includes all three types of prosody (zero on 1sg, 3sg, 3pl, labialisation on 2sg and 1pl inc, and palatalisation on 1pl exc and 2pl).

The following chart shows the intersection of noun roots with open final syllables (CV#) with each different prosody and each possessive suffix, thus realising a VV combination in the underlying form.

117)	1sg	2sg	3sg	1pl inc	1pl exc	2pl	3pl
C a #	C - ʊla	C - ɔŋgʷɔ	C - ahaŋ	C - a lɔkʷɔ	C - a ləmɛ	C - a lʊkʷiyɛ	C - a təta
C ɛ #	C - ʊla	C - ɔŋgʷɔ	C - ɛ\ahaŋ	C - ɛ\a lɔkʷɔ	C - ɛ ləmɛ	C - ɛ lʊkʷiyɛ	C - ɛ\a təta
C ɔ #	C - ʊla	C - ɔŋgʷɔ	C - ɔ\ahaŋ	C - ɔ lɔkʷɔ	C - ɔ\a ləmɛ	C - ɔ\a lʊkʷiyɛ	C - ɔ\a təta

This chart shows the following results:

a) in 1st and 2nd singular forms, the final vowel of the root is 'deleted,' leaving the associative morpheme vowel linking the two morphemes.

118)   /ɬala wla/   →   [ɬalʊla]   'my village'

        /ʸdzara ʷaNga/   →   [dʒerɔŋgʷɔ]   'your (sg) truth'

        /ʷtda wla/   →   [tʊdʊla]   'my panther'

b) in roots with no prosody, there is no spread from the suffix back to the associative morpheme vowel.

119)   /ɬala aʷlaka/   →   [ɬalalɔkʷɔ]   'our (inc) village'   not *[ɬalɔlɔkʷɔ]

        /dwa aʸlma/   →   [dúwaləmɛ]   'our (exc) milk'   not *[dúwɛləmɛ]

c) when the prosody of the root is the same as the prosody of the suffix, the associative morpheme vowel will also take on this prosody

120)   /ʷtda aʷlaka/   →   [tʊdɔlɔkʷɔ]   'our (inc) panther'

        /ʸ dzara a ʸlma /   →   [dʒerɛləmɛ]   'our (exc) truth'

d) when the prosody of the root is different from the prosody of the suffix, there is free variation between the vowel of the root and the associative morpheme vowel.

121)   /ʷtda a ʸlma /   →   [tʊdɔləmɛ] ~ [tʊdaləmɛ]   'our (exc) panther'

        /ʸ dzara aʷlaka /   →   [dʒerɛlɔkʷɔ] ~ [dʒeralɔkʷɔ]   'our (exc) truth'

        /ʷtda a tta/   →   [tʊdɔtəta] ~ [tʊdatəta]   'their panther'

        /ʸ dzara a tta/   →   [dʒeretəta] ~ [dʒeratəta]   'their truth'

In very careful speech, both of the intersecting vowels can sometimes be heard (ie. [tʊdɔaləmɛ] [dʒerɛalɔkʷɔ]), however these constructions are not permitted by the syllable structure of Moloko.

The following chart shows the intersection of noun roots with closed final syllables (VC#) with each different prosody and each possessive suffix. Note that the final vowel of the root becomes -Low with the addition of a suffix (ref. §3.3.2). The consideration here is whether the vowel of the associative morpheme takes on the prosody of the root, or the suffix, or remains stable.

122)	1sg	2sg	3sg	1pl inc	1pl exc	2pl	3pl
a C #	əC - ʊla	əC - ɔŋgʷɔ	əC - ahaŋ	əC - a\ɔ lɔkʷɔ	əC-a\ɛ ləmɛ	əC-a\ɛ lʊkʷiyɛ	əC - a təta
ɛ C #	ɪC - ʊla	ɪC - ɔŋgʷɔ	ɪC - ahaŋ	ɪC - a\ɔ lɔkʷɔ	ɪC -a\ɛ ləmɛ	ɪC -a\ɛ lʊkʷiyɛ	ɪC - a təta
ɔ C #	ʊC - ʊla	ʊC - ɔŋgʷɔ	ʊC - ahaŋ	ʊC - a\ɔ lɔkʷɔ	ʊC-a\ɛ ləmɛ	ʊC-a\ɛ lʊkʷiyɛ	ʊC - a təta

This chart shows the following results:

a) In all the singular forms, and 3rd plural, there is no change in the associative morpheme vowel.

123)   /ɓrv wla/   →   [ɓərəvʊla]   'my chest'

        /ʸlms ʷanga/   →   [ləmɪʃɔŋgʷɔ]   'your (sg) song'

        /ʷbaɓm ahn/   →   [bɔɓumahaŋ]   'his/her cheek'

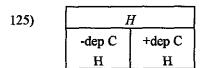   /harts a tta/   →   [harətsatəta]   'their scorpion'

4. TONE

4.1 Tone Melodies

4.1.1 Depressor consonants

There are certain consonants which affect tone in Moloko. The voiced obstruents [b, d, g, mb, nd, ŋg, v, z, dz, nz and ʒ] have the effect of lowering the tone of the syllable in which they occur. These are known in the literature as depressor consonants.

It seems likely that at an earlier stage in the diachronic development of Moloko that there were two tones, Low (L)and High (H). At some stage, the depressor consonants split the L tone into two groups - the tone of words with depressor consonants became even lower, creating a 'depressed-Low' tone to contrast with regular Low. If we then call this depressed L 'Low' and the non-depressed L 'Mid' we find the synchronic three-way division between High, Mid and Low.

Depressor consonants do not affect H tone words.

125)

H	
-dep C	+dep C
H	H

L	
-dep C	+dep C
M	L

The phonemes /h/ and /w/ sometimes appear to function as depressors, which suggests that they may have come from different historical sources. Since several closely related languages have a voiced velar fricative [ɣ] which is absent in the Moloko consonantal inventory, it is possible that this language once contrasted [x] and [ɣ], but now has just one phoneme /h/ with one allophonic variant [x]. The phoneme /w/ on certain occasions can alternate with [v], such as the verb [wàs-āy] 'erase/wipe out' which may also be pronounced [vàs-āy] with no change in meaning. Although this is the only case I have found, it supports the idea that /w/ could in certain cases function as a depressor consonant.

The liquids /r/ and /l/ sometimes appear to function as depressors also, however more research is required to establish their status. The following nouns contain no other depressors, yet all have Low tone.

126) [àlè]   'thing'   [ɬàlà]   'village'
      [màràts] ('insect')   [tàpòràkàm] 'hoof'

4.2 Tone melodies

From an underlying two-tone system, with the influence of depressor consonants, certain melodies can be derived. There are different melodies for nouns and verbs.

4.2.1 Nouns

Almost any combination of tones can be found among the nouns.[36] The following chart shows how the underlying tone melodies (UTM) are realised at the level of surface tone (ST) on one, two and three syllable nouns. One column gives examples with no depressor consonants, the other with depressor consonants, which realise different tone melodies.

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[36] Besides the LH combinations prohibited by the lowering rule (4.3.1), the following melodies are not attested among the data I have collected (out of 350 nouns): ML, HML, MLM, MLL.

UTM	ST	-dep C	gloss	ST	+dep C	gloss
H	H	[tsáf]	'shortcut'	H	[záy]	'peace'
	HH	[tʃétʃɛ]	'louse'	HH	[bóʐóm]	'cheek'
	HHH	[mólókʷó]	'Moloko'	HHH	[dɛ́ndárá]	'lamp'
L	M	[dāf]	'boule'	L	[gàr]	'difficulty'
	MM	[kə̄rā]	'dog'	LL	[dàndày]	'intestines'
	MMM	[mĩtɛ̄nɛ̄ŋ]	'bottom'	LLL	[àdàngày]	'stick'
HL	HM	[mɛ́kɛ̄tʃ]	'knife'	HL	[dʒérɛ̀]	'truth'
	HMM	[átūkʷɔ]	'okra'	HLL	[mógʷɔdɔ̀kʷ]	'hawk'
	HHM	[mósókʷɔ̄y]	'veg. sauce'	HHL	[ázɔ́ŋgʷɔ̀]	'donkey'
LH	MH	[ɫə̄máy]	'ear/name'	LM	[bɔ̀gʷɔ̄m]	'hoe'
	MMH	[kĩtɛ̄fɛ́r]	'scoop'	LLM	[gàgə̄māy]	'cotton'
	MHH	[āmɛ́lɛk]	'bracelet'	LMH[37]	[gɛ̀mbĩrɛ́]	'dowry'
HLH	HMH	[ákũfɔ́m]	'mouse'	HLM	[dɛ́dĩlɛ̄ŋ]	'black'
LHL	MHM	[sə̄sáyāk]	'wart'	LML	[kĩmɛ̄dʒɛ̀]	'clothes'
				MHL	[mɔ̄ŋgáhə̀k]	'crow'

127)

The mapping rules of how the tone melody assigns surface tone to each syllable have yet to be established. There are many exceptions among the nouns, such as the following examples which contain no depressor consonants, yet realise Low tones.

128)   [kʷɔsɔ̄kʷó]   'market'

[àtàpà]   'tobacco'

[kʷókʷɔ]   'baobab'

4.2.2 Verbs

For the most part, the tone of verbs is predictable from the structure.[38] Among verbs there is a three way contrast between *H, L* and toneless *Ø*. *H* is not influenced by depressors, *L* with no depressors realises M, with depressors realises L, toneless usually takes the L as the default surface form, regardless of depressors.

In the following chart, taking the most common verb type (underlying form /CaC/ with high tone /-y/ suffix in the 2nd person imperative form), we will look at the realisations of surface tone.

UTM	dep C	ST	example	surface	gloss
Ø	-	L	/haɓ/	[hàɓāy]	'dance'
	+	L	/daʐ/	[dàʐāy]	'join'
L	-	M	/pàɗ/	[pādáy]	'bite'
	+	L	/ʐàv/	[ʐàvāy]	'swim'
H	-	H	/fáɗ/	[fádáy]	'fold'
	+	H	/bál/	[báláy]	'wash'

129)

The components of the underlying form (from §3.2.1), particularly initial vowel and number of consonants, influence what tone the root will have. The following chart is designed to show what components give what underlying tone to a verb root, based on a sample of 337 roots. The final column giving figures to

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[37] The only examples in my data of LMM are [aɓalaŋ] 'anklet' and [kərkayax] 'tortoise' which are both poly-morphemic, and while they have no obvious depressor consonants, they both contain liquids which are suspect.

[38] There are of course exceptions. I tested 12 verb roots whose tones I had not elicited, and correctly determined the tone of 9 of them using this chart.

indicate the proportions of each type. The surface tone column and the examples both use the 2nd person singular imperative form, which takes no pronoun, but does take the High tone suffix /-y/ where required.

130)

Cs (no. & type)	Form of verb	initial /a-/	UTM	ST	examples	no.
one C						
+dep	Ce, C-n, C-ay	-	L	L	[dɛ̀] 'cook' [ɓàŋ] 'start' [bày] 'light'	11
-dep	Ce, C-ay	-	L	M	[ʃē] 'drink' [pāy] 'open'	9
+/-dep	Ce, C-n	-	H	H	[gé] 'do' [ɓán] 'hit'	6
two Cs	**no -ay suffix**					
+dep	CC, CaC³⁹	-	$\varnothing$	L	[dàɗ] 'fall' [bàx] 'pour'	18
+dep	CC	+	L	L	[bàz] 'harvest'	4
-dep	CC, CaC, CCe	-	L	M, MH	[fāt] 'grow' [tʃīkɛ́] 'stand'	21
+/- dep	CC, CaC-n	-	H	H, HM	[fár] 'scratch' [mbéʃēŋ] 'rest'	24
two Cs	**plus -ay suffix**					
+/- dep⁴⁰	CC-ay, CaC-ay	-	$\varnothing$	LM	[hə̀māy] 'run' [hàɓāy] 'dance'	27
+dep	CC-ay, CaC-ay	+	L	LM	[gə̀rāy] 'tremble' [ɓàvāy] 'swim'	51
-dep	CC-ay, CaC-ay	+/-	L	MH	[tsə̄ɗáy] 'shine' [fātáy] 'lower'	54
+/- dep	CaC-ay⁴¹	-	H	HH	[báláy] 'wash' [fáɗáy] 'fold'	25
three Cs	**plus -ay suffix**					
+ dep	CCaC-ay, CCC-ay⁴²	-	L	LLM	[vònàhāy] 'vomit' [də̀bə̀nāy] 'learn'	47
-dep	CCaC-ay, CCC-ay	-	L	MMH	[ɬə̄ɓātáy] 'repair' [tsə̄fə̄ɗáy] 'ask'	28
four Cs	**plus -ay suffix**					
+dep	CCCaC-ay	-	L	LLLM	[bə̀dzə̀gàmāy] 'crawl'	11

It is interesting to note the following peculiarities:

a) there are no verbs of three or more consonants with underlying H tone.

b) initial vowels only occur with underlying L tone roots.

The following verbs do not follow the rules:

131) M tone verbs with depressor consonants:

[mbē] 'argue'   [nzāráy]   'separate'
[ndāy] 'chop'   [ŋgə̄dātsáy]   'squeeze'
[gə̄dzār] 'grab'   [hə̄dzə̄gāɗáy] 'limp'

132) L tone verbs without depressor consonants:

[pə̀ɗàkāy] 'cut'   [tə̀kàsāy]   'cross'
[dɔ̀tsāy]   'extract'   [tsə̀ɗāy]   'castrate'

The pronoun in Moloko appears to be toneless, and it is the tense of the verbal construction which allocates tone to the pronoun. In the "present" and "future" tenses,⁴³ the pronoun always takes H tone. In the other "tenses", the pronoun copies the first tone of the root if it is L or M. If the first tone of the root is H, the pronoun takes on M tone.

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³⁹ Toneless CaC has all depressors, but [tax] and [har] are suspect

⁴⁰ Toneless CC-ay has both +/- depressors, but CaC-ay has only +depressors (with the the the suspect [haɓay])

⁴¹ One exception [ŋgəlay] 'bring/do again' which is /CC/

⁴² All examples of /CCC-y/ with Low tone either have explicit depressors or suspicious consonants /h, r, l/. However some examples of Mid tone /CCC-y/ also contain suspicious consonants: eg. [sə̀lɗáy] 'cross ankles' and [pə̄lɗáy] 'peel'

⁴³ The tense/aspect system of Moloko has not been analysed in detail, therefore these labels are deliberately left vague.

4.2.3 Affixes

Each affix in Moloko carries tone. Paradigms such as the possessive suffixes show a consistent tone melody throughout, as shown in the following chart:

133)	1sg	2sg	3sg	1pl inc	1pl exc	2pl	3pl
possessive suffix	[-ólā]	[-óŋgʷɔ̀]	[-áhāŋ]	[-álɔ̀kʷɔ́]	[-álīmɛ́]	[-álòkíyɛ́]	[-átɔ̄tá]
surface tone	HM	HL	HM	HMH	HMH	HMH	HMH

From this chart it seems that the tone melody for possessive suffixes is *HLH*. Since only the 2nd person singular contains a depressor consonant /ng/ which, all other forms have the surface pattern HMH. The singular forms with only two syllables drop the final H tone.

The following chart gives examples of each underlying tone melody with 2sg, 3sg and 1pl (exc) possessive suffixes. Some of the rules governing variations in the surface form will be considered in the following section §4.3.

134)	example	gloss	2sg	3sg	1pl exc
H	[tsáf]	'shortcut'	[tsɔ́fóŋgʷɔ̀]	[tsɔ́fáhāŋ]	[tsɔ́fálīmɛ́]
	[bóɮóm]	'cheek'	[bóɮómóŋgʷɔ̀]	[bóɮómáhāŋ]	[bóɮómálīmɛ́]
L	[dàf]	'boule'	[dɘ̀fóŋgʷɔ̀]	[dɘ̀fáhāŋ]	[dɘ̀fálīmɛ́]
	[dàndày]	'intestines'	[dàndiyóŋgʷɔ̀]	[dàndiyáhāŋ]	[dàndiyálīmɛ́]
HL	[mɛ́kētʃ]	'knife'	[mɛ́kītʃóŋgʷɔ̀]	[mɛ́kītʃáhāŋ]	[mɛ́kītʃálīmɛ́]
	[móɡʷɔ̀dɔ̀kʷ]	'hawk'	[móɡʷɔ̀dòkʷɔ́ŋgʷɔ̀]	[móɡʷɔ̀dòkʷáhāŋ]	[móɡʷɔ̀dòkʷálīmɛ́]
LH	[ɬɘ̄máy]	'ear'	[ɬɘ̄míyóŋgʷɔ̀]	[ɬɘ̄míyáhāŋ]	[ɬɘ̄míyálīmɛ́]
	[bɔ̀gʷɔ̄m]	'hoe'	[bɔ̀gūmóŋgʷɔ̀]	[bɔ̀gūmáhāŋ]	[bɔ̀gūmálīmɛ́]
HLH	[ákūfóm]	'mouse'	[ákūfómóŋgʷɔ̀]	[ákūfómáhāŋ]	[ákūfómálīmɛ́]
	[dɛ́dīlēŋ]	'black'	[dɛ́dīlōŋgʷɔ̀]	[dɛ́dīlāhāŋ]	[dɛ́dīlālīmɛ́]
LHL	[sɘ̄sáyāk]	'wart'	[sɘ̄sáyākʷóŋgʷɔ̀]	[sɘ̄sáyɘ̄káhāŋ]	[sɘ̄sáyɘ̄kálīmɛ́]
	[mɘ̄ŋgáhɘ̀k]	'crow'	[mɘ̄ŋgáhɘ̀kʷóŋgʷɔ̀]	[mɘ̄ŋgáhɘ̀kāhāŋ]	[mɘ̄ŋgáhɘ̀kālīmɛ́]

4.2.4 Tonal minimal pairs

A limited number of lexical items are distinguished by tone, however most are in different grammatical classes, therefore would not be confused.

135) minimal pairs in different grammatical categories:

[àvà]	'arrow'	[ává]	'there is'	[ávā]	'under'
[kūrsáy]	'sweep'	[kòrsāy]	'cucumber'		
[lālá]	'come back'	[lālā]	'good'		

136) minimal pairs in same grammatical categories:

nouns

[háy]	'millet'	[hày]	'house/compound'
[ànēŋ]	'snake'	[ánēŋ]	'other'
[gɘ̀lāŋ]	'kitchen/clan'	[gɔ́láŋ]	'threshing floor'
[háhàr]	'bean'	[hāhár]	'straw granary'
[mɘ̀dɘ̀rà]	'bicep'	[mɘ̄dárā]	'fire'
[mɔ́lɔ̀]	'twin'	[mɔ̀lɔ̀]	'vulture'

verbs

[dár]	'burn'	[dàr]	'withdraw/recoil'
[hàr]	'build/make'	[hār]	'pick up/transport'
[nȝɛ̀]	'sit'	[nȝɛ́]	'suffice'

4.3 Tone Rules

4.3.1 Lowering rule

A High tone will be lowered to Mid following a Low tone, ie. H → M / L _

This rule applies consistently within morphemes and words.

137)	syllable	no cases of LH combinations in any word			
138)	morpheme	[ɬàlà + aháy]	→	[ɬàlàhāy]	LL+H → LLM
		'village' 'PLURAL'		'villages'	
		[yàm] + [áhāŋ]	→	[yàmāhāŋ]	L+HM → LMM
		'water' '3sg poss'		'his/her water'	
139)	word	[yàm] + [ábá]	→	[yàm ābá]	L+HH → LMH
		'water' 'there is'		'there is water'	
		[ázúŋʷɔ] + [ná] + [ɬā]	→	[ázúŋʷɔ nā ɬā]	HHL+H+M → HHLMM
		'donkey' 'and' 'cow'		'donkey and cow'	

This rule implies that a surface Mid tone can have two sources: either an underlying *L* tone with no depressor consonants, or a surface H tone lowered by a preceding L. Acoustic testing is required to determine any differences in these two Mid tone realisations.

4.3.2 High tone spreading rule

There is a high tone spreading rule which is optional across word boundaries

140)	[záná] + [ndɔzɔzɔgā]	→	[záná ndɔ́zɔzɔgā] ~ [záná ndɔzɔzɔgā]	
	'fabric' 'red'		'red fabric'	
	[ʃèʃɛ̄] + [ndɔzɔzɔgā]	→	[ʃèʃɛ̄ ndɔ̄zɔzɔgā] ~ [ʃèʃɛ̄ ndɔzɔzɔgā]	
	'meat' 'red'		'red meat'	

In these two examples, the final tone of the noun optionally spreads to the first syllable of the adjective and replaces the Low tone. This only applies to words with Low tone on the first syllable, ie. a Mid tone will not be affected in the same way, as in the following examples:

141)	[ʃèʃɛ̄ bábɔ́ɗgá]	'white meat'
	[záná mālɔ̄ŋgá]	'large pagne'

A similar case involves the H tone conjunction [ná] 'and/with' which optionally spreads to an initial Low.

142)	[ná]	[ɬàlà]	→	[ná ɬálà]	'and the village'
	[ná]	[ʃèʃɛ̄]	→	[ná ʃéʃɛ̄]	'and the meat'

Verbs conjugated in the present tense take a High tone pronoun, which then spreads to the first syllable of an underlyingly Low tone verb, as in the following example:

143)	[vɜ̀nàh-āy]	'vomit!'	(2nd person singular imperative)
	[nɜ́ vɜ́nàh-āy]	'I vomit'	(1st person singular present tense)

Having established that the rule is optional across word boundaries, this may help us to determine where the word boundaries exist. For example, the preposition 'on' is formed by placing the morpheme [ká] both before and after the noun, as in the following example:

144)	/ká yàm ká	→	[káyámāká]	'on the water'	not *[káyàmāká]

Here the rule is not optional, therefore we must conclude that this morpheme is an affix rather than a freestanding clitic. This kind of evidence is helpful in establishing orthographic rules.

4.3.3 Floating tone

Certain morphemes in Moloko appear to have a floating Low tone, as in the following examples:

145)	[dāf]	'boule'	+	[á]	'(preposition)'	+	[háy]	'millet' → [dɔ̄f á hāy]	'millet boule'

In this case, the H tone noun has become M, but there is no L apparent which would cause this. Therefore it seems that the tone on the morpheme [a] morpheme is actually HL, with a floating L which only affects H tones because of the above lowering rule H -> M / L _

The same phenomenon occurs with the morpheme [āŋgá] meaning 'for'

146)   /āŋgá záná/   →   [āŋgá zāná]

      'for'   'fabric'   'for the fabric'

Some morphemes with [á] do not manifest the same phenomena, such as [áná] 'of' or [āsá] 'if.' This appears to indicate that the [á] in these cases represents a different morpheme.

The other apparent incidence of floating tone is with the aspect morpheme [-va].[44]

Using the verb [bál-áy] 'wash' and the object noun [háy] 'millet':

147)   [nɔ́ báláy háy]   'I wash the millet'

      [nɔ̄ bálvá hāy]   'I washed the millet'

In the second example, the tone of 'millet' has been lowered from H to M, with no apparent L.

Using a verb with a different tone melody, [dàr-āy] 'plant' in the same example:

148)   [nɔ́ dàrāy háy]   'I plant the millet'

      [nɔ̀ dàrvā hāy]   'I planted the millet'

we see that the tone of the object has again been lowered, and the tone of the aspect marker has also been lowered from H to M, due to the preceding L of the verb. We can assume therefore that the underlying tone of the aspect marker [-va] is HL.

5. CONCLUSION

Like its distant Afroasiatic relations, the Semitic languages, the phonology of Moloko is built on a consonantal skeleton. This is then broken up with vowel slots, which may contain either a phonemic or an epenthetic vowel. We have analysed the vowel system of Moloko as having only one phonemic vowel /a/, which then contrasts with the -Low central vowel [ə], a non-phonemic epenthetic vowel. If a word carries either a labialisation or a palatalisation prosody, all vowels in that word, and certain consonantal segments, will be affected.

Having discussed the vowel and consonant systems and how each is affected by these prosodies, we then considered the structure of Moloko words, examining the roots and affixes of nouns and verbs, and the morphophonological rules which apply to the affixation process across morpheme and word boundaries.

In the tone section, the relationship between consonants and tones was examined, the tonal melodies of nouns and verbs established, and certain tone rules discussed.

My hope is that this paper will contribute to the body of work already completed on Chadic languages, and may be helpful for those considering comparative work with related languages.

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[44] There appear to be at least two different aspect markers with the segments [va], both indicating some kind of past tense (the finer details of the distinction have not yet been properly established). Only the marker with apparent floating Low tone will be considered here.

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