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A Morphophonology of Komo: Non-tonal Phenomena

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by

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ILLUSTRATIONS

MAPS OF THE KOMO AREA

ACKNOWLEDGMENTS

ABSTRACT

Komo, a sub-Bantu language spoken in northeastern Zaire, exhibits a number of interesting interactions between the morphology and phonology during the process of word derivation. A framework using parametric rule description, underrepresentation of morphemes, and lexical phonology is used in describing non-tonal phenomena of the language. Use of this framework results in optimalizing the description of lexical entries and simplifying the derivation of forms exhibiting complex phonological alternations. Complete paradigms of verbs in a number of tense-aspect-mood configurations are included, even though they may go beyond the requirements of the analysis. Thus, this paper brings to light a number of unique features of a language that has not previously been studied.

ABBREVIATIONS

The upper case letters E or O in a graphic description indicate a vowel underspecified for one or more phonological features. A hyphen in the gloss to an orthographic form means a morpheme break, while a colon means that more than one morpheme has been inserted within a set of brackets.

ATR	Advanced Tongue Root
BE	Bracket Erasure
C	consonant
F	Feature
N	a nasal
OCP	Obligatory Contour Principle
TAM	tense-aspect-mood marker
UAC	Universal Association Convention
X	skeletal position
V	vowel
appl	applicative
cl.(N)	noun class N
cs	causative
def	default
hab	habitual
impf	imperfective
obl	oblique
pf	perfective
ptp	participle
recip	reciprocal
rou	round (in a derivation)
sub	subordinating morpheme
subj	subjunctive
s-place	secondary place

1p	first person plural
1s	first person singular
2p	second person plural
2s	second person singular
3p	third person plural
3s	third person singular
/	link a feature to the right (if in a derivation)
\	link a feature to the left (if in a derivation)
°	node (if by itself).

1. INTRODUCTION

1.1 Typology of the Komo language

Komo is a sub-Bantu language that over 200,000 people speak in the regions of Maniema and Haut-Zaïre in Zaire.[1] It is spoken in the large area extending from Kisangani in the west to the Lindi, Osokari, and Mandayo Rivers near Walikale in the east.

Neighboring languages are Bali and Lombi to the north and northwest, Lengola to the west and southwest, Lega to the south, Kwame to the southeast, Nyanga to the east, and eBhele (the only one of these that has a close linguistic relationship with Komo) to the northeast. Lombi is an Adamawa language. The rest are Bantu languages.

Administratively, Komo is found in the Ubundu, Opienge, and Bafwasende Zones (Tshopo Subregion of Haut-Zaïre), the Lubutu and Punia Zones of the Maniema Region, and into the Walikale Zone of the Nord-Kivu Region.

Komo belongs to the following language groupings, in order of decreasing generality: Niger-Kordofanian, Niger-Congo, Benue-Congo, Bantoid, Bantu, Bira-Huku. Its Guthrie (1948) number is Kumu D23 in the Lega Kalanga group. Kutsch Lojenga and Raymond (1985) list it as one of four related languages of which the other three are Bera (Guthrie: Bira D32), Bila (no Guthrie number), and eBhele (Kutsch Lojenga and Raymond call it Bele; Guthrie lists it as Peri D31). More

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[1] 'Komo' as a root does not exist in isolation in the language. Furthermore, the final vowel is [-ATR], thus [kómɔ], with a high tone over the first syllable is the correct pronunciation of the root. Derivatives are [ŋkómɔ] 'a Komo person', and [ɓakómɔ] 'Komo people'. Native speakers refer to the Komo language as [ɟɔngá á ɓakómɔ], 'the Komo's speaking'. Alternatively, Komo speakers use the borrowed Swahili noun class prefix ki-, yielding [kikómɔ] as the correct pronunciation of the language.

recently, there has been discussion based on a short word list as to whether Amba (no Guthrie number) also belongs to this group (Kutsch Lojenga, personal communication, September 1998).

Komo has been variously dubbed 'sub-,' 'semi-,' and 'border' Bantu because of this typological idiosyncrasy: it lacks concord between nouns and verbs, as well as between nouns and noun phrase modifiers including adjectives and numerals. However, its large number of Bantu cognates, its largely lexicalized but recognizable noun-class prefixes (Thomas in preparation, a), and its agglutinative verbal morphology make it recognizable as a Bantu language.

The illustration (11) below gives maps of the Komo area.

1.2 Review of the literature

Previous studies of Komo with linguistic content include a very brief sketch in Harries (1958) and an appendix and glossary in De Mahieu (1975). Studies by Thomas include (1991, 1992, and in preparation, n.d.).

(1)   Maps of the Komo area.
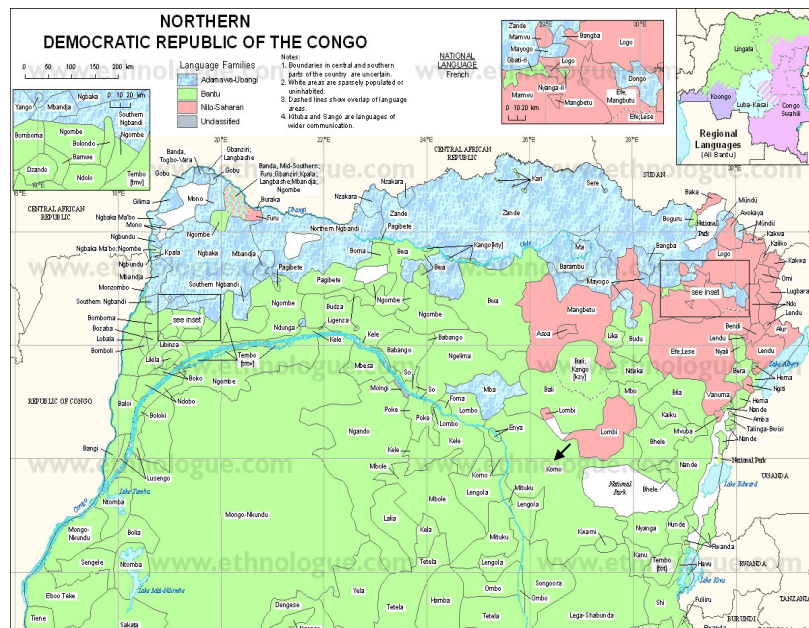
Map from: http://www.ethnologue.com/show_map.asp?name=CD&seq=10, used by permission.

The literature about related languages is also limited. There is only a phonological description of the closely related language, eBhele in Meyer and Raymond (1981). Thus, this study is significant in that it brings to light a hitherto little-known language group.

1.3 Purpose, significance, framework, and delimitation of this study.

This study and Thomas (1992) are the first in-depth phonological studies to be published in any of the sub-Bantu languages. Recognizing the importance of any work in this group of languages in filling a gap in the world database of languages, I have attempted to provide a systematic exposition of the data as regards the phonological alternations of nouns and verbs in Komo.

Another purpose is theoretical. Several related and interconnected phonological frameworks have come into vogue. These include Lexical Phonology (Mohanan 1982 and 1986, Pulleyblank 1986), Autosegmental Phonology (Goldsmith 1976, 1990), Nonconcatenative Morphology (McCarthy 1981), and the framework of arboreal representation of phonological structure (Clements 1985). I shall draw on all of these in the process of my description of the Komo data where they seem relevant.

In particular, Archangeli and Pulleyblank (1986) have unified the field of some of the other frameworks enumerated above. They have also introduced several constraints on the class of possible phonological rules. In their system, rules may insert or delete structure or content, but they may not do some things that are permitted in a transformational system like the metathesis of segments. That is, they introduced a parametric and non-transformational system of rule notation that explicitly states the power of a rule (e.g. whether it inserts or deletes, whether it acts on

structure or content).[2] This system implicitly excludes such rules as metathesis from the set of simple phonological rules (Archangeli and Pulleyblank 1986:129).[3]

It is this system that I use in the initial statement of each rule. However, in deference to the reader who is not familiar with Archangeli and Pulleyblank (1986), I repeat each rule in a more traditional manner.

I have purposely limited the scope of this study to mostly non-tonal aspects of the derivation of the verb. A paper on tone has been presented in Thomas 1992.

1.4 Research questions

I attempt to answer the following questions:

A. What are the minimal lexical specifications necessary for Komo vowels?

B. What are the content and possible structures of Komo morphemes? In what ways may Komo morphemes interact?

C. How do the phonology and the morphology of Komo interact?

1.5 Definitions

anchor   An anchor (or skeletal position or skeletal slot) is an indivisible element or position marker to which a feature may be associated. An anchor is sometimes referred to as a C (consonant anchor) or a V (vowel anchor).

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[2] Piggott (1988) also has used a parametric approach to the description of nasal harmony.
[3] I note here that Archangeli and Pulleyblank (1986) has not yet been published, and that Goldsmith (1990) has used parametric formalism with regard to the description of metrical structure.

autosegment An autosegment is a feature that is not linked to any skeletal element. It may link to a skeletal element or unit by an association convention.

default rule A default rule is a context-free feature-adding rule. I note that the existence of a default rule does not necessarily prevent the default value from appearing in the lexicon. For example, the [a] in Komo is shown to be lexically empty of feature content, yet [round] is postulated to be equipollent (two-valued) for the other Komo vowels (see (35), page 46).

derivation Unfortunately, this word has to serve double duty. On the one hand it is the name of the first lexical stratum through which a word passes in undergoing morphological and phonological rules. On the other hand, it refers to the process by which one starts with a sequence of lexemes and ends up with a phonetic utterance. In general, *derivational stratum* refers to the former process and *derivation of* refers to the latter process.

lexical Pertaining to when affixes are concatenated to (added to either side of) a root and phonological rules are applied in the process of concatenation.

post-lexical Pertaining to when phonetic or syntactico-phonological processes take place (i.e., after the formation of a word).

redundancy rule A redundancy rule is a feature- or content-
adding rule whose context is only sensitive to other
features: in other words, the other features
determine the redundant feature.

root A root is a morpheme that underlies a derivational
or inflectional paradigm. It is the most basic input to
the derivation of a word.

skeleton This refers to the feature-bearing elements or
nodes of a morpheme. In Komo, a skeleton is usually
grouped into CV units where the C dominates
consonantal features and the V dominates vowel
features.

stem A stem is a root plus zero or more derivational
affixes. In other words it has undergone the
derivational part of its lexico-phonological
derivation.

syntactico-phonological phrase, or simply *phonological phrase*
This refers to the result of combining one or more
words into a single syntactical unit, often delimited
by pauses, and incorporating such syntactical units
as *noun phrase* or *interrogative*.

universal association convention The universal association
convention (UAC) governs the linking of free
autosegments onto free anchors. It states that free
autosegments are mapped onto free anchors (1) in a

one-to-one relation, and (2) from left to right in the default case. If mapping is from right to left, then the UAC is said to be marked for the particular autosegment concerned.

word   Remarkably, this term is difficult to define. Here, I refer to it as the output of the lexical processes of derivation and inflection, and the input to syntactico-phonological derivation.

1.6 Data-gathering methods

I have had the privilege of learning to speak and listen to the language over three years of living with the Komo people. My personal fluency is at the point of being able to speak Komo in extemporaneous public speaking.

Data has been formally gathered principally from three native speakers. I have elicited paradigms and texts, and compiled a dictionary database of over 2500 entries.

I have also done some psychological experimentation using nonce, or coined words, transliterated foreign words, and a language game utilizing syllable reversal.

I have done instrumental analysis of limited data, particularly with regard to tonal phenomena.

Many of the paradigms have been checked by Constance Kutsch Lojenga, a consultant in phonology and phonetics. I, of course, take full responsibility for any error in the data and analysis.

2. NASALS AND SYLLABLE STRUCTURE

In this section, I provide an overview of Komo consonants and syllable structure. This is necessary for several reasons. First, I introduce the reader to some typologically interesting and briefly statable characteristics of the language. Second, I discuss nasal assimilation, which is typologically interesting because a Komo nasal may sometimes assimilate features from a following vowel.

Chart (2) below gives the Komo consonants and vowels, classed by point and manner of articulation.

A few comments are necessary about the articulatory characteristics of several of the consonants:

- The egressive coronal consonants ([d], [ǰ], [č], [s], and [t]) are all laminal consonants.[4] There is speaker to speaker variation in the pairs {[d],[ǰ]}, {[č],[t]} and {[s],[č]}. For example, one encounters: dúá/ǰúá 'to appear', čína/tína 'root', and saá/čaá 'cup', as well as: číko/tíko 'field', and močí/motí 'one'. Minimal pairs still exist with regard to these groups, however, as in: dákɛ́ 'his/her friend' and ǰákɛ́ 'his/her return', čína 'root' and sína 'which', čá 'plot' and tá 'hunt with arrows'.

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[4] I use here the terminology of Ladefoged and Maddieson (1996), especially with regard to the term 'palato-alveolar' (pp. 14–15).

(2) Komo consonants and vowels[5]

<u>Consonants</u>

	bilabial	alveolar	Palatal laveolar	velar	labio velar
obstruents:					
voiceless	p	t	č	k	kp
voiced	b	d	ǰ	g	gb
prenasalized	mb	nd	ɲǰ	ŋg	ŋgb
implosive	ɓ	ɗ	ʄ		
fricative	ɸ	s			
resonants:					
nasal	m	n	ɲ		
lateral		l			

<u>Vowels</u>

	front	mid	back	
High	i		u	
Mid	e		o	([+ATR])
	ε		ɔ	([−ATR])
Low		a		

---

[5] I use here a slightly modified IPA system of transcription for two reasons: (a) the Komo people use an orthography that underrepresents tone and nasal-implosive combinations (mɓ vs. mb), (b) I wish to avoid confusion: colleagues working in nearby languages reverse the way in which implosives are contrasted with non-implosives (e.g., 'b' = [ɓ] and 'bh' = [b] in the Komo orthography, 'b' = [b] and 'bh' = [ɓ] in Budu, located not far to the north).

- Whenever a nasal noun-class prefix precedes an egressive voiced stop, it links to that stop and makes it prenasalized. Otherwise, it is part of a preceding rhyme. Since a nasal noun-class prefix preceding the labiovelar voiced stop also causes the stop to be prenasalized, I have concluded that (both) labiovelars are egressive. This is not immediately obvious when simply listening to the stop being pronounced by a native speaker.[6]

2.1 Nasals: preliminary

The purpose of the following sections on nasals is to exhibit two unique properties about them. A nasal plus obstruent combination is syllabified in two different ways, depending on the obstruent. A voiced egressive obstruent is prenasalized. When the obstruent in question is either voiceless or implosive, and a nasal precedes it, the nasal becomes a constituent of a preceding rhyme. This discussion leads to a digression on labiovelars, which are predicted to be egressive as a result of the preceding discussion.

Also, a morpheme that consists solely of a nasal with no lexical specification for point of articulation is shown to assimilate to a following vowel through the features [labial] and [round].

This discussion forms a transition. It introduces the formalism that is used in subsequent chapters, and provides motivation that [round] is a more optimal feature for describing Komo vowels than [back].

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[6] The semi-vowels [w] and [y] do not occur. In loan words that originally include a semi-vowel, [o] is substituted for [w] and [ǰ] is substituted for [y] as in:

Swahili mwalimu 'teacher' → Komo moalímu,
Swahili yesu   'Jesus'   → Komo ǰéso.

2.2 Position of nasals preceding obstruents within the syllable

Only five pre-nasalized consonants, [mb], [nd], [ɲǰ], [ŋg], and [ŋgb] occur stem-internally, in words such as gámbá 'oil', ɛɸɛndɛ 'white matter in the eye', gaɲǰá 'circumcision', ɓáŋgá 'fear', and ɓunéŋgbo 'others'.[7] Stem initially, [+nasal] may precede any obstruent (examples below). This leads to a hypothesis with a corollary. The hypothesis: only voiced, egressive obstruents may be prenasalized. Other consonants preceded by nasals form nasal-obstruent clusters where the nasal is part of a preceding rhyme. The corollary: a stem syllable may be either V, as in one of the vowels in iíi 'image' or the syllabic [m] in mpáka 'cat', or CV as in the final two syllables of mɓóndigi 'guard'. CVN syllables, where N denotes a nasal consonant, are forbidden in stems.[8]

A contrasting hypothesis would make all consonants preceded by [+nasal] into nasal-consonant clusters. I call this analysis the 'clusters everywhere' analysis. Such an analysis must allow stems to contain CVN syllables. It cannot base a constraint concerning the distribution of stem-internal nasal-consonant combinations in terms of syllable structure.

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[7] Furthermore, I have found only three verb stems, ŋgoŋgónísá 'make angry', ŋgoŋgónágá 'grumble', and ŋgáná 'deny', which begin with a prenasalized consonant of any sort.

In the examples that follow, words such as mpaka 'cat' are likely preceded by a Bantu noun class 9 prefix. There are, however, no language-internal grounds to make such a morpheme cut, because there is no system of concord. I am therefore treating such words as being synchronically lexicalized as monomorphemic words.

[8] At the word level, CVC syllables, where the final C is [+nasal], may, for example, occur as a result of adding plural ɓa- to mpáka 'cat' to yield ɓampáka.

(3) Nasals and obstruents

```
      σ                σ   σ                          σ   σ
     /|               /|  /|                         /|   |
    O R              O R O R                        O R   R
    |  ├──────┐      |   | | |                      |  |   |
    |  Nu    Co       | Nu| Nu                      | Nu Nu
    |  |      |       |  | | |                      |  |   |
    C  V      C      C  V C V                       C  V   V
    |  |      |      |  | | | |                     ┌┘ |   |
   [ɓ  a]    [m  p á  k a]                          mb á   ú
   'plural-cat'                                     'tree species'⁹
```
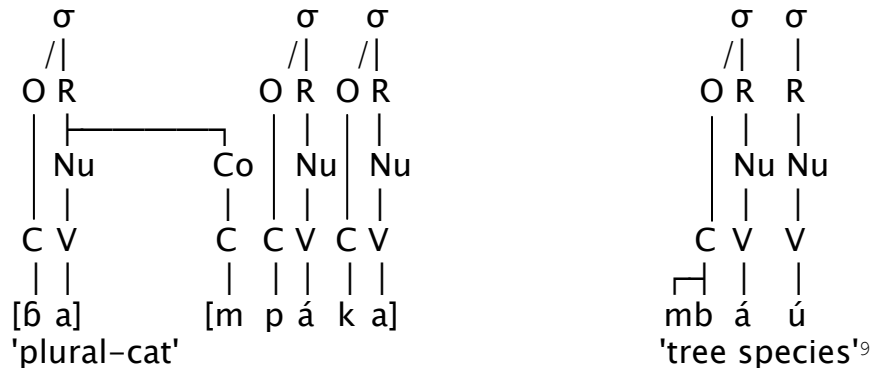
Chart (3) gives illustrations of the proposed syllable structures of words beginning with the feature [+nasal] and an obstruent, where O signifies 'onset', R signifies 'rhyme', Nu signifies 'nucleus', Co signifies 'coda', and σ signifies syllable.

Three additional facts support the hypotheses about Komo syllable structure and the occurrence of nasals before obstruents.

a. *Whistled tone*s. When a speaker is asked to pronounce a word, then whistle its melody, what I analyzed above to be a nuclear nasal receives a tone while a prenasalized consonant does not. This is independent of whether or not the nasal in question is a morpheme. For example, mbímba 'morning', ŋgáná 'to refuse', and mbóbó 'fool' (cf. bóbóká 'to be foolish') are all whistled with two tones, even though the last example clearly contains two morphemes. On the other hand, the initial nasals in mɓína 'dance', mpáka 'cat', and nsɔɗɔ 'dirt' all are whistled with a distinct tone. In the first case the initial obstruent is voiced, but imploded, in the other two cases, the initial obstruent is voiceless. Additional examples are given in (4).

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⁹ This tree species figures prominently in circumcision (Wauthier de Mahieu 1985).

(4)   *Tone and syllabicity*, the whistle test

word	gloss	whistled melody

Prenasalized stops:

mbáŋgɔ	fast	HL
ndúmbú	nude	HH
ɲǎe	buffalo	HL
ŋgáná	refuse	HH
ŋgbági	hero	HL

Syllabic initial nasals:

mɓóndigi	guard	LHLL
mpáti	track	LHL
mɸáse	twin	LHL
nɗúndugu	writer	LHLL
nsɔ́a	arrow	LHL
ɲčá á	shallows	LHH
ntúté	pestle	LHH
áí	fool	LHH
ŋkúmbá	baggage	LHH
ŋkpá	person	LH

Postulating that only syllabic nuclei can be tone-bearing units gives a principled explanation as to why initial nasals are not whistled in the first group of (4), but are whistled in the second group.

The clusters everywhere analysis cannot make a principled distinction between what can bear a whistled tone and what cannot.[10]

b. *Kimasa*. Kimasa is a language game where words are transformed so that the order of their syllables are completely reversed, back to front, as exemplified in the following:

---

[10] Indeed, syllabic nasals can in rare cases bear high tones as well as the low tones shown here, as is shown below:

(5) Kimasa

$$\sigma_1 \quad \sigma_2 \quad \cdots \quad \sigma_{n-1} \quad \sigma_n \quad \longrightarrow \quad \sigma_n \quad \sigma_{n-1} \quad \cdots \quad \sigma_2 \quad \sigma_1$$

The name of the game is derived from the trade-language Swahili samaki 'fish', which was selected because the initial syllable of kimasa looks like it contains the Bantu noun-class 7 prefix ki-, which is productively found before names of languages (e.g., kifaranza 'French', kigerumani 'German'). Three groups of examples follow in (6). The first group is a list of words with their Kimasa transforms. Group two shows that prenasalized consonants are not split up into nasal plus consonant under the transformation. Group three shows that syllabic nasals become detached and moved around like other syllables. (Note that the tonal melody of a word does not change under the transformation.)

The word final nasals in group 3 are syllabic, taking the tone of the final syllable in the basic word and even being pronounced sometimes with a preceding glottal stop. From being initial syllabic nasals under the Kimasa transformation, they have been moved to the end of the Kimasa word. This occurs in spite of the fact that words always end with a vocalic element in the real language.[11]

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[11] Some other facts about Kimasa include:

1. The Kimasa rule applies before nasal assimilation. As an example, ŋkpá 'person' becomes kpań or kpaʔń.

2. A word-internal nasal-voiceless stop undergoes pervasive voicing: ke-n-tende 'cl.5-cl.9-NSayo version of circumcision ceremony' becomes ndeteŋge and ɓampáka 'cl.2-cat = cats' becomes kapámba. The alternations nk-ŋg and mɓ-mb are apparently the result of repair strategies—to use Goldsmith's (1990) terminology—to meet a monomorphemic word-internal morpheme structure constraint requiring nasal-obstruent clusters to form onsets having unique points of articulation that are voiced and egressive.

3. Apparently, the Kimasa rule is a word-level application regardless of its length, but not at the level of the phonological phrase. Thus, amá-sɔŋgɔɗɔmiɔ 'mother of-[empty morpheme] = earthworm') becomes maá-ɔmiɗɔŋgɔsɔ.

(6)   Kimasa examples

Komo	Kimasa	Gloss

Group 1

ɓaɸíí	iɸíɓá	guitar
čéɗé	ɗéčé	frog
číko	kíčo	field
ɓasú	suɓá	fish (plural)

Group 2

mbáŋgɔ	ŋgɔ́mba	fast
mbókó	kómbó	horn
ndúmbú	mbúndú	nude
ŋgáná	náŋgá	refuse
ɓoŋgbíŋgbí	ŋgbiŋgbíɓó	length

Group 3[12]

mpáti	típam	track
–or–	típaʔm	
m̀po	póm	then
	póʔm	
mɸáse	seɸám	twin
	seɸáʔm	
ɲčáɲǰá	ɲǰačáń	shallows
	ɲǰačáʔn	
ntíndí	nditíń	civet
	nditíʔń	
ŋkpá	kpań	person
	kpaʔń	

Kimasa gives a glimpse of exactly what are syllables in Komo. They are structured as predicted by an analysis making [+nasal] preceding voiced obstruents prenasalized, namely into V and CV units.

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[12] The real language has no words that end in consonants. The result is that the speaker uses different strategies to resolve this inconsistency that comes up nowhere else in the language. That is why alternate possibilities exist in this group.

The clusters everywhere analysis makes wrong predictions: for example, it would have Kimasa transform mbáŋgɔ 'fast' into *gɔnábm instead of ŋgɔ́mba.

     c. *High-tone dissimilation*. Komo has a rule of high-tone dissimilation that changes an initial sequence of two or more high tones in a word to low tones in the context of associative-linked noun phrases and oblique phrases where the head component has a high tone. In the following examples, the citation form of the word is on the left, and the word with its melody after káŋgá 'without' and before the demonstrative ndé 'this' is shown on the right.

     Thus, words with branching H-initial melodies (i.e., where the H is linked to more than one syllable) end up with low tones. Any other tone melody, including that coming from a word having an H-initial melody where the H is only linked to one syllable, is not changed. These facts are exhibited in (7).

     I make an analysis without formally stating a rule: in an associative or oblique phrase context, if the tone on the first two or more syllables of the adjunct noun is high, that tone is deleted. Deletion of that tone causes all the syllables to which it was linked to end up with low tones through a default rule (see Thomas 1992).

(7)   High-tone dissimilation

citation form 'gloss'	*in frame: 'without this...'*
H-initial patterns:	
číɗó 'chigger'	káŋgá čiɗo ndé
bóbóká 'being foolish'	káŋgá boboka ndé
ɗúsúkánágá 'dying'	káŋgá ɗusukanaga ndé
gbútu 'baton'	káŋgá gbútu ndé
káŋga 'bird'	káŋgá káŋga ndé
L-initial patterns:	
pɛɲǰɛa 'pen'	káŋgá pɛɲǰɛa ndé
sosó 'hat'	káŋgá sosó ndé
ǰɔmbi 'panier'	káŋgá ǰɔmbi ndé
ɲɔŋgɔ 'word'	káŋgá ɲɔŋgɔ ndé

If a word-initial nasal is part of an onset, the rule of dissimilation continues to hold. In the following examples, all the words in the left column contain a prenasalized stop. The first two groups of words have high tones linked to the first vowel. The words in the first two groups therefore meet the structural conditions for high-tone dissimilation, and the rule functions on these words.

(8)   High-tone dissimilation, prenasalized stops

citation form 'gloss'	*in dissimilation frame*
ŋgómí 'pity'	káŋgá ŋgomi ndé
mbóŋgó 'young plant'	káŋgá mboŋgo ndé
mbóbi 'vine'	káŋgá mbóbi ndé
mbía 'palm'	káŋgá mbía ndé
ndokpá 'squirrel'	káŋgá ndokpá ndé
ŋgaɲǰá 'circumcise'	káŋgá ŋgaɲǰá ndé
mbuka 'fruit'	káŋgá mbuka ndé
ndemigi 'trickster'	káŋgá ndemigi ndé

Nasals with high tones are rare, due to the fact that most word-initial syllabic nasals are allomorphs of the low toned Bantu noun-class 9 prefix (N-). A nearly exhaustive list of words with high-tone nasals is: ḿa 'mother (infantile)', ḿbé [animate near demonstrative pronoun], ḿbɔ́ [animate far demonstrative pronoun], ńa- [allophone of the 3s subject prefix when concatenated before an imperfective stem], ńdé [inanimate near demonstrative pronoun], ńgbe 'dog whistle', ńdɔ́ [inanimate far demonstrative pronoun], and ńsa 'fire, firewood'.

ḿbé, ḿbɔ́, ńdé, ńgbe, and ńdɔ́ are all anomalous. According to the analysis, the words should all contain initial prenasalized stops, incapable of bearing tone. I can only assume that the initial nasals of these words are lexically syllabified.

The behavior of these after káŋgá is as follows:

(9) High-tone nasals in a dissimilation frame

citation form 'gloss'	*in dissimilation frame*
ńdɔ́ [far demonstrative]	káŋgá ńdɔ
ńsa 'firewood, fire'	káŋgá ńsa ndé

These words seem then to follow the pattern whereby a branching high tone dissimilates, regardless of what type of segment, nasal or vowel, that the tone is linked to.[13]

However, except for the few anomalous forms mentioned above, high-tone dissimilation never applies to a word containing a cluster of an initial nasal and a voiceless obstruent, as shown in the following examples.[14]

---

[13] However, at the phonological phrase level, the final vowel of káŋgá and the initial nasal are dominated by the same rhyme. Not discussed here is a rule that spreads an H throughout a rhyme (see Thomas (1992)).

[14] Unfortunately, no examples of words containing initial nasal-implosive clusters exist where the second and third syllables have high tone. This is due to a quirk of tonal morphology: the agentive nouns, where such clusters are found, have

(10) High-tone dissimilation, syllabic word-initial nasal

citation form 'gloss'	in dissimilation frame
mpɔ́kɔ́ 'plantain'	káŋgá mpɔ́kɔ́ ndé
ŋkɛ́kɛ́ 'paste'	káŋgá ŋkɛ́kɛ́ ndé
ŋkɔ́i 'eagle'	káŋgá ŋkɔ́i ndé
nsámi 'fish'	káŋgá nsámi ndé
nsuŋgú 'manioc'	káŋgá nsuŋgú ndé
ntuɸú 'hornbill'	káŋgá ntuɸú ndé
mɸoɸi 'tailor'	káŋgá mɸoɸi ndé
ŋkatɔ 'trail blaze'	káŋgá ŋkatɔ ndé

All the examples in the left-hand column of (10), when whistled, yield three tones, of which the first tone is always low. The presence of the low tone borne by the syllabic nasal blocks high-tone dissimilation.

In the clusters everywhere analysis, however, no prenasalized word-initial nasals exist. Dissimilation should never occur, which is a wrong result.

I now digress briefly to make an application of this analysis to labiovelars; i.e., that the voiced labiovelar is almost always prenasalized and is language particular to Komo (single exception: ńgbe 'dog whistle'). In Yoruba, it is not (Maddieson and Ladefoged 1989:122). That Komo labiovelars are egressive is also language particular (Maddieson and Ladefoged 1989:122-123).

If the Komo voiced labiovelar were implosive, one would expect that a nasal clustered with it would be syllabic, since a nasal can only cluster in an onset with a voiced egressive obstruent. It turns out that this is not the case. First, combinations of nasal plus voiced labiovelar may be found non-initially, as in: ŋgbaŋgbata 'cemetery', gbaŋgba

---

either LHL or LLL surface tonal melodies. For details on high tone dissimilation, see Thomas (1992).

'larva', and g̲b̲u̲ŋ̲g̲b̲ú̲k̲í̲t̲í̲ 'circumcision dance'. Second, words like ŋ̲g̲b̲a̲ŋ̲g̲b̲a̲t̲a̲ and ŋ̲g̲b̲ɛ̲ are whistled as if there were no initial syllabic nasal present. Third, in Kimasa, a prenasalized voiced labiovelar is moved as a unit. Thus, ŋ̲g̲b̲a̲ŋ̲g̲b̲a̲t̲a̲ becomes t̲a̲ŋ̲b̲a̲ŋ̲g̲b̲a̲ in Kimasa and g̲b̲u̲ŋ̲g̲b̲ú̲k̲í̲t̲í̲ becomes t̲i̲k̲í̲ŋ̲g̲b̲ú̲g̲b̲ú̲. Finally, these prenasalized forms undergo tonal dissimilation, which has been shown to apply only to voiced egressive obstruents:

(11) Tone dissimilation, non-syllabic word-initial nasal

citation form 'gloss'	*in dissimilation frame*
ŋgbáŋgbá 'hut'	káŋgá ŋgbaŋgba ndé
ŋgbótá 'big being'	káŋgá ŋgbota ndé
ŋgbági 'hero'	káŋgá ŋgbági ndé

I conclude that the voiced labiovelar is an egressive obstruent that can be prenasalized.[15]

2.3 Nasal assimilation

I now discuss nasal assimilation as it is found in Komo. This is done for two reasons. First, I wish to demonstrate a concrete example of the rule-writing formalism that I have chosen and the arboreal model of feature organization on a straightforward case before making use of it in the chapters on vocalic phenomena. Second, I present some initial motivation for choosing [round] as a more optimal feature for the description of Komo vowels than [back].

---

[15] I have listened to digitized recordings of labiovelar consonants played back at slow speed. These clearly show that such consonants have an initial velar closure and a final labial release, regardless of the voicing. Physically, this probably necessitates an egressive pulmonic articulation. Voiced implosive consonants, on the other hand, would have both an initial labial closure and a labial release. This leads me to the conclusion that both labiovelars are egressive.

2.3.1 Description of nasal assimilation

I first note that nasals assimilate to the place of articulation of a following consonant without restriction. The initial nasals in the following examples are likely the result of noun-class prefix allomorphy (from noun classes 1, 3, or 9). Given the lack of noun-class concord in Komo, it is difficult to know this for sure.

(12) Nasal assimilation

Komo	gloss
mpókɔ	resting place of an antelope
mɓáku	knife
ntíndí	civet
nɗɔtí	handicapped person
ɲčáɲǎ	shallows
ɲɟai	crazy person
ŋkama	ten
ŋkpá	person

It turns out that a nasal can also in some way assimilate to a following vowel if the nasal is unspecified lexically for a point of articulation. This is the case with four homophonous morphemes, the class 1, 3, and 9 noun prefixes and the third person object prefix N-. They depend on the initial vowel of a following morpheme in order to determine their points of articulation. The phonological content of the morphemes includes the feature [+nasal] and a low tone which attaches to a following vowel. In the following examples, I first present a group of verbs with their nominalizations using an N- prefix (of whatever class). Then I present a group of roots, some of them the same as in the first group, but which are concatenated with the third person singular object prefix. (Note in each case that the morpheme in question is realized as <u>m</u>- before round vowels and as <u>n</u>- elsewhere.)

(13) Nominalizations and third person objects[16]

root	gloss	class 9	Gloss
amísá	save	n-amisi	Savior
ímá	erase	n-ími → [nǐmi]	light switch
eá	eat	n-i	Eater
úbá	know	m-úbi → [mǔbi]	Knower
oká	braid	m-oki	Braider

root	gloss	with object	Gloss
amísá	save	ne-n-amísi	I saved him/her.
éá	eat	ne-n-i	I ate him/her.
ɛ́ká	trap	nɛ-n-ɛ́ki	I trapped him/her.
úbá	know	ne-m-úbi → [nemǔbi]	I know him/her.
ɔ́ká	hear	nɛ-m-ɔ̂ki → [nɛmɔ́ki]	I heard him/her.

Thus, the Komo rule of nasal assimilation must account for both vowel and consonant triggers.

2.3.2 Description of the parametric rule framework

Before stating the parametric rules, I describe in detail the parametric framework upon which I base my analysis. First, I paraphrase below from Archangeli and Pulleyblank (1986:7ff.):

In this framework, a rule consists of three parts:

I. a group of four parameter settings,
II. the argument for the rule,
III. the trigger or target conditions.

The argument (part II) for the rule consists of either a node or a feature to which two things can happen: (1) it can be inserted or deleted, or (2) structure or lines of association which have the argument as an end point can be inserted or deleted.

---

[16] Note that the morphemes in question function as depressors of a high tone stem, leaving a rise on the initial syllable of the stem.

One method of traditional rule formulation takes the form:

$$X \ A \ Y \longrightarrow X \ B \ Y.$$

In the system that is being used here, either A or B would be null, that is, only insertion or deletion rules are permitted. The non-null member of the set {A, B} would be the argument of the rule in the parametric rule framework. A rule of the form:

$$\text{[+round]} \longrightarrow \text{[+labial]}$$

would be ill-formed in this framework inasmuch as it means that the feature [+round] were to be replaced by [+labial]. However, a rule of the form:

$$\emptyset \longrightarrow \text{[+labial]} \ / \ \underline{\quad\quad}$$
$$\text{[+round]}$$

may be stated in this framework as:

  II. [+labial]
  III. [+round]

where [+round] could be either a trigger condition, where its existence is necessary for the rule to take place, or a target condition, where its existence is sufficient for the rule to take place, or both.

 I next list the four parameter settings that pertain to part I of a rule. Each parameter has a default setting, which, when overtly listed in a rule for the sake of clarity, is listed in parentheses. Below, I list the non-default setting first followed by the default setting in parentheses. In other words, in the absence of overt specification for a particular setting, the setting in parentheses is in force for that particular rule. After the description of each parameter, I give an example.

a. *delete* (insert). This parameter determines whether the rule would delete or insert either features or association lines.

A rule that inserts is taken to be less marked than a rule of deletion. 'Insert' is thus the default setting of the parameter, and need not be explicitly stated in the writing of a rule, except when—for didactic purposes—one wishes to list it between parentheses.

A rule set for *insert* would be traditionally formulated as:

$$\emptyset \longrightarrow A \ / \ X \ \underline{\quad} \ Y.$$

In the framework used here, the same rule would be stated as:

I. a. (insert)$_{def}$

II. A

III. X $\underline{\quad}$ Y.

Since *insert* is the default setting for this rule, the preceding could be abbreviated as:

II. A

III. X $\underline{\quad}$ Y.

A rule set for *delete* would be traditionally formulated as:

$$A \longrightarrow \emptyset \ / \ X \ \underline{\quad} \ Y.$$

In the framework used here, the rule would look like:

I. a. delete

II. A

III. X $\underline{\quad}$ Y.

b. *minimal* (maximal). This parameter governs the tier or nodes on which a rule functions.

A maximal insertion of a vowel feature, for example, links that feature directly to the feature skeleton. A minimal insertion inserts an autosegmental feature (Archangeli and Pulleyblank 1986:128). With respect to feature spreading, a maximal vowel content or feature spreading rule would scan each vowel, including a phonologically transparent vowel. Minimal vowel content spreading would skip over a transparent vowel.

As another example of parameter (b) above, the *minimal* parameter comes into play where a vowel is transparent to vowel harmony, as is the case for Khalkha Mongolian (Archangeli and Pulleyblank 1986:280ff; Steriade 1979; Chinchor 1978), where [back] harmony can skip over the transparent [i] in a word like zaxir–Vx 'to direct' to yield zaxir–ax and not *zaxir–ex, which would have been the case had the [i] been a harmony trigger, or *zaxur–ax, had [i] been a host for [+back] spreading from the first [a].

(14) Khalkha Mongolian

```
zaxir – Vx   →   zaxir – ax
CVCVC    VC       CVCVC    VC
  \                 \    /
[+back]           [+back]
```

c. *structure* (content). This describes whether the rule inserts or deletes content or structure.

Here, content refers to phonological features and structure refers to nodes. The default setting for this parameter is (content).

Rules insert content by default. Such a rule, if it were also maximal (by default), would resemble the following, where X is an initially free skeletal position and A is a feature.

```
X  →  X
      |
      A
```

Parametrically, this is equivalent to:

    II. A

On the other hand, harmony, or spreading rules insert lines of structure. An example, where X and Y are skeletal positions and A is a feature:

```
X  Y  →  X  Y
|        |  /
A        A
```

Parametrically, this is equivalent to:

    I. c. structure
    II. A

    d. *bidirectional*, *opposite direction* (same direction).

In the default case, it is assumed that a rule scans in the same direction as the initial autosegment—anchor mapping. If, as in the unmarked case, the association convention for an autosegment F is left to right, then the default setting of the directionality parameter should also be left to right. However, a particular rule may override the default direction. In such a case, another binary choice is possible: either the rule applies in the opposite direction to the direction of the association convention for F, or it applies bidirectionally.

This is a departure from the traditional view that the default direction is left to right. However, in a case where ATR could be shown to link right to left across a word, the expected direction of ATR harmony would also be right to left. The traditional view would incorrectly mark such a rule for leftward directionality. In the approach used here, directionality would assume the default parameter of *same direction*, and would not be marked for directionality.

There is also one parametric target condition, *linked* or *free*, which refers to whether a target is linked to the feature contained in the argument or not. Archangeli and Pulleyblank (1986) is not clear about when a vowel is free by default and when it is linked. For the sake of clarity of definition, I make the default parameter *free* in lexical strata of derivation and *linked* in post-lexical strata. Here is an example of a rule linking the feature [+A] onto an skeletal position X that is previously linked to [–A] in a context of Y:

```
   X  Y →      X  Y
   |            /\
  [–A]      [+A] [–A]
```

Parametrically, the preceding rule would be written as follows:

```
    II. [+A]
   III. a. linked
       b.  X Y
           /\
       __ [–A]
```

The framework of parametric rule statement (Archangeli and Pulleyblank 1986) seeks to characterize different types of rules through constraints on their form and function. For example, a redundancy rule can only include default parameter settings in part I. That is, if the argument of a redundancy rule is F (see the glossary, 9),

then F consists only of content (a feature value) that can only be inserted where there is a free target.

2.3.3 Analysis of Komo nasal assimilation

Using the preceding framework, I now write the set of rules necessary to describe Komo nasal assimilation. First, I assume that the seven Komo vowels are minimally specifiable by only the features [round], [high], and [ATR]. Next, since the feature [+round] implies rounding of the lips, it follows that the segment to which it is linked can also be linked to the feature [+labial].[17] I state this explicitly as redundancy rule (15), using the parametric model for phonological rules.

(15) Redundant labial

    I. a. (insert)$_{def}$
         b. (maximal)$_{def}$
         c. (content)$_{def}$
         d. (same direction)$_{def}$

    II. [+labial]

    III. Trigger/target conditions
         a. (free)$_{def}$
         b. [+round]

This (maximal) rule scans rhyme nodes. If it encounters a rhyme node that dominates the feature [+round] (a feature held in common by the vowels [u], [o], and [ɔ]), the feature [+labial] is inserted.

---

[17] There must be a feature called [labial] in Komo phonology in order to be able to specify a labiovelar consonant.

Subsequently it is linked by the Universal Association Convention (UAC) to the target rhyme:

(16) Graphic description of (15)


```
    V      →      V
    |            |\
[+round]         | [+round]
          [+labial]
```
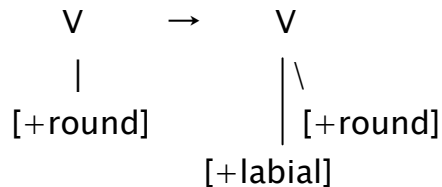

Of course it is only really necessary to explicitly state non-default parameters of a rule. Rule (15) could thus be written in a more abbreviated form as (17).

(17) Redundant labial

    II. [+labial]
    III. [+round]

      I now arrive at a point in my argument where I show additional phonological detail in order to characterize Komo nasal assimilation. In the system of Clements (1985) as revised in Archangeli and Pulleyblank (1986), a phonological structure can be described using an arboreal or tree-like representation. The various branches of the phonological tree join at nodes, and the leaves of the tree are specific features. The base of the tree is the root node, which anchors directly onto the skeletal tier at either the macro node or the rhyme node: "the rime node dominates macro nodes and serves as the head of a syllable: the difference between [i] and [y] is that the former has a rime node and the latter does not (Archangeli and Pulleyblank 1986:56, who spell 'rhyme' as 'rime')." This is their diagram from the same page:

(18)

[i]   [y]
°   rime node
°   °   macro node
:   :
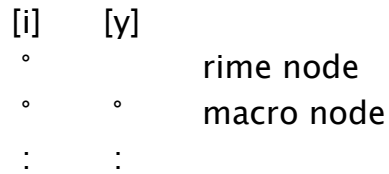
The tree structure that I use looks like the following (with alternate spelling of 'rhyme'):

(19) The phonological tree[18]

°   rhyme node
|
°   macro node
|
°⌐   root node
| └°   laryngeal node (constricted, spread, voiced)
°   supralaryngeal node (manner features)
|
°   place node (distributed, anterior, etc.)
|
°   s-place node (vowel features: high, ATR,
                 etc.)[19]
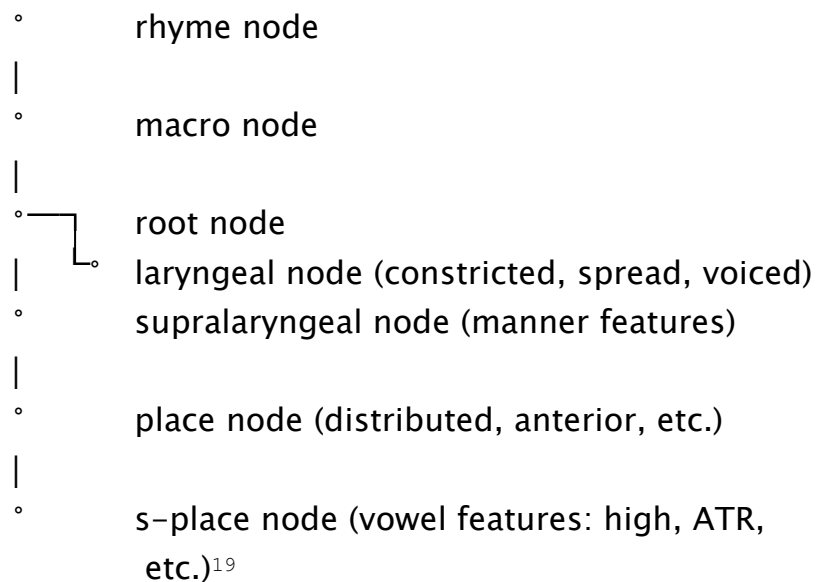
Next, I give a detailed graphic description of (15) in (20). In the description, a dotted line represents an ellipsis of non-crucial parts of the tree.

In prose, the feature [+labial] is inserted as the argument of the rule. It is immediately linked to the feature tree as a result of the

---

[18] Other presentations of the arboreal model of feature organization can be found in Ladefoged (1989), Goldsmith (1990), and Odden (1991).

[19] The s-place node dominates vowel features; the place node dominates point of articulation features, as well as vowel features via the s-place node.

maximal parameter. As a point of articulation feature, it is linked to the place node.

(20) Arboreal representation of (15)

```
° rhyme node        →              °
|                                  |
° macro node                       °
:                                  :
° place node                ┌──────°
|                           |      |
° s-place node              °      |
 └──┐                       |      |
   [+round]               [+round  |
                           [+labial]
```
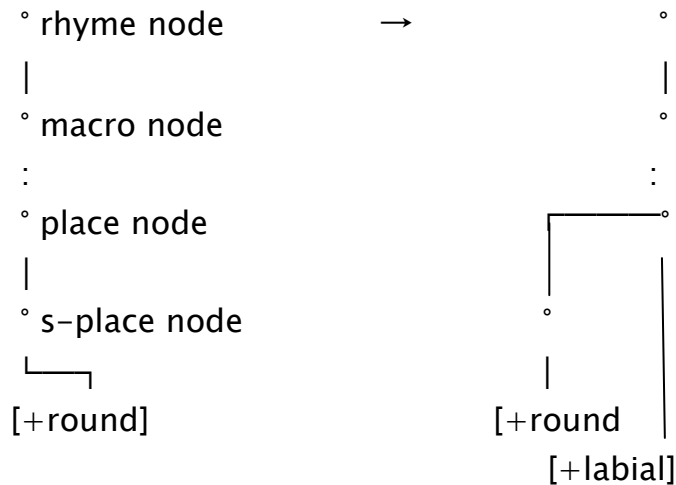
I next describe the Komo rule of nasal assimilation. As has been demonstrated, nasals may assimilate to both vowels and consonants. Since any place feature or combination of place features may be assimilated, it follows that the type of node that immediately dominates all these features is the node that must spread from a segment to a nasal. Such a node is the place node, which in the Archangeli and Pulleyblank (1986:52) framework immediately dominates both primary place features and the secondary place node.

The rule of nasal assimilation must then insert a line of association leftwards from a place node to a segment that dominates the manner feature [+nasal] and is unspecified for a point of articulation, as shown below in part IIIa of the rule. Again, it is not necessary to specify the first two parameters in (21), since they are default settings. It is difficult to judge which way nodes associate by the Universal Association Convention. I therefore assume the default case for rule directionality.

(21) Nasal assimilation

    I. a. (insert)$_{def}$
       b. (maximal)$_{def}$
       c. structure
       d. (same direction?)$_{def}$

    II. place node

    III. a. (free)$_{def}$
        b. [+nasal]

     I next give a graphic illustration of (21) before proceeding with a derivation showing the interaction of the last two rules.

(22) Illustration of (21)

```
          X    X                          skeleton
          ⋮    ⋮
          °    °                          supralaryngeal node (manner
         /     |                             features)
    [+nasal]   |
              °——————┐                    place node
             /       |
          place       |
        features      |
                      °                   s-place node (if a vowel)


  →        X   X
           ⋮   ⋮
           °   °
          /|   |
     [+nasal]| |
          └——°——┐
             /   |
          place   |
        features  |
                  °
```
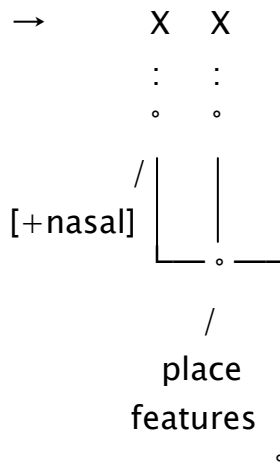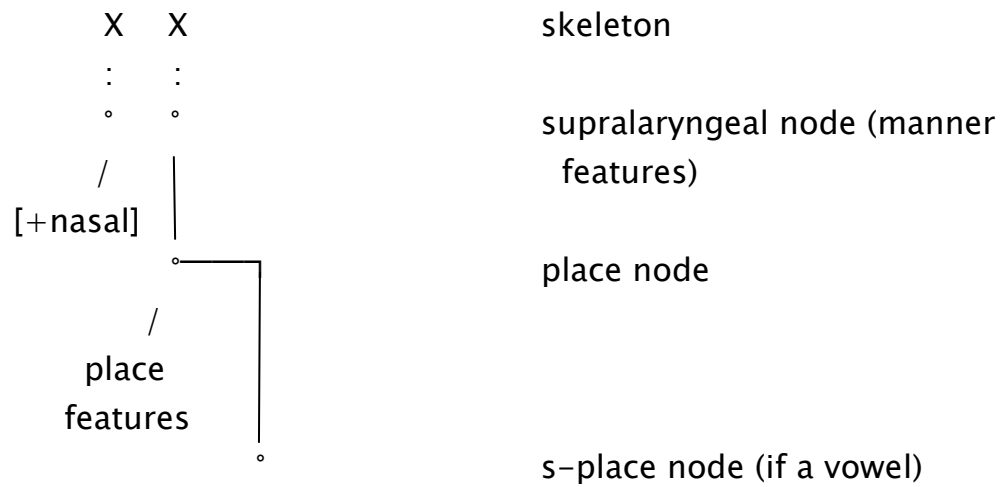
I now show how a nasal that is unspecified for point of articulation becomes an [m] before a round vowel. In (23), the skeletal position designated with a V could be either a [u], [o], or [ɔ].

If, on the other hand, the vowel in question were not a round vowel, none of the trigger conditions for 'redundant labial' would be met, spreading of the place node would have no effect, and consonantal default rules (not discussed here) would fill in the features for an [n].

(23) Derivation of [m] before a round vowel

```
        N     V                          skeleton
        :     :
        °     °                          supralaryngeal node

       /      |
   [+nasal]   |                          place node
              °
              |
              °                          s-place node

              |
          [+round]
```

```
  →     N     V                          redundant labial (15)
        :     :
        °     °

       /      |
   [+nasal]   |
              °————————————┐
              |     [+labial]
              °
              |
          [+round]
```

```
  →     m     V                          nasal assimilation (21)
        :     :
        °—————°
        |     |
       /      |
   [+nasal]   |
        └—————°————————————┐
              |     [+labial]
              °
              |
          [+round]
```
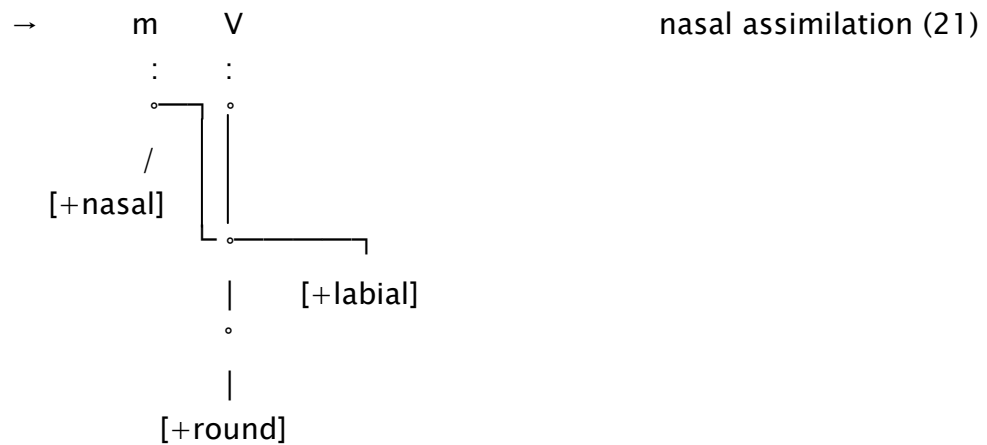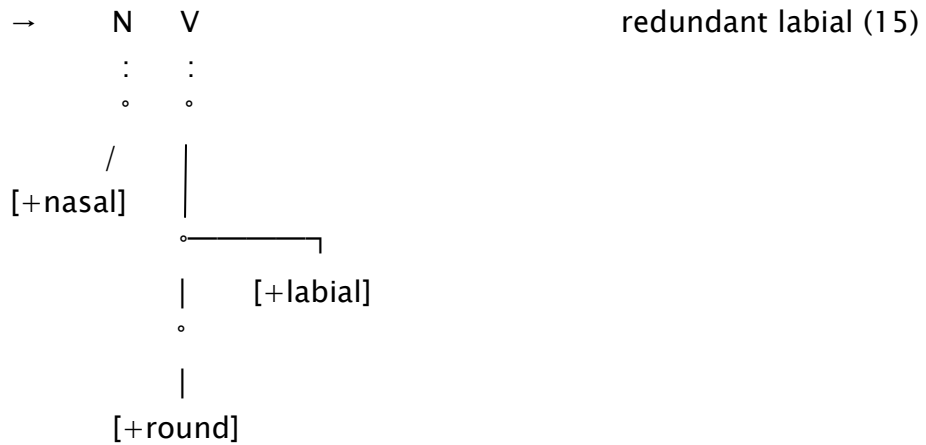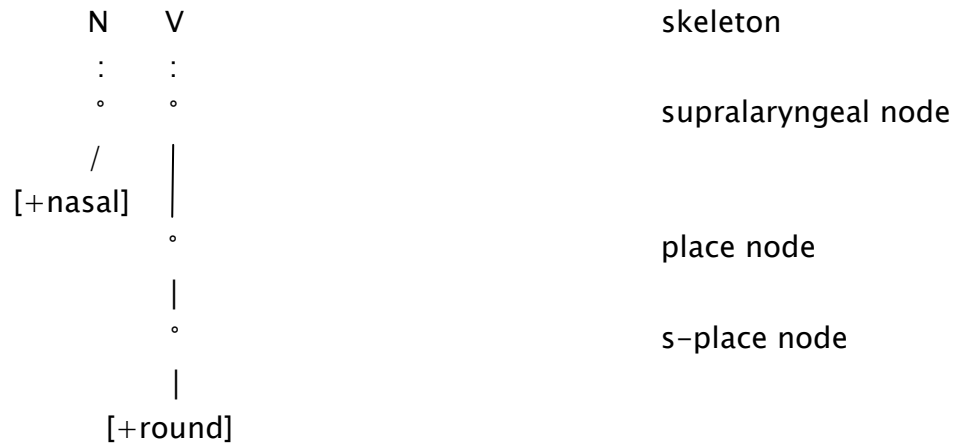
(24) Derivation of a nasal assimilating before a consonant

```
    N        g  skeleton                    input
    :        :
    °        °  supralaryngeal node
   /         |
[+nasal]     |
             °  place node
          / | \
     (features for a [g])
```

```
         ŋ    g                         nasal assimilation
         :    :                         (21) and output
         °    °
        /|    |
[+nasal] |    |
        |____°
         / | \
     (features for a [g])
```
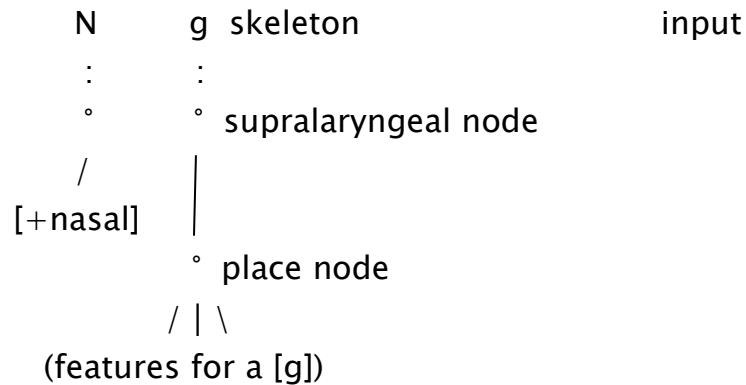
I conclude with two observations. First, with regard to nasal assimilation, a step is saved if [round] is taken to be a underlying vowel feature rather than [back]. If [back] were instead taken to be primitive, a redundant [round] rule that is triggered by the features [+back] and [−low] would be needed as well in order to complete the description of nasal assimilation.

Second, Komo nasal assimilation includes the spreading of labiality from vowels to consonants. This favors a feature geometry where a labial node is connected to both the place and vowel (or secondary) place nodes, as in Clements (1990), over a geometry where it is connected just to the place node as in Clements (1985), Archangeli and Pulleyblank (1986), and Odden (1991).

2.4 Syllable structure

In a previous section, it was shown that nasals exist in Komo that are dominated by rhymes. I can now state the principle of syllable structure in Komo.

(25) Principle of syllable formation in Komo

    I. Rhymes license the following:

        1. Vowels
        2. Nasals

    II. Anything else is part of an onset.

Thus, post-lexically at least, the Komo syllable can take the form V, CV, or CVC with the constraint that the final C must be [+sonorant, +nasal] and the proviso that the V position (the nucleus) may be [+sonorant, +nasal], if it is word initial.

Examples of syllables of a nasal as nucleus are the initial nasals in <u>mpáka</u> 'cat' and <u>nɗɔti</u> 'cripple', where the [p] in 'cat' is voiceless and the [ɗ] in 'cripple' is implosive. As has been shown, neither [p] nor [ɗ] is capable of licensing a nasality feature in the onset. A word that is a V by itself is the associative <u>á</u>. V's by themselves can also occur word internally, as in the first [a] of <u>íánágá</u> 'reflect upon'. Syllables with a nasal as coda occur as the initial syllable in <u>ɓa-m-páka</u> 'cl.2-cl.9-cat = cats' and <u>ke-n-tende</u> 'cl.7-cl.9-circumcision ritual'. In fact, such syllables seem restricted to multiple-prefixed nouns.

3. PROLEGOMENA TO THE VOWEL SYSTEM

In this chapter I first give an overview of the Komo vowel system. Secondly I demonstrate how Komo has assimilated words from a five vowel language, Swahili, with which it has long had contact. This loan word data is then used to provide initial motivation for an analysis where the features [–high] and [+ATR] are taken to be default values and [a] is taken to be an unspecified vowel. A third argument is mentioned (page 51) but is presented in a subsequent chapter (page 76).

3.1 Overview of the Komo vowel system

Komo uses a seven vowel system:

(26) Komo vowels

	front	mid	back	
High vowels:	i		u	
Mid vowels:	e		o	([+ATR])
	ɛ		ɔ	([–ATR])
Low vowel:		a		

These vowels show up in the near–minimal group of words of (27) that vary at most by their tone and final vowel qualities.

Next, I examine attested possible co–occurrences in adjacent syllables of vowels within morphemes. I do this using a group of examples (28) with a following index (29). Where it is likely that a noun–class prefix, productive or not, is part of a word in the list, I have so indicated with a hyphen without attempting to indicate a gloss for the prefix.[20]

---

[20] Unfortunately, there is no test to determine in every case whether or not a word contains a prefix. In most Bantu languages, such a test would be to check for whether the word triggers concord with a verb or adjective. But no concord system exists in Komo.

(27) Near minimal group of words using each Komo vowel

Word   gloss

agí   he/she said/did
agĕ   he/she went (perfective)
ágĕ   he/she should go (subjunctive)
ágǎ   he/she should go (imperative)
ágɔ́   bat species
agó   he/she attacked (perfective)
agú   he/she fell (perfective)

I have also shown one compound word (example 10 in (28)). The compound word was necessary because it is difficult to find morphemes with mid-vowel-[+ATR][-ATR] sequences where the two vowels in question share the same value of [round].[21]

(28) Vowel co-occurrences

1.	bibi	charcoal
2.	i-ímé	unknown ancestor
3.	m-biɛ́	bird species
4.	a-míta	fifth boy circumcised in a circumcision cycle
5.	ɔmíɔ	match
6.	i-ímo	mountain spirit
7.	ndíu	however
8.	e-gendí	final bride payment
9.	eké	egg
10.	toko-á-ɗeŋgɛ́	a plant
11.	a-téɓa	adulterer
12.	m-bénɔ	time
13.	n-seŋgó	bad humor
14.	a-ɓétu	boxer

---

[21] I know of no reason why this is so, besides a possible pragmatic reason that [ɛ] is the verb stem ending for the subjunctive. That is, the language avoids nouns having only an ATR articulatory distinction between its stem vowels in order to avoid paradigmatic confusion between nouns and subjunctive verb stems.

15. ɛ-gɛndí   bride price
16. ɓu-ɟ̂ɛnɛ́   poverty
17. ɛ-kɛka   marriage ceremony
18. mɔ-ɓɛɔ́a   red-footed squirrel
19. ɛ-ndɛu   beard
20. ɓo-tái   net
21. gase   grey-cheeked mangabey (a monkey)
22. găkɛ́   however
23. i-ɓata   duck
24. ǰákɔ   chicken cage
25. n-gandó   crocodile
26. n-kau   a tree
27. mɔ-kɔki   bonds
28. n-gɔɛ́   female dignitary
29. n-gɔ́a   good luck
30. ɔ-kɔ́tɔ́   bamboo drum
31. ɔ-gɔu   throat
32. e-koi   rich person
33. ki-n-koté   bedbug
34. mo-kpómɛ́   a tree
35. mo-čóčá   rapids
36. n-kókɔ   frond
37. á-ɓogo   a fish
38. o-ǰoú   women's fishery
39. múɸí   needle
40. úe   crumbs
41. uɛ́bɛ   youngest child
42. n-kúa   bone
43. uŋgɔ   winnow
44. n-kumo   fig
45. ɓúɓú   chicken louse

From (28), co-occurrences of vowels have been noted in (29) where each number in the index corresponds to an example in (28).

This shows that there are four unattested vowel combinations. These consist of unattested lexical ATR melodies for adjacent mid

vowels in a morpheme. These unattested melodies are all of the form [–ATR][+ATR]. I formalize this in generalization (30).

(29) Index to (28)

V1\V2	i	e	ɛ	a	ɔ	o	u
i	1	2	3	4	5	6	7
e	8	9	10	11	12	13	14
ɛ	15	16	17	18		19	
a	20	21	22	23	24	25	26
ɔ	27		28	29	30		31
o	32	33	34	35	36	37	38
u	39	40	41	42	43	44	45

(30) Morpheme structure constraint, ATR sequences

A lexical ATR sequence of the form [–ATR][+ATR] is ill-formed. More formally (30) can be represented as (31).

(31) Morpheme structure constraint: *[–ATR][+ATR].

However, this is valid only with respect to mid-vowels. Vowels of either value of ATR can occur on either side of a low vowel or a high vowel. The framework of lexical underspecification can account for this by positing that high and low vowels are not underlyingly specified for ATR. Rather, ATR with regard to high and low vowels is redundant, being added to the feature matrices of such vowels by a redundancy rule at some stage in the derivational process. In this way, one can speak of a lexical constraint on ATR melodies even though any ATR melody is possible, as long as the constraint applies before the redundancy rules.[22]

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[22] I note here that an analysis, based upon a framework that assumes fully specified feature matrices at the lexical level, cannot make as simple a statement about the nature of the lacunae in (29). Rather, it would have to somehow exclude high and low vowels from the generalization.

3.2 Komo words of Swahili origin

In this section I provide data concerning loan words. It will be suggestive for choosing [high] as a privative (one-valued) feature (Goldsmith 1990:245) in the Komo vowel system.

Komo has a long history of contact with Zaire Swahili (hereafter referred to as 'Swahili'), a five-vowel Bantu language spoken as a second language throughout eastern Zaire as far as the Zaire River. Whereas there are five emic vowels of Swahili; viz., /i/, /ɛ/, /a/, /ɔ/, and /u/, there are seven in Komo; viz., /i/, /e/, /ɛ/, /a/, /ɔ/, /o/, and /u/. Chart (32) below demonstrates how each vowel in Swahili is assimilated in Komo.

(32) Komo words of Swahili origin

Swahili	Komo	gloss	analysis
malaika	malaéka	angel	i → e
takatifu	takatéɸo	Holy	
mungu	móŋgo	god	u → o
mpunga	mponga	rice	
mu-gɛni	mɔ-kɛ́ní	foreigner	ɛ → ɛ
ngɔmbɛ	ngɔmbɛ	cow	
kuɔna	ɔ́ná	to see	ɔ → ɔ
bɔngɔ	ɓɔngɔ́	Skull	
maana	maana	meaning	a → a
bata	iɓata	duck	

Actually, a number of Swahili words have become lexicalized into Komo. (Note particularly that Swahili mid (open) vowels become mid open vowels in Komo. The example mugɛni in the third grouping contains a noun-class prefix and is subject in Komo to ATR harmony

with the stem.[23] Thus, the <u>mu</u>– prefix in Swahili in this case becomes <u>mɔ</u>– in Komo.)

The generalization is not exceptionless. Final high vowels in words of Swahili origin do not always change. Thus <u>ɛlɛfu</u> 'one thousand' in Swahili becomes <u>ɛ́ɛɸu</u> in Komo and <u>ndɛvu</u> 'beard' in Swahili becomes <u>ɛndɛu</u> in Komo. As in the examples above, however, <u>takatifu</u> 'holy' becomes <u>takateɸo</u> in Komo. The reasons for this are unclear because candidates for such cases are not abundant.[24]

Another exception to the generalization concerns technical Swahili words that have been relatively recently introduced. For example, elders can still count in base five using Komo words. Younger people always count in base ten using words of Swahili origin. Thus, <u>sita</u> 'six' and <u>tisa</u> 'nine' have not varied in Komo. Similarly, relatively recently introduced Christian words (the first Christian missionaries came in 1935) that are not present in Islam, the religion of the merchants who introduced Swahili to the Komo area (in the late nineteenth century), such as <u>kutubu</u> (Komo: <u>túɓúá</u>) 'repent' and <u>kubatiza</u> (Komo: <u>ɓatísá</u>) 'baptize' have not undergone any vowel changes.[25]

Despite the exceptions, the vowel shift displayed in (32) usually holds. Many Komo speakers, especially men, are bilingual in Swahili,

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[23] For the sake of clarity, I am spelling the Swahili words phonetically here, where the mid vowels are in reality [–ATR] vowels.

[24] Possibly, the [u] remains invariable in the cited examples because a single downshift to an [o] in such cases would leave an ill–formed *[–ATR][+ATR] lexical ATR melody in the resulting words. If there were to be a downshift to a mid vowel, the shift would have to change two features and result in an [ɔ]. Apparently, the process of lexicalization of loan word stems is somehow constrained from doing this.

[25] Komo people have been in extensive contact with Swahili since at least the late nineteenth century. As a result, they have stories of Tippu Tip, a Swahili trader whose subordinates were in the Komo area during that time. It is known from Western records that envoys of Tippu Tip (Tippu Tip himself for part of the way) accompanied the Stanley expedition down the Zaire river past Kisangani in 1876–1877 (Packenham 1991:29ff). Kisangani was originally a part of Komo territory.

yet they continue to pronounce Swahili words in the way described when speaking Komo.

I also observe that the Swahili vowels do not have quite the same qualities as the Komo vowels. Chart (33) below illustrates their approximate relative vowel qualities: apparently, the four non-low Swahili vowels shift downward when borrowed into the seven vowel Komo system.

(33) Komo vowels versus Swahili vowels (italics)

Komo	*Swahili*	
i, u		high vowels
	i, u	
e, o		mid vowels
ε, ɔ	*ε, ɔ*	
a	*a*	low vowels

One possible analysis of the data is that [high] is redundant in Swahili. That is, high Swahili vowels are lexically unspecified for [high]. A Komo speaker who has a [–high] default value of [high] when he is speaking Komo would take a Swahili surface high vowel (which in the Komo lexicon becomes unspecified for [high]) and make it [–high], resulting in a mid vowel.

3.3 Minimal features of the Komo vowel system

Using the above data as suggestive, I propose lexical specifications of the Swahili and Komo vowels.

(34) Five vowel representation, Swahili

```
[+round] [−round] [+round] [−round]
   |        |        |         |
   x        x        x         x         x
                     |         |         |
                   [low]     [low]     [low]
```

```
   u        i        o         e         a
```

Example (34) is Goldsmith's (1990:302) proposal of the most likely lexical representations in a five vowel system like Swahili. That is, the vowels of a five-vowel system can be distinguished with one privative feature ([low] = 'non-high' in Goldsmith's system) and one equipollent feature (= bivalued feature, cf. Goldsmith (1990:245)).

A high vowel in such a five vowel system has [+high] only as a default value, being added at a late stage of derivation to bring about surface realization. If such a system is normative for Swahili, and [high] rather than [low] were the operative (privative) feature for vowel height in Komo, then the algorithm in (35) will derive the proposed Komo underlying representation of (35) from the Swahili one.

However, if [low] were retained as a feature for Komo lexical vowel specification, then this feature would have to be added to a Swahili high vowel to make it a Komo mid vowel. In the proposed system, little change in feature specification is needed for a speaker to transform a Swahili high vowel into a Komo mid vowel.

(35) Proposed seven vowel representation for Komo

```
[+rou]  [−rou]  [+rou]  [−rou]  [+rou]  [−rou]
  |       |       |       |       |       |
  x       x       x       x       x       x       x
  |       |                       |       |
  |       |                     [−ATR]  [−ATR]
[+high] [+high]
```

```
   u       i       o       e       ɔ       ɛ       a
```

A. Add the feature [−ATR][26] to any vowels dominating both the features [low] and [round] (i.e., [+round] or [−round]) that are present in the Swahili word (i.e., the Swahili mid vowels [ɔ] and [ɛ]).

B. Erase the feature [low] wherever it occurs.[27]

---

[26] [−ATR] is presumably already added by Swahili redundancy rule.

[27]This analysis implies that a Komo speaker does not 'hear' all the surface features of a [+high] Swahili vowel. All he or she needs to distinguish it from another vowel is whether it is [low] or [round]. That is, neurolinguistically speaking, I am making the prediction that the Komo speaker's brain somehow only needs those frequency components of a Swahili vowel associated with [low] and [round] in order to distinguish it from a different Swahili vowel. When borrowing a Swahili word into Komo speech, I am proposing that only two transformations are needed: the part of the brain that was used in Swahili to hear and store the [low] component of speech becomes disused, and the mid vowels are given the default [ATR] quality. Thus, in a sense, I am saying here that brains do not 'hear' (i.e., neurons do not fire in response to) the totality of surface features in a sound (e.g., nasality, stricture, voice, vowel height), but only those features needed to distinguish it from another sound. All else is background sound that at best may reinforce comprehension. Thus, markedness, not surface features, is what a Komo speaker (or any speaker) hears. Otherwise, I would have immediately 'heard' with my 5-vowel oriented brain the difference between [ɔ] and [o] the first day I arrived in Komo land, which in fact I had great difficulty hearing for months.

The lexical descriptions of the vowels in their Komo pronunciation would then fit in matrix (35), which describes a proposed lexical representation of the seven Komo vowels. For the sake of clarity, I preserve binary specifications for every feature (so Goldsmith's [low] would be written as [−high]), since lexical reference has to be made later in a small class of verb roots to non-privative values of the features depicted here.

I note that (35) exhibits tertiary power (in the lexicon) with respect to [round]. That is, the Komo lexicon includes plus, minus, and null values of [round]. This is also the case in Goldsmith's representation of a five vowel system in (34), with respect to [round]. In Thomas (1992), tertiary power is needed for the tone feature [+upper].

(35) is then the representation system that I propose for Komo vowels. That is, the cardinal vowels [a], [i], and [u] are lexically neither plus nor minus ATR. Furthermore, [a] is proposed to be lexically neither round nor non-round, and thus, at least lexically, neither front nor back. Indeed, in the Komo system, it is underlyingly unspecified for features.

3.4 Two arguments supporting the lexical specification of [a]

In this section, I present an argument that [a] is underlyingly unspecified and also that [+high] is the default feature for vowel height, and an argument that [a] is (at least) the least marked Komo vowel.

3.4.1 Elision

An argument that [a] is underlyingly unspecified comes from the following elision data.

In the derivation of phonological phrases, final low vowels elide before word-initial vowels, as in these examples.[28]

---

[28] Note that the [a] in nɔŋgɔ á does not elide. In closely related eBhele, which is geographically contiguous to the NSayo area, the associative is lá (Timothy Raymond, personal communication). In Komo, this failure of [a] to elide after [ɔ] is

(36) Examples of elision

káŋgá	íso	→	[káŋgíso]	
without	eye			
'blind'				

ká	éndú	→	[kéndu]
obl	house		
'in the house'			

káŋgá	ɛɓɔndɛa	→	[káŋgɛ́ɓɔndɛa]
without	inheritance		
'without an inheritance'			

ɲɔŋgɔ	á	úgulukútu	→	[ɲɔŋgɔúgulukútu]
word	of	owl		
'because of the owl'				

káŋgá	oɓáɔ	→	[káŋgóɓáɔ]
without	plank		
'without a plank'			

káŋgá	ɔ́ɓɛ́ɲjɛ	→	[káŋgɔ́ɓɛɲjɛ]
without	plank		
'without a plank'			

Thus, [a] + X → X. In a system having [a] as being underlyingly unspecified, elision can be stated very simply: [a], having no features, cannot affect the quality of the right-hand vowel. If [−high] had been chosen as lexically significant instead of [+high], then the expected result of an elision of an [a] and an [i], for example, would be [e], which combines the qualities [−round] from the [i] and [−high] from the [a]. The vowel representation system that I propose is therefore preferable on the grounds that it yields a simpler analysis with regard to the elision data.

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due either to a limitation on which strata elision may occur, or to an empty onset that was left behind when the features of the [l] dropped from the language.

3.4.2 The inflectional morpheme complex

An argument that [a] is (at least) the least marked vowel comes from data on the Komo inflectional morpheme complex. Briefly, Komo verbs are preceded by an inflectional morpheme complex consisting of as many as three syllables having the following features: (a) the vowel is the same in each syllable and registers subject–person agreement, (b) each consonant registers information about the clause, including in its maximal expansion, distant past or subordination, plural subject, and negative. This will be presented in detail in chapter 7.

In (37) I show variant forms of the distant past plural (ɗV–) and the subordinating (nV–) morpheme complex, where ɓV– shows plural subject agreement. The prefix vowels show person agreement: [e/ɛ] for first person, [o/ɔ] for second person, and [a] for third person.

In the first and second person, there are two possible forms each of the distant past and subordinating prefixes, depending upon whether vowel copy occurs from the vowel following [ɓ]. If copy does not occur, an [a] results in each case. This is the expected result in an analysis with [a] as the least marked vowel. However, in an analysis where another vowel is least marked, one would expect that other vowel to appear as the first vowel in the variant lines.

(37) Distant past plural and subordinating plural, 'talk'

	distant past	subordinating prefix
1p	ɗɛ́-ɓɛ-ɟ̂ɔngí	nɛ-ɓɛ-ɟ̂ɔngí
-or-	ɗá-ɓɛ-ɟ̂ɔngí	na-ɓɛ-ɟ̂ɔngí
2p	ɗɔ́-ɓɔ-ɟ̂ɔngí	nɔ-ɓɔ-ɟ̂ɔngí
-or-	ɗá-ɓɔ-ɟ̂ɔngí	na-ɓɔ-ɟ̂ɔngí
3p	ɗá-ɓa-ɟ̂ɔngí	na-ɓá-ɟ̂ɔngí

An argument regarding the lack of [–ATR] spreading from an [a] is presented on page 52.

An argument regarding the third person singular subject prefix <u>a</u>– changing to <u>ĕ</u>– when the features of the third person plural object morpheme are inserted onto it is presented on page 73.

4. VOWEL HARMONY

In this chapter I present data focusing on vowel harmony, which supports or developes my analysis of the Komo sound system, particularly that which pertains to its vowels.

4.1 ATR Harmony

In this section, I advance arguments in favor of default [+ATR]. It follows that the ATR harmony rule for Komo consists of the spreading of [–ATR].

[–ATR] is considered by some Bantuists to be the default value of ATR among Bantu languages (Kutsch Lojenga, personal communication). For this reason, my proposal of default [+ATR] could be controversial. In seeking to support it, I shall refer to two possible analyses of Komo ATR; viz., the default [+ATR] analysis and the default [–ATR] analysis.

My strategy is as follows: First, I present phonological paradigms of mid-vowel prefixes with respect to the vowel of the initial syllable of the stem of various words. In presenting this data, I observe that a [+ATR] vowel surfaces on a prefix preceding a stem whose first vowel is an [a]. This is problematic for the default [–ATR] analysis. In such an analysis, one would either have to analyze [a] as being a [+ATR] trigger, or one would have to lexically specify every prefix as being [+ATR], thereby complicating both the lexicon and the rule of ATR harmony.

Next, I take a look at the applicative suffix, which in certain stem configurations surfaces as an [e], causing still more problems for the default [–ATR] analysis, which would then have to lexically specify the

applicative as being [+ATR]. This contrasts with the default [+ATR] analysis, which would have to make no such lexical specification.

4.1.1 Prefixes

In the following examples, I give a list of both noun-class and verbal inflectional prefixes, with a phonological paradigm for each.[29] That is, each prefix is presented in each of seven environments, one for each possible vowel as the vowel of the initial syllable of the stem to which the prefix is concatenated. In each group of examples, I show the behavior of a prefix first before a stem whose first vowel is an [a], then before stems whose first vowels are high, then before stems whose first vowels are mid.

Noun-class prefixes of classes 1, 3, and 18 (see 38) in most Bantu languages are homophonous. Distinctions are primarily semantic. For the purpose of brevity, I therefore regroup nouns of this class into one group, since I wish to explore the phonology, and not the semantics, of these classes.

(38) Class 1/3/18 (proto-Bantu *mo-)

mo-gánda	a youth
mo-ɗíŋga	tap root
mo-kumá	healing ritual
mo-séphé	a fish
mo-čóčá	rapids
mɔ-mɛ́ɲɔ	hatred
mɔ-gɔgɔ	sheep

---

[29] Komo, as a Bantu language, has a wide variety of noun class prefixes. Although some have low productivity, all except one are identifiable as reflexes of Bantu noun class prefixes, in terms of both their phonological shape and their semantic function (Thomas in preparation a). Because of this I have concluded that they can as a group be treated synchronically as prefixes.

(39) Class 5 (proto-Bantu *i̱-)

e-ɗáka	tongue
e-títí	a bird
e-gugu	cloud
e-seŋge	a fruit
e-somba	ritual
ɛ-gɛmbɛ	giant pangolin
ɛ-ɓɔ́kɔ́tí	generation

(40) Class 7 (proto-Bantu *ke̱-)

ke-aŋga	ritual maiden
ke-limelímé	blindness
ke-ɓúŋ̌áɓúŋ̌a	ritually unclean place
ke-seká	disgust
ke-kobá	bark
kɛ-ɔŋga	leg fetters
kɛ-n-kɛtɛ	ant species[30]

(41) Class 11 (proto-Bantu *do̱-)

o-kámé	dry season
o-kíi	childhood illness
o-ɓúo	golden cat
o-demaĵɔ	treachery
o-kombé	tom-tom drum
ɔ-gɔu	throat
ɔ-bɛ́a	torch

---

[30] This word has a double prefix.

(42) Class 17 (proto-Bantu *ko-?)[31]

ko-áɟá	cousinage
ko-níkí	childhood
ko-munamémá	fraternity
ko-bobo	foolishness
kɔ-bɔ́bɔkɔ	fear
kɔ-gbɛga	adulthood

I next continue with verbal prefixes. The same alternation that occurred above with noun prefixes occurs with respect to ATR in the following groups of examples.

(43) First person subject (ne-/nɛ-), perfective tense

ne-áŋgi	I protected.
ne-ɓimbíki	I swelled.
ne-ɓuŋgígi	I got lost.
ne-bómi	I insulted.
ne-ɗekéti	I left it.
nɛ-ɗɔtí	I am lame.
nɛ-ɓɛ́ti	I hit.

All the following subject prefixes can substitute for the prefixes in (43), making the relevant changes.

(44) Subject prefixes

person	singular	plural
1	ne-/nɛ-	ɓe-/ɓɛ-
2	o-/ɔ-	ɓo-/ɓɔ-

The present participle is formed by prefixing a mid back vowel.

---

[31] There is a prefix ko- in Komo that seems to correspond most closely to Bantu class 17 (*ko-). However, in most Bantu languages, ko- plays the semantic role of a locative whereas in Komo it seems to form abstractions. I therefore put a question mark after the class number in (42).

(45) Present participle formative

o-áŋga	protecting
o-ɓimbika	swelling
o-ɓuŋgaga	being lost
o-bóma	insulting
o-ɗeketa	leaving
ɔ-ɗɔta	limping
ɔ-ɓɛta	hitting

The object prefix is always concatenated immediately before the verb stem. In the following examples, I show the second person plural subject prefix concatenated with the first person singular object prefix. (Note that ATR harmony extends through both prefixes.)

(46) First person singular object prefix

ɓo-mo-áŋgi	You protected me.
ɓo-mo-imísi	You forbade me.
ɓo-mo-duŋgí	You seized me.
ɓo-mo-bebí	You praised me.
ɓo-mo-kokí	You bit me.
ɓɔ-mɔ-ɓɛti	You hit me.
ɓɔ-mɔ-gɔ́ti	You seized me.

The prefixes for the first person plural object and the second person singular and plural objects can be substituted in the place of the object prefix in (46) while varying the subject prefix between the first and second person to prevent subject and object from becoming coreferential.

(47) Object prefixes

singular	*plural*
1 mo-/mɔ-	só-/sɔ́-
2 ko-/kɔ-	nó-/nɔ́-

Finally, I present the reflexive prefix <u>e</u>-/<u>ɛ</u>- as it attaches to gerundive forms of verb stems.

(48) Reflexive prefix

é-kpatana	hang oneself
é-bimisa	approach oneself to
é-kumíá	cite oneself
é-bebá	praise oneself
é-dodéá	fix oneself in place
ɛ́-ɓɛta	hit oneself
ɛ́-sɔmɛ́á	hide oneself

My first observation about the data in the preceding groups of examples is that the ATR value of prefixes is completely predictable based upon the ATR value of the first root vowel. A root whose first vowel is either [+ATR] or an [a] has a [+ATR] prefix vowel. Otherwise, the prefix vowel is [−ATR]. This leads to the following generalization:

(49) Generalization about ATR in the lexicon

Only vowels of roots contain underlying specification for ATR.

My second observation is that prefixes before stems having [a] as a first vowel are unexpectedly [+ATR]. The default [−ATR] analysis makes wrong predictions no matter which way it is interpreted. There are four possible interpretations. (1) If [a] were lexically specified as [−ATR], then the prefix vowel would be expected to be [−ATR] as well. (2) If [a] were lexically unspecified for [ATR], then a prefix would be expected to turn out as [−ATR] by default. (3) If [a] were completely unspecified for features and the spreading rule were minimal (able to

jump over empty nuclei, when scanning for harmony targets), then a minimal spreading rule could be proposed to derive [+ATR] prefix vowels, as illustrated (50).

(50) A minimal spreading rule

```
    [–round]
       |
     V  C  V  C  e  →  e  C  V  C  e
                  |        └──────┬──────┘
               [+ATR]          [+ATR]
```
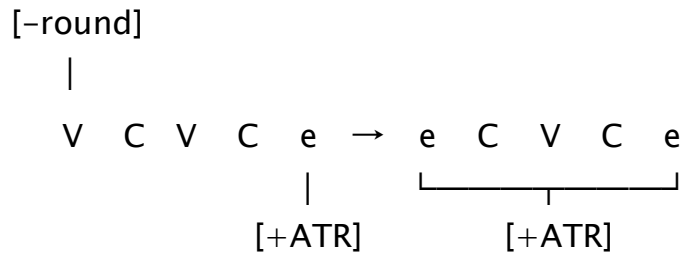
Even this interpretation does not work for roots having only lexically empty [a]'s like ékpatana 'to hang oneself'. Still worse for the default [–ATR] analysis with minimal spreading are words ending in [–ATR] vowels like moaŋgɔ 'program', where minimal spreading would then start from the final [ɔ] to yield *mɔaŋgɔ.

A fourth interpretation would be to lexically specify all mid–vowel prefixes as [+ATR], and to have a rule spreading [–ATR] from a [–ATR] root as illustrated in (52). Some sort of convention would delink the [+ATR] of the prefix vowel when [–ATR] spreads to it.

(51) Analysis with lexically [+ATR] prefixes

```
      V  ⎤⎤  C  a  C  a  →  V  | |  C  a  C  a
      |  ⎥⎥     └───┬───┘    |  | |     └─────┬─────┘
   [+ATR]⎥⎥      [–ATR]   [+ATR]⎥ |       [–ATR]
         ⎦⎦              ⎦ ⎣
```
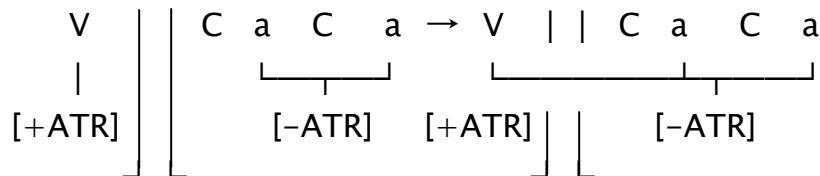
This leads to a deoptimalization; i.e., ATR would now be a lexical specification for prefixes in contrast to (49). The analysis would also then have both a [–ATR] spreading rule and a [–ATR] default rule. This

is undesirable, since the feature in the argument of a default rule should involve the opposite value of the feature in the argument of that feature's corresponding spreading rule.

The default [+ATR] analysis, on the other hand, correctly predicts the [ATR] value of a prefix before a stem whose first vowel does not participate in ATR, such as in a word like moaŋgɔ 'program'. It is [+ATR], which is derived simply by application of a [+ATR] default rule.

The preceding data also presents a further argument as to why [a] should be underlyingly unspecified for features. If [a] were lexically specified as [–ATR], then there should be spreading from an [a] in a root to a prefix. However, this evidently does not happen in forms like ékpatana/*ɛ́kpatana 'hang oneself'.

Even if [a] were lexically unspecified for ATR, but specified for something else, say [+low], it would be hard to see how redundant [–ATR] in a [+low] context would not apply, then spread to the prefix early in a derivation.

(52) [a] with a lexical specification of [+low]

```
   [+round] │ │[+low]       [+round] │ │[+low]
       │    │ │  ┌─┘             │    │ │ ┌──┘
      m V   │ │ a ŋg ɔ  →  m V   │ │ a  ŋg  ɔ
            │ │                  │ │ └────┬──┘
            ┘ └                  │ │   [–ATR]
                                 ┘ └
```

$$\begin{array}{ccccc} & \text{[+round]} & & \text{[+low]} & \\ & | & & \ulcorner\urcorner & \\ \rightarrow \text{*m} & \text{ɔ} & & \text{a} \quad \text{ŋg} \quad \text{ɔ} \\ & \llcorner & \perp & & \text{[−ATR]} \end{array}$$
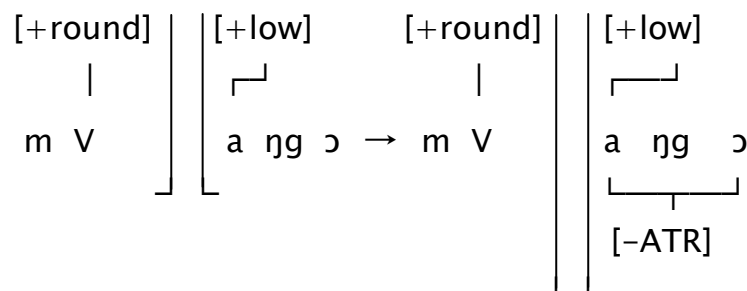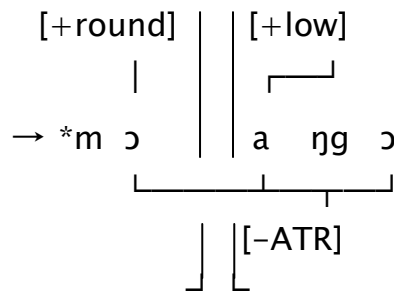
On the other hand, under the analysis I am proposing, [a] has no lexical vowel quality, and thus cannot participate in ATR harmony. The prefix vowel correctly becomes [+ATR] by default.

I now state the rules that account for the above data using the default [+ATR] analysis. First, I formalize the default [+ATR] analysis with a rule, leaving out default parameters.

(53) Default ATR

II. [+ATR]

Using transformational notation, this might be stated as:

∅ → [+ATR] / (free ATR-bearing target)

Chart (53) above states that [+ATR] quality is inserted wherever there is a free target. To illustrate:

(54) Graphic representation of (53)

```
V      →      V                          by rule (53)³²
              |
           [+ATR]
```

I now formalize the rule of ATR harmony. A rule of ATR harmony inserts lines of association from a [–ATR] feature, which is dominated by a vowel onto a vowel that is free of association with [ATR]. Since structure is being added, one of the switches of the rule is then 'I.c. structure'.

(55) ATR harmony (preliminary)

   I. c. structure
  II. [–ATR]
 III. [αround]

The [αround] in part III of the rule merely states that the rhyme node triggering the rule must be linked to some value of [round]: it cannot be underlyingly unspecified for features.

(56) Graphic description of (55b)

```
   °         ° rhyme node    → °   °
   :         :                 :   :
   °         ° place node      °   °
   °         ° s-place node    °   °
   |         |                  \ /
[αround]  [–ATR]              [–ATR]
```

---
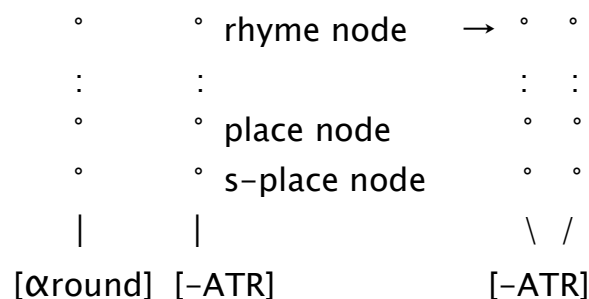
³² The line of association is inserted automatically, since the rule is maximal. See the discussion of this parameter on page 52.

The question arises, why the target specification of a '[αround]' in part III of the rule? The problem is that it would be undesirable for [–ATR] to spread to an empty nucleus (i.e., an [a]) at this point. Otherwise, it could continue to spread to a prefix in a word like moaŋgɔ 'program', which would yield *mɔaŋgɔ.

(57) The need for [αround] in (55)

```
    V    V    C   ɔ        →
    :         :
    °         °                    s-place node

    |         ┌───┴──────┐
 [+round] [–ATR]  [+round]
```

```
    V    a    C   ɔ        →
    :    :        :
    °    °        °

              └────┬───┘
               [–ATR]
```

```
  *ɔ    a    C   ɔ
    :    :        :
    °    °        °

         └───┬────┘
          [–ATR]
```
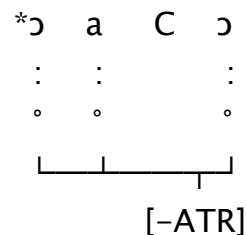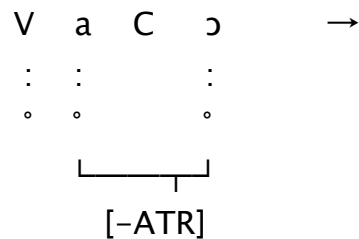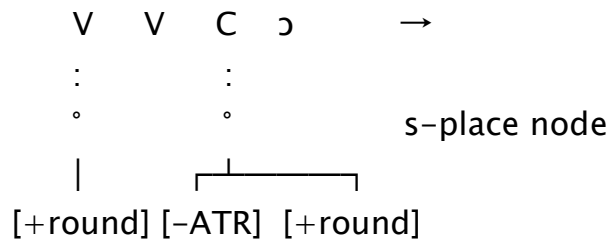
On the other hand, the skeletal position for an [a] in the proposed analysis, having no quality, does not dominate an s–place node and cannot be a host to ATR harmony. An [a], however, can block harmony because the rule is maximal (by default) and must scan rhyme nodes. An [a] consists of exactly that: an empty rhyme node.

Another objection is that [a] should surface as a [-ATR] vowel and therefore spread [-ATR]. [-ATR] is indeed assigned to [a], only it is assigned post-lexically in the framework under consideration. Its eventual articulation is simply not relevant at the lexical stage of derivation.

4.1.2 The applicative suffix

Until this point, I have examined the behavior of ATR with respect to prefixes. Now I examine a (usually) mid-vowel suffix and its behavior with respect to ATR. This leads me to a small modification of the rule of ATR harmony.

For the non-Bantuist reader, I first note that Bantu verb stems are traditionally said to consist of three parts, a CVC root, a group of derivational suffixes of the form -V or -VC, and a final aspectual vowel.

The applicative suffix is a front mid vowel whose ATR value may vary based upon the ATR value of the verb root.[33] In the following examples, the ATR value of the applicative is totally dependent upon the lexical ATR specification of the root. A root with a low vowel does not seem to have any effect upon the ATR value of the applicative. In fact, the paradigm for the applicative is similar at this point to that of a mid-vowel prefix.

---

[33] Grammatically, the applicative suffix indicates the presence of an oblique object.

(58) Applicative suffix (–e̱/–ɛ̱)[34]

base form	gloss	with applicative	gloss
bɛɗá	take	bɛɗ–ɛ́–á	work with
ɓɛ́tá	hit	ɓɛ́t–ɛ́–á	cinch up
táŋgá	read	táŋg–é–á	read to
bómá	insult	bóm–é–á	accuse
bebá	praise	beb–é–á	praise for

Here, ATR here seems to spread from left to right. Hence, I propose that the directionality parameter for ATR be specified as bidirectional, and restate the rule of ATR harmony as follows:

(59) ATR harmony (finalized)

    I. c. structure
       d. bidirectional
    II. [–ATR]
    III. [αround]

Now in the proposed feature organization for Komo vowels (35), a front vowel is specified as [–round]. Thus, I lexically specify the applicative suffix as a [–round] vowel. Post–lexical default and redundancy rules that are sensitive to the existence of a [round] context (i.e., any specification of [round]) would later derive a front mid vowel:

(60) Redundant [low] (context = [round])[35]

    II. [–low]
    III. [αround]

---

[34] I postpone the treatment of stems with [i] or [u] for didactic purposes, since high–vowel stems trigger vowel height harmony.

[35] In the absence of a specification of [round], a default [low] rule would presumably apply under this system, deriving an [a].

(61) Default [high]

      II. [–high]

In prose, the feature [–low] is added by a redundancy rule to a vowel specified for some value of [round]; [–high] is added to a vowel not previously specified for [high].

      In the derivation that follows, I assume that the final vowel in a verb stem at whatever stage of derivation is extraharmonic, and not subject to harmony rules (but subject to the UAC).

(62) Derivation of b̪ɛ́ɗɛ́á 'work with', ignoring tone[36]

$$\begin{bmatrix} b\varepsilon\text{ɗ} \\ \backslash \\ [-\text{ATR}] \end{bmatrix} \qquad \text{root}$$

$$\begin{bmatrix} \begin{bmatrix} b\varepsilon\text{ɗ} \\ \backslash \\ [-\text{ATR}] \end{bmatrix} & \begin{bmatrix} \text{V} \\ \\ [-\text{rou}] \end{bmatrix} \end{bmatrix} \qquad \begin{array}{l} \text{concatenation of the} \\ \quad \text{applicative} \end{array}$$

---

[36] Henceforth in derivations, the V's mark lexically unspecified skeletal vowel slots.

$$\left[\left[\begin{array}{c} b\epsilon\text{ɗ} \\ \backslash \\ [-ATR] \end{array}\right]\left[\begin{array}{c} V \\ | \\ [-rou] \end{array}\right]\right] \qquad \text{UAC}$$
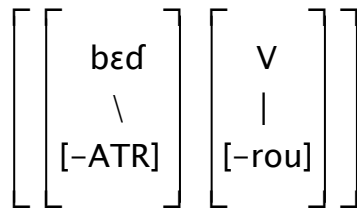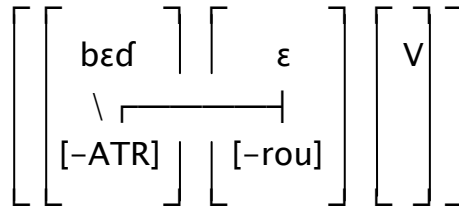
$$\left[\left[\left[\begin{array}{c} b\epsilon\text{ɗ} \\ \backslash \\ [-ATR] \end{array}\right]\left[\begin{array}{c} \epsilon \\ \\ [-rou] \end{array}\right]\right]\left[V\right]\right]$$
concatenation of the aspectual vowel, ATR harmony[37]

[bɛɗɛa]
BE, default and redundancy rules (to derive an [a]), and surface realization

It is possible to collocate the reciprocal suffix, which surfaces as –<u>an</u>, before the applicative suffix. In this case, the applicative is always –<u>e</u>. In the following examples, the roots, except for the third line, are the same as in (58):

---

[37] Despite appearances, extraharmonicity does not apply. Rather, spreading applies only to non-low vowels.

(63) Reciprocal in collocation with the applicative, using the roots of
(58)[38]

bɛɗ-án-é-á   'work for' (cf. bɛɗá 'to take')
ɓɛt-án-é-á   'research' (cf. ɓɛtá 'to hit')
ɔ́k-án-é-á   'wait' (cf. ɔ́ká 'to listen')
táŋg-án-é-á   (cf. táŋgá 'to count')
bóm-án-é-á   (cf. bómá 'to split')
beb-án-é-á   (cf. bebá 'praise')

Apparently, ATR harmony in the above examples is blocked for the same reason as it is with prefixes and subject clitics: low vowels neither trigger nor spread ATR harmony. Formally, they are underlyingly unspecified for features, contain no s-place nodes, and thus are not targets of (59).[39]

In the following derivation, the reciprocal is first concatenated, and the root vowel is specified as [-ATR]. The final stem vowel is blocked from ATR spread by the intervening non-participating low vowel.

---

[38] Such collocations are somewhat unusual. As a result, for the roots táŋgá and bómá, I had to play a language game by asking what these forms would look like were one to add the reciprocal and applicative suffixes.

[39] I here note that a default [-ATR] analysis would be made problematic by the applicative suffix collocation data. Under such an analysis, *bɛɗanɛa would be the result of the following derivation. One possible solution would be to posit that the suffix is underlyingly [+ATR]. This would complicate the lexicon and lose a possible extension of generalization (49); viz., that affixes are unspecified for ATR to suffixes, not just prefixes. It would also have to complicate the rule of ATR harmony in the case of bɛɗɛá: an additional rule or convention that deletes the lexical [+ATR] of the applicative would be needed.

(64) Derivation of <u>bɛ́ɗánéá</u> 'work for'

$$\begin{bmatrix} b\varepsilon \\ \backslash \\ [-ATR] \end{bmatrix}$$ root

$$\begin{bmatrix} \begin{bmatrix} b\varepsilon\text{ɗ} \\ \backslash \\ [-ATR] \end{bmatrix} & \begin{bmatrix} Vn \end{bmatrix} \end{bmatrix}$$ concatenation of the reciprocal

$$\begin{bmatrix} \begin{bmatrix} b\varepsilon\text{ɗ} \\ \backslash \\ [-ATR] \end{bmatrix} & \begin{bmatrix} Vn \end{bmatrix} & \begin{bmatrix} V \\ | \\ [-rou] \end{bmatrix} \end{bmatrix}$$ concatenation of applicative ATR spreading blocked by V of reciprocal

$$\begin{bmatrix} \begin{bmatrix} b\varepsilon\text{ɗ} \\ \backslash \\ [-ATR] \end{bmatrix} & \begin{bmatrix} Vn \end{bmatrix} & \begin{bmatrix} V \\ | \\ [-rou] \end{bmatrix} & \begin{bmatrix} V \end{bmatrix} \end{bmatrix}$$ concatenation of aspectual vowel

[bɛɗanea]   BE, redundancy rules, and output

4.2 Vowel Height Harmony

Vowel height harmony only operates in Komo with regard to the applicative suffix, which is the only mid vowel suffix. For example <u>biká</u> 'come' is a non-applicative stem, and <u>bik-í-á</u> means 'come for someone'.

The applicative vowel is a min vowel if the root vowel is a low or mid vowel, as chown below. In the examples that follow (and in all subsequent examples of stems incorporating the applicative suffix) only the gloss of the bare stem is included. This is because more than one sort of oblique object may be registered by the presence of the applicative suffix.

(65) Applicative affixes (citation forms of the stems)

bare stem	*applicative stem*	*gloss of bare stem*
éá	ééá	eat
geá	geéá	say,do
ɓɛ́tá	ɓɛ́tɛ́á	hit
bɛda	bɛ́dɛ́á	take
ɓátá	ɓátéá	curl
mámá	máméá	stand
ɓɔ́ŋgá	ɓɔ́ŋɛ́á	attract
ɓɔ́mbá	ɓɔ́mbɛ́á	flee
ɓóá	ɓóéá	tie
ɓotá	ɓotéá	pull

If the root vowel is a high vowel, then the applicative is an [i].

(66) Applicative with high root vowel (same column headings as in (65)

biká	bikíá	come
tiɓá	tiɓíá	push
gbúká	gbúkíá	fold
múmá	múmíá	suck

These facts can be captured with a rule of vowel height harmony. The rule would insert a line of association from a previously linked [high]. However, unlike ATR harmony, height harmony is not bidirectional. Otherwise, prefixes would be subject to height harmony, which they are not as is clear from examining the groups of examples beginning on page 53. I further assume that the directionality parameter for default [high] has the same direction as this rule (left to right), so that it is unmarked (i.e., as *same direction*).

(67) Vowel height harmony. Domain: before TAM determination[40]

    I. c. structure
   II. [+high]
  III. [αround]

(See the second and third lines of the derivation for a graphic example of how the rule operates.)

In prose, structure is inserted from the feature [−high] rightward onto a vowel bearing a lexical specification for [round]. Such a rule is not triggered by an [a], because it has no lexical specification for [round].

(68) Derivation of 'come for someone'

  [bik]   root
    |
  [+high]

---

[40] See the fourth line of the derivation for justification of limiting the domain to before TAM determination: otherwise vowel height harmony could spread to the final [a] of the gerund.

```
     [[bik][V]]                          concatenation of applicative
       |    \
     [+high][−rou]


     [[bik]    [i]]                      vowel height harmony (67)
        └──┬──┘
         [+high]


     [[bik]   [i][a]]                    concatenation of gerund ending
        └──┬──┘
         [+high]


     [bikia]                             bracket erasure and output
```

The spreading of [+high] to the applicative suffix provides an additional argument that [+high] is lexically specified and that [−high] is the default feature. This argument is parallel to the one that [+ATR] is default and the spreading feature [−ATR] is lexically specified.

That is, consider an alternative analysis in which [+high] is the default value of [high], and [−high] spreads. The main objection to such an analysis hinges on applicative suffixes having [a]'s (which are underlyingly unspecified for features in this analysis) on each side. In such cases, the applicative is −e, as in máméá 'stand:appl' and gbúkanéá 'fold:recip:appl'. Under the alternative analysis, default [+high] would apply to the suffix in such forms, yielding *mamíá and *gbúkáníá.

A rescue allowing [−high] to spread minimally across an unspecified vowel (similar to a rescue for the default [−ATR] analysis), doesn't work either: máméa has no lexical specification for [high] on any root vowel and gbúkánéa contains a vowel which is specified

lexically as [+high], yet [−high] surfaces on the applicative in both cases.

Thus, only default [−high] is consistent with the facts.

4.3 Summary

I summarize the claims of this chapter as follows:

First, Komo [a] is a lexically unspecified vowel and is, in the framework, an empty rhyme. It participates neither in ATR harmony, nor in vowel height harmony.

Second, in Komo, [−ATR] is the dominant (spreading) feature, as evidenced by the behavior of affixes when an adjacent vowel from which harmony would expect to be triggered is an [a], which in turn is neutral and opaque to harmony. [+ATR] is the default value for this feature.

Third, the applicative's only lexical feature content is [−round]. Its height and ATR content are determined by harmony and default rules.

Fourth, [+high] is dominant, as evidenced by the behavior of the applicative suffix.

5. TENSE-ASPECT-MOOD MORPHOLOGY

In this chapter I first provide additional evidence in support of the lexical representation of Komo vowels made in (35). This will then tie directly into a discussion on the behavior of verb stems with respect to tense-aspect-mood marking. The evidence will come from further examination of the behavior of the third person plural object prefix.

I will then describe the tense-aspect morphemes, and seek to optimalize their lexical content.

5.1 The third person plural object prefix

The third person plural object prefix displays a wide degree of alternation. In the following paradigm, the third person plural object prefix consists solely of a high tone overlaying the subject prefix. In the examples, hyphens separate the subject/object prefix from the stem.

(69) First and second person subject prefixes with third person plural
object tone marks

[–ATR] root:

singular subject   *plural subject*

ɓɛ́tá 'to hit'

nɛ–ɓɛ́ti	ɓɛ–ɓɛ́ti
1s–hit:pf	1p–hit:pf
'I hit it.'	'We hit it.'
nɛ̌–ɓɛ́ti	ɓɛ̌–ɓɛ́ti
1s:3p–hit:pf	1p:3p–hit:pf
'I hit them.'	'We hit them.'
ɔ́–ɓɛ́ti	ɓɔ́–ɓɛ́ti
2s:3p–hit:pf	2p:3p–hit:pf
'2s hit them.'	'2p hit them.'

[+ATR] root:

ɓŏtá 'to pull'

ne–ɓŏti	ɓe–ɓŏti
1s–pull:pf	1s–pull:pf
'I pulled it.'	'We pulled it.'
ně–ɓŏti	ɓě–ɓŏti
1s:3p–pull:pf	1s:3p–pull:pf
'I pulled them.'	'We pulled them.'
ŏ–ɓŏti	ɓŏ–ɓŏti
2s:3p–pull:pf	2p:3p–pull:pf
'2s pulled them.'	'2p pulled them.'

Thus far, one can safely conclude that the third person plural object includes a high tone. In the next examples, I show an additional property about the third person subject prefixes. These prefixes normally have the low vowel, [a]. And upon conflation of the third person plural object morpheme, an [e] surfaces in place of the [a].

The following examples show the third person subject prefixes in the presence of both third person singular and plural object prefixes.

(70) Third person object prefixes (same roots as in as in the preceding table)

<u>3s subject prefix with</u>

3s object prefix

3p object prefix

a–m–ɓɛ́ti
3s–3s–hit:pf

ɛ̌–ɓɛ́ti
3s:3p–hit:pf

'He/she hit him/her.'

'He/she hit them.'

a–m–ɓǒti
3s–3s–pull:pf

ɛ̌–ɓǒti
3s:3p–pull:pf

'He/she pulled him/her.'

'He/she pulled them.'

<u>3p subject prefix with</u>:

3s object prefix	3p object prefix
ɓá-m-ɓɛ́ti	ɓɛ́-ɓɛ́ti
3p-3s-hit:pf	3p:3p-hit:pf
'They hit him/her.'	'They hit those others.'
ɓá-m-ɓŏti	ɓé-ɓŏti
3p-3s-pull:pf	3p:3p-pull:pf
'They pulled him/her.'	'They pulled those others.'

If the low vowel is completely unspecified in the lexicon, it is easy to write the vocalic part of the lexical entry for the third person plural object. It consists of the feature [–round]. When inserting this feature onto the lexically unspecified [a], one gets an [e] by UAC and the node generation convention (Archangeli and Pulleyblank 1986:75):

(71) Node generation

A rule or convention assigning some feature or node A to some node B creates a path from A to B.

(72) Conflation of [–round] to an [a]

```
    V                →                [e]  (after redundancy
    °          rhyme node             °      rules apply)
    °          macro node             °
                                      :
               place node            °
               s-place node          °
[-round]                                     [-round]
```

When conflating the third person plural object with a second person (i.e., [+round]) subject prefix (such as singular o̱– or plural 6o̱–) there is a lexical specification for [round] already present. Since there is no provision made in the analysis to link the [–round] of the third person plural object prefix to a linked target, it remains unlinked and has no surface realization.

(73) Second person subject plus third person plural object

```
    V      →         V                    → [o]
    |                |
 [+round]        [+round]  [-round]

 [subject]       [subject]  [object]           (output)
```
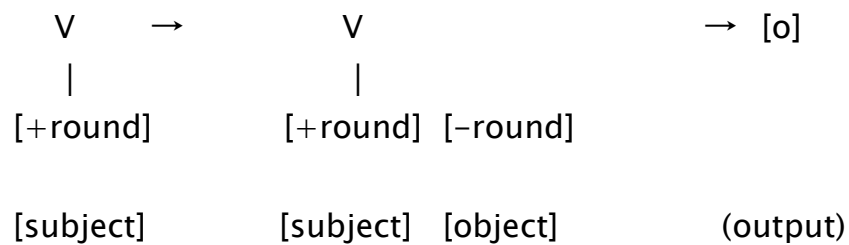
(Note that I ignore tone in the derivations of (74) for expository purposes. In addition, I abbreviate [ATR] as [A].)

(74) Derivations (non-tonal part)
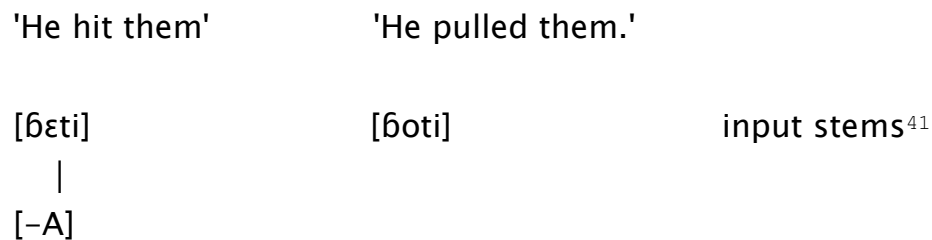
'He hit them'   'He pulled them.'

```
[ɓɛti]               [ɓoti]               input stems[41]
  |
[-A]
```

```
[[V][ɓɛti]]              [[V][ɓoti]]              concatenate 3s
     |                                                subject
   [−A]
```

```
[[V][ɓɛti]]              [[V][ɓoti]]              concatenate 3p
   └┐  |                    └┐                        object
    |[−A]
[−rou]                   [−rou]
```

```
[[ɛ][ɓɛti]]              ----------               [ATR] harmony,
  |\  |                                              redundancy rules
  └┐ [−A]
[−rou]
```

```
--------                 [[e] [ɓoti]]             default [+ATR],
                           |\  |                     redundancy rules
                           └┐ [+A]
                         [−rou]
```

```
[ɛɓɛti]                  [eɓoti]                  bracket erasure,
                                                     output
```

The data on the third person plural object prefix confirms the analysis of [a] as being underlyingly unspecified. Positing the third person subject prefixes to be lexically [+low], for example, would necessitate a feature changing rule to make them [−low] in the context of the third person plural morpheme. No rule is needed at all in the analysis of [a] as being underlyingly unspecified: the UAC, together with a set of redundancy rules, handle all occurances.

5.2 Tense-aspect-mood suffixes

In this section I formalize the shape of the three TAM markers for Komo, namely, the perfective, imperfective, and subjunctive. In the process, I provide additional motivation for the lexical characterization of Komo vowels presented in (35).

5.2.1 Perfective and imperfective

I here make comparisons between perfective and imperfective stems, ignoring prefix morphology and tone.

In the majority of verbs, the final syllable of the imperfective ends in a single low vowel and its corresponding perfective ends in an [i]. I call this stem class 1a.

(75) Stem class 1a (most common of all stem classes)[42]

gloss	imperfective stem	perfective stem
throw	máka	mákí
fight	mána	mání
pound	goga	gogí

In stem class 1b, the imperfective ends in a low vowel, the perfective with an [e]. With the exception of the reduplicated stem for 'stop', these stems are monosyllabic.

---

[42] I present the stems here in a declarative-final context, which is what one would most likely obtain during a typical elicitation session. In other contexts, there would be left-to-right high tone spreading, and so a final high tone. For more on this, see Thomas (1992).

(76) Stem class 1b (same column headings as (75) here and below.[43]

go	ga	gě
carve	kpá	kpé
hunt	tá	té
stand	ma	mě
stop	mama	mamé

Stem class 2a has a final vowel complex with two vowels in the imperfective, but only one vowel in the perfective.

(77) Stem class 2a

swallow	mia	mǐ
enter	ŋgía	ŋgí
write	ɗundua	ɗundú
roll	kéndúá	kéndú

Stem class 2b is like stem class 2a except that in the imperfective, the penultimate vowel is a mid vowel.

(78) Stem class 2b

eat	éa	í
flee	téa	tí
say	gea	gǐ
hide	sɔmɛa	sɔmí
thatch	bɔbɔtɛa	bɔbɔ́tí
bite	tóa	tú
drink	nóa	nú
choose	sɔmbɔa	sɔmbú
hold self erect	ɓɔɔa	ɓɔú

Stem class 3a has a CVV or a CVVV pattern for both the perfective and the imperfective.

---

[43] For an analysis of tonal alternations, see Thomas (1992).

(79) Stem class 3a

lick	ɗía	ɗíi
push over	kpúa	kpúi
hunt	gbúa	gbúi
leave	meá	meí
move	tóa	tói
be long	kóa	kói
cough	kɔ́a	kɔ́i
blaze trail	kɔɔa	kɔɔ́i
side a house	ɓáa	ɓái

Stem class 3b has a CVV pattern like 3a except that both final vowels are mid vowels.

(80) Stem class 3b

tie	ɓóa	ɓó or ɓóe
trap	góa	gó or góe

The stem class data present a rather complicated set of facts that I shall analyze by means of optimizing the lexical specification of each stem class. I first look at stem class 1a. The great majority of Komo verbs have this form.

To account for this phenomenon, I make two proposals. First, I propose that most roots take the form CV or CVCV, where for class 1a, the final vowel is unspecified. Second, I propose that the imperfective morpheme has no vowel or consonant feature content, nor (usually) skeletal content.[44] Thus, the default rules derive an [a]. However, an alternative analysis, where the root takes the form CVC and tense–aspect–mood morphemes include a V, will be examined at the end of the next chapter once the present analysis is fully developed.

---

[44] It does, however, have tonal content: it consists of a low tone (Thomas 1992).

The sign of the perfective in class 1a is a final [i]. I therefore propose that the perfective consists of the features [+high] and [–round] without any skeletal content. For the sake of clarity, I leave tone out of the derivation of a class 1a stem (81) and through the rest of this section.

(81) Derivation of class 1a, imperfective and perfective

```
gogV                    gogV                    input
                        / \
                     [+high][–rou]


goga                    gogi                    UAC, default and
                        / \                        redundancy rules
                     [+high][–rou]
```

In stem class 1b the skeleton is the same as that of class 1a. The imperfective behaves in the same way as it does in stem class 1a. The perfective, however, ends in an [e]. I account for this by lexically specifying the vowel of the root as a [–high] vowel.[45] A sample derivation is in (82).

---

[45] I can refer to 'the vowel of the root,' because all of the roots in the class are monosyllabic except one, which is reduplicated (mǎ 'stand' vis-a-vis mamá 'stop').

(82) Derivation of class 1b, imperfective and perfective for 'go'

```
    gV                    gV              input
    |                     |
 [-high]               [-high]


                       [-rou]

 -------                gV              TAM
                        |
                     [-high][+high]


                       [-rou]
                        |
    ga                  ge              UAC, default and
                        |                  redundancy rules
                     [-high][+high]


    ga                  ge              output
```
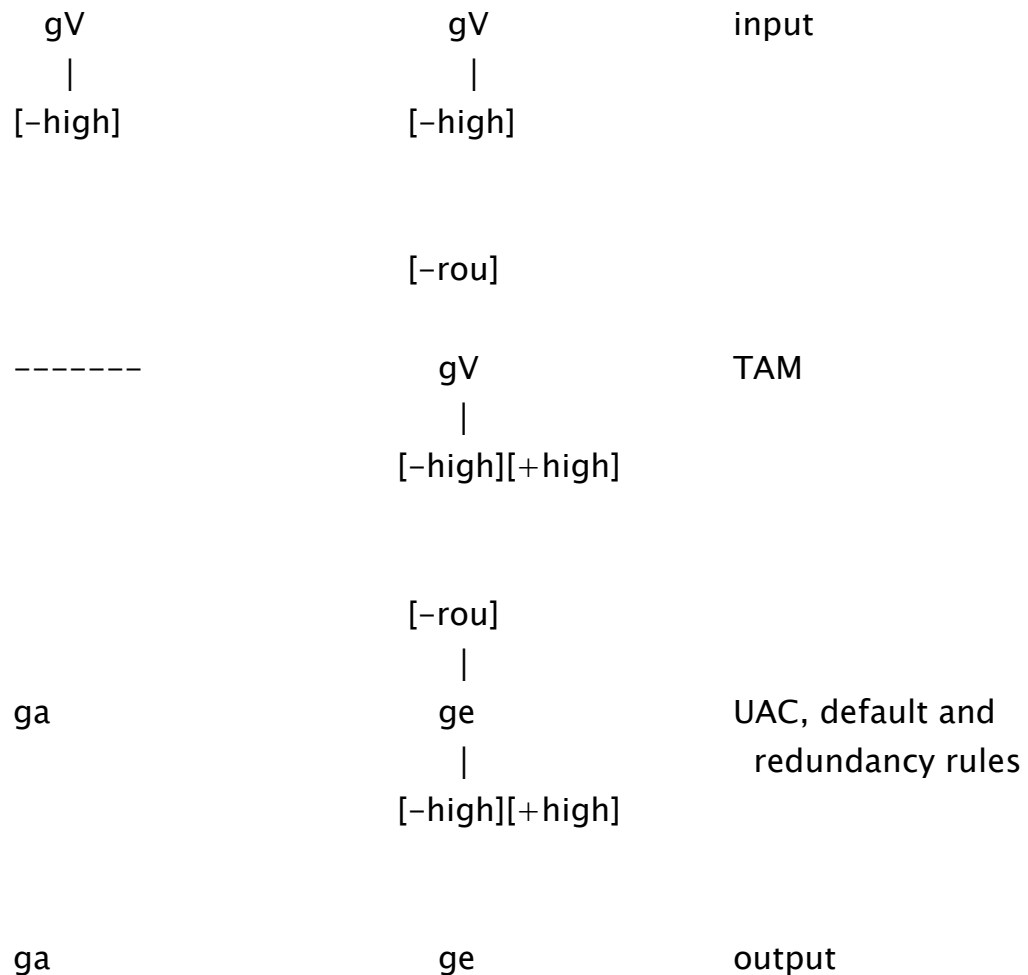
In class 2, the root lexically takes the form CV or CVCV. The specification of the final vowel is either [+high] for class 2a or [αround] for class 2b. In this way, a single mid or high vowel obtains with both classes for the perfective, but a high- or mid-vowel-[a] combination surfaces with class 2b for the imperfective. This necessitates an allomorph of the imperfective, consisting of a V.

(83) Imperfective, non-tonal part

Imperfective: V, stem class 2.

That is, in the imperfective, a vowel is inserted after a vowel that is specified for round. After (23) applies, redundancy rules then fill in an [a] for the final vowel.

(84) Derivation of 'swallow:impf/pf', stem class 2a

Imperfective	Perfective	
mV	mV	input
|	|	
[+high]	[+high]	
-------	mV	TAM
	|	
	[+high][+high]	
mVV	-------------	rhyme insertion
|		
[+high]		
mia	mi	OCP, default and
|	|	redundancy rules[46]
[+high]	[+high]	
mia	mi	output

---

[46] Practically speaking, the OCP 'Obligatory Contour Principle' deletes a second adjacent occurrence of the same feature, such as [+high] in the derivation.

(85) Derivation of 'eat:impf/pf', stem class 2b

```
      [-rou]                [-rou]              input
        |                     |
        V                     V




     ------               [-rou][-rou]          TAM
                              |
                              V

                           [+high]




     ------                [-rou]              UAC, OCP
                              |
                              V
                              |
                           [+high]




     [-rou]                -------             imperfective
        |
       VV




       ea                    i                default, redundancy
                                                rules, output
```
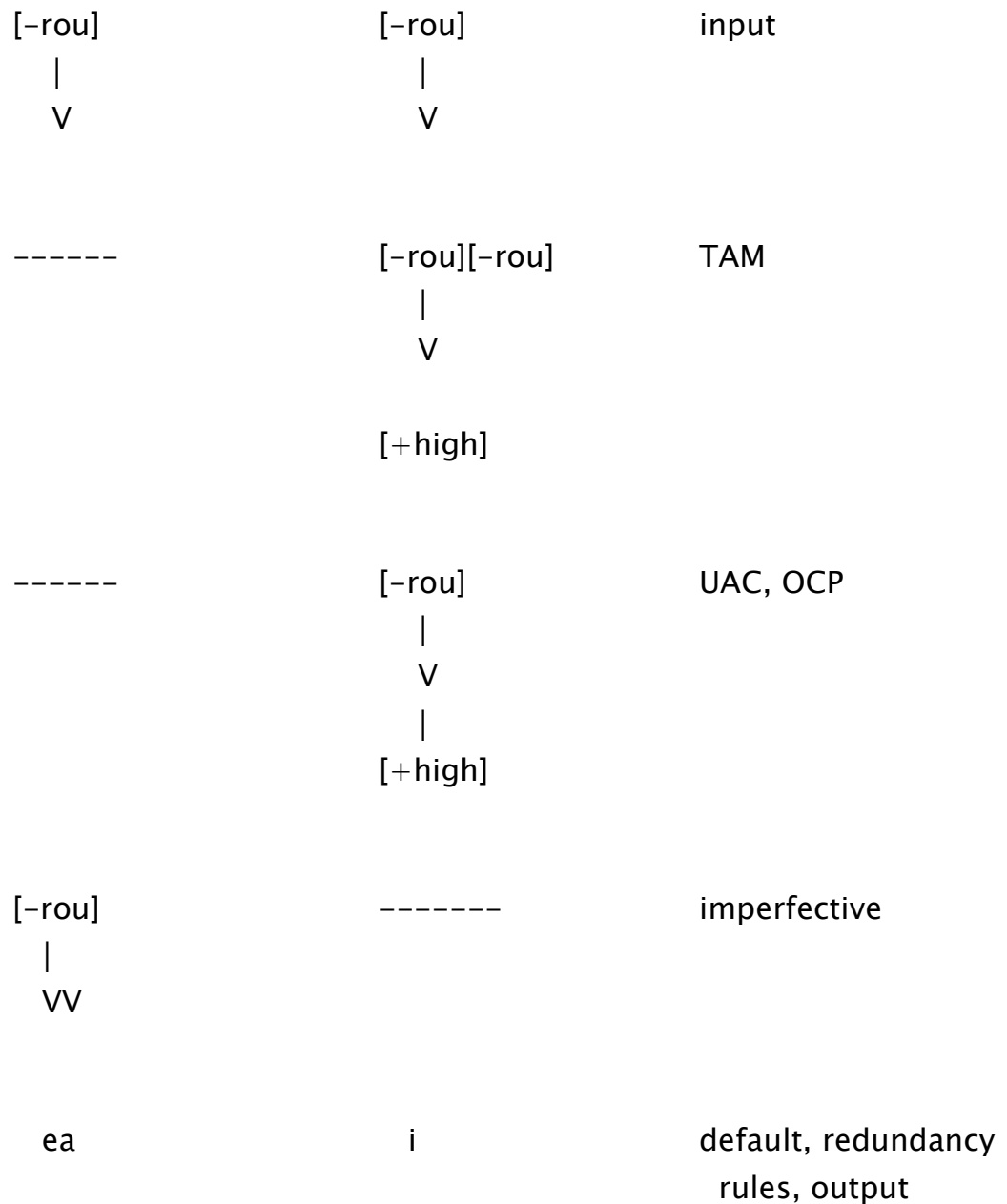
In class 3, the stem lexically takes the form CVV, where the last vowel is completely unspecified for lowness and backness. Thus, redundancy rules derive an [a] in the imperfective. In the perfective, stem classes 3a and 3b differ in that the final vowel in stem class 3b is

optionally articulated and lexically linked to [–high] in a manner similar to class 1b. Thus, if the second vowel is articulated, it is realized in the perfective as an [e]. If not, the stem has only one vowel, an [o]. Stem class 3b is only attested by the two examples cited.

(86) Derivation of 'push over:impf/pf'

```
    [+round]              [+round]                input
       |                     |
     kpVV                  kpVV
       |                     |
    [+high]               [+high]



  --------              [+round][-round]        TAM
                             |
                           kpVV
                             |
                        [+high][+high]



                         [+round][-round]       UAC, OCP, output
                           | ┌───────┘
                           kpui
                           └┘
                         [+high]
```
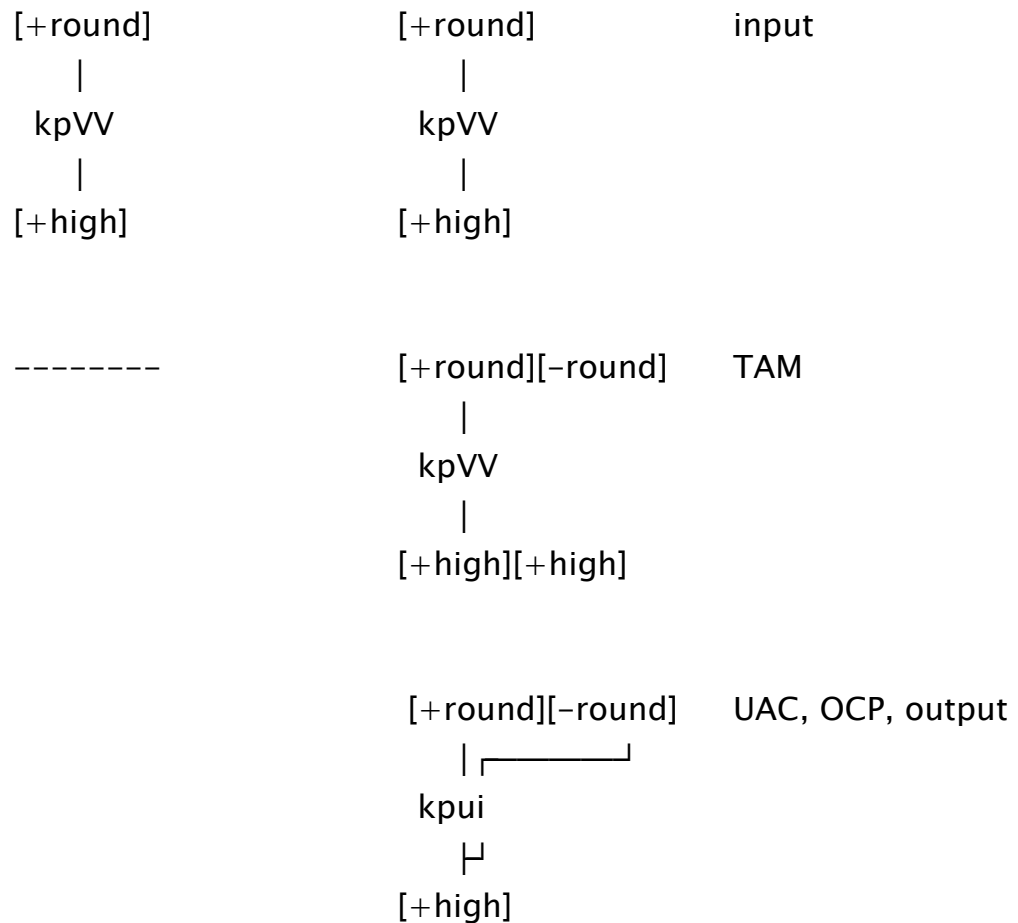
(87) Derivation of 'tie:impf/pf' (class 3b)

```
[+round]              [+round]
   |                     |
  ɓVV                   ɓVV                input
   ⊔                     ⊔
[–high]              [–high]


––––––––              [+round][–round]
                            |
                          ɓVV               TAM
                           ⊔
                      [–high][+high]


[+round]              [+round][–round]
   |                     | ┌────────┐
  ɓoa                   ɓoe              UAC, default and
   ⊔                     ⊔                  redundancy
[–high]              [–high][+high]        rules, output
```
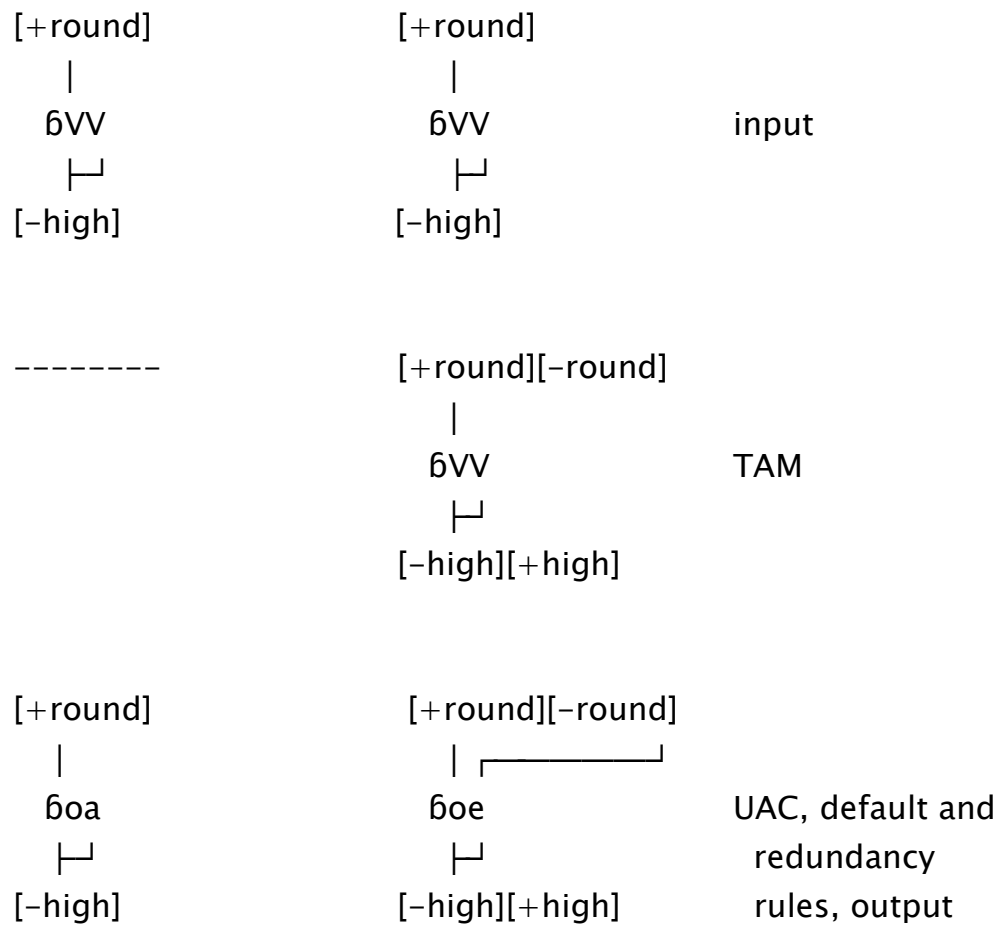
I summarize the above discussion on stem classes, imperfective and perfective as follows:

(88) Stem classes, perfective and imperfective morphemes, not
      including tone

    imperfective: skeleton: null or V; feature: null

    perfective: skeleton: null; feature: [+high]

    stem class 1a root: CV or CVCV

    stem class 1b root: CV   (reduplication possible in
                           | one case)
                    [–high]

    stem class 2a root: CV or CVCV
                       | |
                 [+high]   [+high]

    stem class 2b root: CV   or CVCV
                       | |
                 [–low]   [–low]

    stem class 3a root: CVV

    stem class 3b root: Co(V)
                      ⊢⌐
                 [–high]

To summarize, stem class 2 is distinguished from stem class 1 because its final vowel is lexically non-low. The allomorph of (83) is operative for the stem class, yielding an imperfective stem ending in CVV. In addition, stem class 3 is distinguished from stem class 1 because it is *lexically* CVV.

Thus, a relatively complex alternation in imperfective and perfective endings can be accounted for by optimizing the lexical content of each morpheme and by the use of straightforward default and redundancy rules.

5.2.2 Subjunctive

There remains one other TAM morpheme acting on the final vowel of the root, which I call the subjunctive. In all subjunctive forms, the final vowel is [ɛ]. Examples are in (89).

Excluding tonal alternations, the subjunctive is almost identical in behavior to the imperfective, except for the shape of the vowel. Therefore, I understand the subjunctive to consist of the features [−ATR, −round] .And as with the imperfective, I understand the subjunctive to include a V allomorph for stem class 2 similar to (83). The result is what we see in (91) below.

(89) Subjunctive stems

stem	imperfective stem	subjunctive
stem class 1		
throw	máka	mákɛ́
fight	mána	mánɛ́
pound	goga	gogɛ́
go	ga	gɛ̌
carve	kpá	kpɛ́
hunt	tá	tɛ́
stop	mama	mamɛ́

stem class 2

swallow	mia	miɛ́
enter	ŋgía	ŋgíɛ́
write	ɗundua	ɗundúɛ́
fall	gua	gúɛ́
roll	kéndua	kéndúɛ́
eat	éa	éɛ́
flee	téa	téɛ́
say	gea	geɛ́
hide	sɔmɛa	sɔmɛ́
thatch	bɔbɔtɛa	bɔbɔ́tɛ́
bite	tóa	tóɛ́
drink	nóa	nóɛ́
choose	sɔmbɔa	sɔmbɔ́ɛ́
hold self erect	ɓɔɔa	ɓɔɔ́ɛ́

stem class 3

lick	ɗía	ɗíɛ́
overburden	ǰía	ǰíɛ́
push over	kpúa	kpúɛ́
hunt	gbúa	gbúɛ́
leave	mea	meɛ́
move	tóa	tóɛ́
be long	kóa	kóɛ́
cough	kɔ́a	kɔ́ɛ́
blaze trail	kɔɔa	kɔɔ́ɛ́
side a house	ɓaa	ɓáɛ́
tie	ɓóa	ɓóɛ́
trap	góa	góɛ́

(90) Subjunctive

Subjunctive: A. [–ATR, –round]

B. V, stem class 2 if the final vowel
of the stem is not an [ɛ].

If the final vowel of the stem is unspecified, as in stem class 1 and 3, then the features of an [ɛ] are inserted directly onto that vowel.
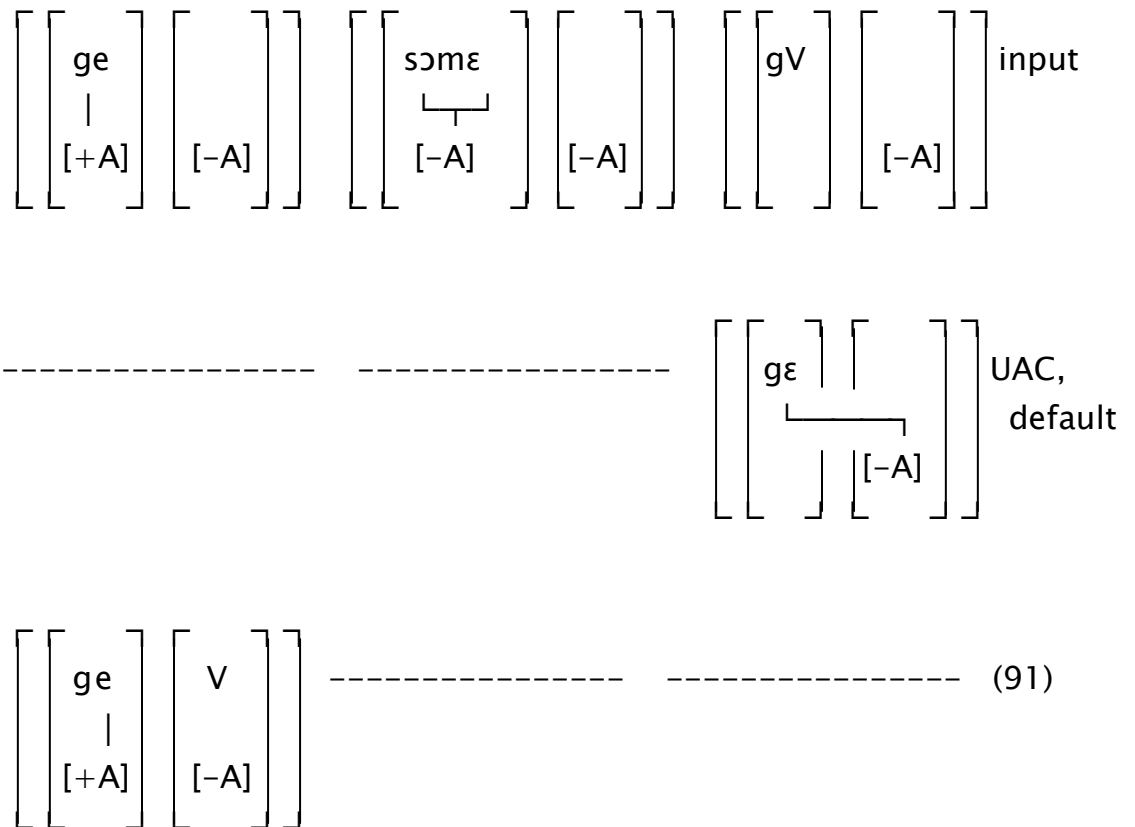
If the final vowel of the stem is of stem class 2, then the V allomorph of (91) is inserted. If, on the other hand, that vowel is already an [ɛ], then another [ɛ] cannot be added, as in the case of sɔmɛ́/*sɔmɛ́ɛ́ 'hide:subjunctive': the trigger condition for the allomorph in (91) is not met.

(91) Partial derivations, ignoring tone and some internal structure ('A' stands for 'ATR')

class 2:
[[say][subj]]

class 2:
[[hide][subj]]

class 1:
[[go][subj]]

$$
\left[\left[\begin{matrix} ge \\ | \\ [+A] \end{matrix}\right]\left[[-A]\right]\right] \quad \left[\left[\begin{matrix} sɔmɛ \\ \underline{\ \ } \\ [-A] \end{matrix}\right]\left[[-A]\right]\right] \quad \left[\left[gV\right]\left[[-A]\right]\right] \quad \text{input}
$$

$$
\text{—————————} \quad \text{—————————} \quad \left[\left[\begin{matrix} gɛ \\ \underline{\quad\quad} \\ \end{matrix}\right]\left[[-A]\right]\right] \quad \begin{matrix}\text{UAC,}\\ \text{default}\end{matrix}
$$

$$
\left[\left[\begin{matrix} ge \\ | \\ [+A] \end{matrix}\right]\left[\begin{matrix} V \\ \\ [-A] \end{matrix}\right]\right] \quad \text{—————————} \quad \text{—————————} \quad (91)
$$

$$\left[\begin{array}{cc}\left[\begin{array}{c}ge\\|\\[+A]\end{array}\right] & \left[\begin{array}{c}\varepsilon\\|\\[-A]\end{array}\right]\end{array}\right] \quad \text{------------} \quad \text{------------} \quad \text{UAC,}$$

default

[geɛ]   [sɔmɛ]   [gɛ]   output
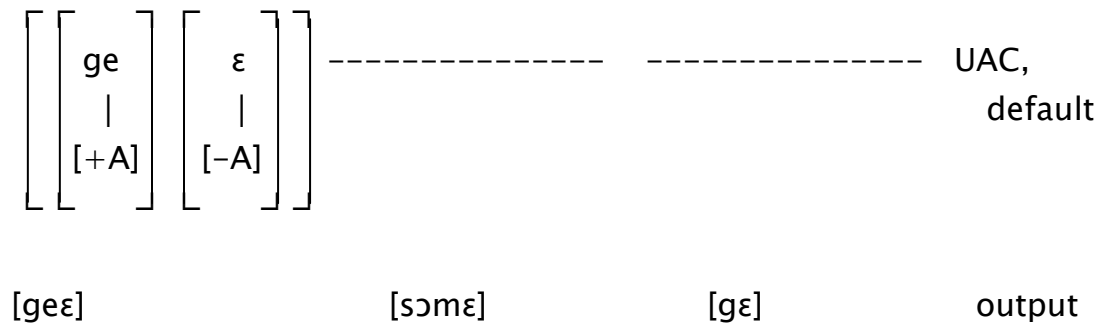
5.3 The lexical structure of Komo morphemes

Concluding this section, I summarize below the lexical specifications of various morphemes presented thus far:

(92) Summary of Komo lexemes (ignoring tone), preliminary[47]

morpheme	*skeletal structure*	*features*
root	CV, CVV, CVCV	varies
noun class	CV–, N–	varies
subject	CV–	varies
applicative	–V	[–round]
reciprocal	–an	null
3s object	null[48]	[+nasal]
3p object	null	[–low]
imperfective	null or V	null
perfective	null	[+high, –round]
subjunctive	null or V	[–ATR, –round]

---

[47] The skeletal structure of the reciprocal morpheme is preliminary, based upon the traditional root–derivational suffix–TAM final vowel assumption about Bantu verb stem structure that I question later on.

[48] I am assuming that there is a rule existing that inserts a skeletal slot that could be either a consonant, syllabic nucleus, or coda as previously shown, wherever there is an autosegmental nasal present.

6. DERIVATIONAL SUFFIXES AND MORPHEME STRUCTURE

In this chapter, I take a detailed look at the causative, applicative, and reciprocal affixes and their behavior with regard to various TAM conditions. The data confirms the analysis thus far as presented in (92).

6.1 An additional note on the applicative suffix

The applicative suffix looks like an infixed front vowel in the following examples (93). As already shown, it can take the form –e̱/–ɛ/–i̱, roughly in order of frequency. Note that the final vowel is always an [i] in the perfective, and always an [a] in the imperfective. Thus, in (93), the glosses are of the non-applicative stem. This is because an applicative may register the presence of more than one sort of oblique object.

That the applicative is always a front vowel is accounted for by lexically specifying it as [–round]. That it always adds a vowel to the stem is accounted for by giving it the skeletal content of –V̱. That it is a high vowel after a high vowel in the root is a consequence of vowel height harmony, which has been already covered.

The stem class 3b forms ɓóá and g̱óá have been shown to have CV(V) roots. The second vowel on the root is, however, no longer optional when the applicative suffix is added.

(93) Applicative affixes, phrase ending intonation[49]

impf stem	appl:impf	pf:appl	gloss (of stem)
stem class 1			
ɓáta	ɓátea	ɓátéi	curl
ɓɛ́ta	ɓɛ́tɛa	ɓɛ́tɛ́i	hit
bɛ́ɗa	bɛ́ɗɛa	bɛ́ɗɛ́i	take
bika	Bikia	Bikíi	come
ɓóá	ɓóéa	ɓóéi	tie
ɓota	ɓotea	ɓotéi	pull
ɓɔ́ŋga	ɓɔ́ŋgɛa	ɓɔ́ŋgɛ́i	attract
ɓɔ́mba	ɓɔ́mbɛa	ɓɔ́mbɛ́i	flee
gbúka	gbúkia	gbúkíi	fold
máma	mámea	máméi	stand
stem class 2			
mia	miia	mií	swallow
ŋgíá	ŋgíía	ngíi	enter
ɗundua	ɗunduia	ɗundúi	write
gua	gúía	gúi	fall
kéndua	kénduia	kéndúi	roll
téá	tééa	téi	flee
sɔmɛa	sɔmɛɛa	sɔméi	hide
tóá	tóéa	tóéi	bite
nóá	nóéa	nóéi	drink
stem class 3			
tóá	tóéa	tóéi	move
ɓaa	ɓaea	ɓaéi	side a house
ɓóá	ɓóéa	ɓóéi	tie
ɠóá	ɠóéa	ɠóéi	trap

I note that—perhaps unsurprisingly—concatenation of the applicative precedes tense-aspect-mood inflection. This occurs, for

---

[49] Not all of the stems found in previous examples have attested (i.e., non-hypothetical) applicatives. Thus, entries for such stems have not been included. In addition, stem subclasses are not relevant for applicatives.

example, with the perfective of the applicative of 'flee', which surfaces as <u>téi</u> (while the non-applicative surfaces as <u>tí</u>). If the [+high] of the perfective applied before the [−round] of the applicative, the expected form would be *<u>tíi</u>.

The following derivations are of a class II and a class III applicative stem.

(94) Derivation of 'write:appl:pf' 'trap:appl:pf', ignoring tone


```
   [+high]              [−high]            input
    / \                  | \
  [ɗVndV]               [gV V
    \ /                   |
   [+rou]              [+rou]
```


```
   [+high]              [−high]            concatenate
    / \                  | \                 applicative
 [[ɗVndV][V]]         [[gV V][V]]
     \ /                  |
   [+rou][−rou]        [+rou] [−rou]
```


```
   [+high]              [−high]            UAC
    / \                  | \
 [[ɗVndV][V]]         [[gV  V][V]]
    \ /   \              |   \
   [+rou][−rou]        [+rou][−rou]
```

```
     [+high]                                          vowel height
      / \ \                                            harmony
[[ɗVndV][V]]                    ─────────────
      \ /   \
   [+rou] [−rou]



   [+high][+high]              [−high][+high]          perfective
     / \ \                        | \
[[ɗVndV][V]]                   [[gV  V][V]]
     \  /   \                      |   \
    [+rou]  [−rou]              [+rou][−rou]



   [+high][+high]              [−high][+high]          UAC
     / \ \                        | \  /
[[ɗVndV][V]]                   [[gV V][V]]
     \ /   \                       |   \
   [+rou] [−rou]               [+rou][−rou]



     [+high]                   [−high][+high]          resolution of
      / \ \                        | \  /                 OCP, default
[[ɗundu][i]]                   [[go  e][i]]               and redun-
      \ /   \                      |  \ |                  dancy rules
     [+rou][−rou]              [+rou][−rou]



   [ɗundui]                       [goei]               output
```

6.2 The causative

The causative morpheme is a suffix that is realized for stem class 1 as –<u>is</u>. For other classes, the first vowel of the causative behaves in a fashion identical to that of the perfective. Below I list some examples:

(95) Causative

	imperfective stem	*imperfective causative*	*perfective causative*
stem class 1a			
throw	máka	mákisa	mákísi
fight	mána	mánisa	mánísi
pound	goga	gogisa	gogísi
stem class 1b			
go	ga	gesa	gesí
carve	kpá	kpésa	kpési
stop	mamá	mame	mamési
stem class 2a			
swallow	mía	mísa	mísi
enter	ŋgía	ŋgísa	ŋgísi
write	ɗundua	ɗundusa	ɗundúsi
fall	gua	gusa	gúsi
stem class 2b			
eat	éa	ísa	ísi
flee	téa	tísa	tísi
say	gea	gisa	gisi
hide	sɔmɛa	sɔmisa	sɔmísi
thatch	bɔbɔtɛa	bɔbɔtisa	bɔbɔ́tísi
bite	tóa	túsa	túsi
drink	nóa	núsa	núsi
choose	sɔmbɔa	sɔmbusa	sɔmbúsi

stem class 3a

lick	ɗía	ɗíísa	ɗíísi
push over	kpúa	kpúísa	kpúísi
hunt	gbúa	gbúísa	gbúísi
leave	mea	meisa	meísi
move	tóa	tóísa	tóísi
be long	kóa	kóísa	kóísi
cough	kɔ́a	kɔ́ísa	kɔ́ísi
blaze a trail	kɔɔa	kɔɔisa	kɔɔ́ísi
side a house	ɓaa	ɓaísa	ɓaísi

stem class 3b

tie	ɓóá	ɓóésa	ɓóési
trap	góá	góésa	góési

The reader will recall that a class 3b root can take the forms CV or CVV in free variation in the perfective. Thus the perfective of ɓóá 'tie' can be either ɓó or ɓóé. I also note here that the maximal expansion of the class 3b root is obligatory when concatenating a derivational suffix. Thus, *ɓósí for the perfective of the causative of 'tie' is ungrammatical.

The vowel of the causative behaves exactly the same as the perfective. I propose as a lexical entry for the causative an –sV skeleton (thus a suffix) and the autosegmentals [+high] and [–round].

(96) Derivation 'write:cs:pf' and 'trap:cs:pf', ignoring tone

```
[+high]             [-high]

  / \                 | \
[ɗVndV]            [gV V]                input
  \ /                 |
 [+rou]             [+rou]
```

```
[+high][+high]        [–high][+high]
   / \                   | \
[[ɗVndV][sV]]        [[gV V][sV]]              concatenate
   \ /    |             |     |                 causative
 [+rou] [–rou]        [+rou] [–rou]


 [+high] [+high]        [–high][+high]
    / \     /             | \      /
[[ɗVndV][sV]]           [[gV V][sV]]            UAC
    \ /    |               |     |
  [+rou] [–rou]          [+rou] [–rou]


    [+high]
    / \  \
[[ɗVndV][sV]]         –––––––––––––         resolution
    \  /   |                                  of OCP
  [+rou] [–rou]


 [+high][+high]          [–high] [+high] [+high]
   / \ \                    | \      /
[[ɗVndV][sV]]            [[gV V][sV]]            perfective
  \/        |                |      |
 [+rou][–rou][–rou]       [+rou][–rou][–rou]


 [+high]                 [–high][+high]
  / \ \                     | \    /
[[ɗundu][si]]            [[go e][si]]        resolution
   \ /    |                 |     |            of OCP,
 [+rou][–rou]             [+rou][–rou]


[ɗundusi]                [goesi]          BE, output
```

(97) Derivation of 'cause to hide', ignoring tone

[hide:causative:perfective]

Derivational stratum


```
[sɔmV]   input
  |
[–ATR]
```

```
    [+high]
[[sɔmV][sV]]                          causative
  |     \
[–ATR][–rou]
```

```
   [+high]
    /
[[sɔmV][sV]]                          UAC
  |     \
[–ATR][–rou]
```

```
   [+high][+high]
        /
[[sɔmV][sV]]                          Perfective
  |    \    \
[–ATR][–rou][–rou]
```

```
[+high][+high]
     /     /
[[sɔmV][sV]]                              UAC
  |    \    \
[-ATR][-rou][-rou]


   [+high]
    /  |
[[sɔmi][si]]                              resolution of OCP, surface
  |  \|                                     realization
[-ATR][-rou]


[sɔmisi]                                  BE, output
```

6.3 The reciprocal

Whereas the causative behaves similarly to the perfective, the vowel of the reciprocal behaves similarly to the imperfective.

(98) Reciprocal examples[50]

	imperfective bare stem	*perfective recip. stem*	*imperfective recip. stem*
Stem class 1			
throw	máka	mákáni	mákana
pound	goga	gogáni	gogana
go	ga	gǎni	gana[51]
stand	ma	mamáni	mamana
Stem class 2			
swallow	mía	míáni	míána
write	ɗundua	ɗundúáni	ɗunduana
eat	éa	éáni	éána
flee	téa	téáni	téána
hide	sɔmɛa	sɔmɛ́áni	sɔmɛana
bite	tóa	tóáni	tóána
choose	sɔmbɔa	sɔmbɔ́áni	sɔmbɔana
Stem class 3			
lick	ɗía	ɗíáni	ɗíána
side a house	ɓaa	ɓaáni	ɓaana
tie	ɓóa	ɓóáni	ɓóána
trap	góa	góáni	góána

Thus, a class 3a stem such as <u>ɗiV</u> 'lick' would potentially have an imperfective stem of *<u>ɗiaana</u> instead of <u>ɗiana</u> if the reciprocal were of the form –<u>an</u>. That is, <u>ɗiV</u> would become <u>ɗiVVn</u> upon adding the reciprocal, then <u>ɗiVVnV</u> upon adding (presumably) a TAM vowel for the perfective. Default and redundancy rules would derive *<u>ɗiaana</u>. One solution to the inconsistency is to postulate a lexical entry of –<u>nV</u>.

---

[50] There is no need to distinguish subclasses of stems with the reciprocal, just as there was no such need with the imperfective.

[51] The reciprocal imperfectives of this line and the next are unattested, but ellicitable as hypothetical cases (i.e., using "What if" questions). The perfectives exist as plural commands.

Stem class 2 would then have an allomorph, this time of –VnV in order to derive forms like téana 'flee:recip' and not *téna.

(99) Reciprocal

    Reciprocal: A. –VnV in stem class 2.
                    B. –nV elsewhere

(100) Derivations of 'write:recip:impf' and 'side a house:recip:impf'

```
'write'                 'side a house'


[+rou]
  / \
[ɗVndV]                 [ɓVV]                  roots
  \ /
[+high]



 [+rou]
   / \
[[ɗVndV][nV]]           [[ɓVV][nV]]            reciprocal
   \ /
 [+high]



 [+rou]
   / \
[[ɗVndV][VnV]]          ----------             rhyme insertion,
   \ /                                          extended
 [+high]
```

```
[+rou]
  / \
[[ɗundu][ana]]          [[ɓaa][na]]              redundancy and
  \ /                                             default rules
[+high]



[ɗunduana]              [ɓaana]                  BE, output
```

6.4 Summary

In (101) I summarize of Komo morphemes as presented thus far. There follows a caveat in 6.5.:

(102) Summary of Komo morphemes: skeletal structure and salient features, final

morpheme	*skeletal structure*	*features*
Nouns:		
stem	CV, CVCV	varies
class prefix	CV–, N–	varies
Verbs:		
subject	CV–	varies
3s object	Null	[+nasal]
3p object	Null	[–low]
Verb roots:		
class 1a	CV, CVCV	final vowel: free
class 1b	CV, CVCV	final vowel: [–high]
class 2a	CV, CVCV	final vowel: [+high]
class 2b	CV, CVCV	final vowel: linked (= non–low)
class 3a	CVV	final vowel: free
class 3b	CV(V)	vowels: [–high]
Tense markers:		
imperfective	null or V	null
perfective	Null	[+high, –round]]
subjunctive	null or V	[–ATR]
Derivational suffixes:		
applicative	–V	[–round]
reciprocal	–nV or –VnV	null
causative	–sV	[+high]

6.5 An alternative analysis of stem, derivational suffix, and TAM marker structure

In the preceding sections, I proposed that verb stems have a CV or CVCV skeleton to which derivational suffixes having a –V or –CV skeleton may be added to form derived stems. TAM markers (usually)

have no skeletal content: they consist of vowel (and tone) features, which are added to the stem late in a derivation. I shall call this analysis the CVCV analysis, based upon its proposed shape for the two-syllable class 1 stem.

An alternative analysis would follow the more traditional analysis of resolving Bantu verb stems into a C or CVC root plus V or VC suffixes plus an aspectual final vowel (Meeussen 1967). I shall call this the CVC analysis after the typical shape of the class 1a root. What were -CV or -V derivational suffixes in the CVCV analysis become -VC or -V suffixes in the CVC analysis.

Next, in a way similar to (101), I summarize below what the results of the CVC analysis would be with respect to the lexical content of various morphemes.

(102) Relevant parts of (101) under the CVC analysis

	skeletal structure	*salient features*
Roots:		
class 1a	C, CVC	None
class 1b	C, CVC	[-high]
class 2a	CV, CVCV	[+high]
class 2b	CV, CVCV	[-low](?)
class 3a	CV	None
class 3b	C(V)	[-high]
Aspectual vowels:		
imperfective	V	None
perfective	V	[+high, -round]
subjunctive	V	[-ATR]
Derivational suffixes:		
applicative	-V	[-round]
reciprocal	-Vn	None
causative	-Vs	[+high][-round]

I now contrast the two analyses, outlining why the CVCV analysis is favored under the framework of Archangeli and Pulleyblank (1986).

A problem for the CVC analysis concerns gĕ 'go'. The root would have to consist of a C and the vowel feature [−high]. This is indeed how the structuralist Harries (1958), the first person to describe Komo, analyzed it.

(103) Structure of 'go:pf' in the CVC analysis

root　　　*TAM vowel*

$$
\begin{bmatrix} g \\ \text{[−high]} \end{bmatrix} \quad \begin{bmatrix} V \\ \text{[+high]} \end{bmatrix}
$$

The [−high] of the root would then have to link outside of the root onto the TAM vowel in order to derive gĕ.

Alternatively, the CVC analysis could propose [gV] as the root for 'go' where the V is lexically [−high]. It would then agree with the CVCV analysis as to the skeletal shape of the root. −V(C) suffixes would then have to be subjected to a deletion rule in order to avoid a perfective of *geí, an imperfective of *gaa, a causative of *geisa, and a reciprocal of *gaana, where the vowel of the suffix has to be deleted in each case.

On the other hand, the CVCV analysis needs no rules other than default and redundancy rules to derive the correct forms. Since its suffixes take either null or −(C)V skeletal forms, no resort to phonological rules are needed to derive the correct forms.

Another interesting case is the root for class 2 'eat', whose perfective stem is í, imperfective is éa, and subjunctive is éέ (see derivation (85). The CVCV analysis gives 'eat' a root of a vowel

specified as [−round]. The perfective inserts the feature [+high] deriving a high vowel; the subjunctive and imperfective add allomorphic vowels for the class, deriving the other two forms.

The CVC analysis would have a null skeleton for the root of 'eat' and the autosegmental feature [−round]. The perfective would insert a high vowel, deriving the correct form í. The analysis of subjunctive and imperfective would either have to: (1) add two-vowel TAM allomorphs, (2) propose a V allomorph for the root, or (3) make the root always V (agreeing with the CVCV analysis), and refer to the deletion rule proposed above. The third solution seems best, since it avoids having to make (many) root allomorphs or an awkward two vowel allomorph. I defer final judgment about the merits of the third option of the CVC analysis until after examination of the next form.

A difficulty for both analyses comes with the form gú/gua 'fall:pf/impf'. The CVCV analysis, as already shown, must posit an allomorph for the imperfective morpheme (86). On the other hand, the CVC analysis concatenates a −V perfective morpheme to the root, which is presumably gu. This leads to a wrong prediction as shown in (104).

(104) Derivation of 'fall:pf' using the CVC analysis

[gu]	root
[gu][i]	TAM
*gui	output

To avoid such a result, a deletion rule is needed in order to exclude the [i]. I can think of no strictly phonological conditioning for such a rule, since the [ui] combination in *gúi is phonologically indistinguishable from that of class 3 kpúi 'push over:pf' (imperfective: kpúa, subjunctive: kpúɛ́). Chart (105) below gives paradigms contrasting the behavior of the two stems.

(105) Paradigms of 'fall' and 'push over'

	'fall'	'push over
imperfective	gua	kpúa
subjunctive	gúɛ́	kpúɛ́
perfective	gú	kpúi

The variant of the CVC analysis proposing a deletion rule is therefore forced in this case to use morphological conditioning. The end result is that the CVCV analysis uses vowel allomorphs of the imperfective, reciprocal, and subjunctive, while the CVC analysis uses a morphologically conditioned vowel deletion rule. That is, it must be constrained from operating on class 3.

Now the Archangeli and Pulleyblank (1986) framework considers a deletion rule to be more marked than an insertion rule, all other things being equal. This is the case here, where the CVCV analysis has a V allomorph of the imperfective for stem class 2. This allomorph could be stated as an insertion rule of the following form (see McCarthy 1981:405):

ø → V / imperfective, class 2

The CVC analysis, on the other hand, deletes a vowel under morphological conditioning in the perfective. It would be written as something like:

V → ø / perfective, class 2.

Thus, at least for stem class 2, the CVCV analysis is preferred with respect to the framework, because it involves morphologically-based insertions rather than deletions.

Another form of interest is the subjunctive of stem class 2 'hide', sɔmɛ́, where the imperfective is sɔmɛa and the perfective is sɔmí. For

other stems in its class, an –ɛ is added to the stem, such as in 'swallow' whose imperfective is <u>mia</u>, perfective <u>mi</u>, and subjunctive <u>miɛ́</u>. It has already been proposed that the subjunctive morpheme, which contains just the feature [–ATR], has an allomorph that adds a vowel for class 2. This vowel is then constrained in the lexical entry for subjunctive from being inserted after an [ɛ]. Alternatively, one could construct an allomorph of 'hide', such as <u>sɔm</u>, so that <u>sɔm</u> + ɛ ⟶ <u>sɔmɛ</u>. This would remove the complexity from the subjunctive morpheme at a cost of adding allomorphs for this kind of root.

  The CVC analysis would be more optimal, if it proposed a CVC root (<u>sɔm</u>) for this form, so that <u>sɔm</u> + –ɛ ⟶ <u>sɔmɛ</u>. If it does, however, then the imperfective of the same stem becomes *<u>sɔma</u>. The CVC analysis, then, must also create an allomorph of the stem (<u>sɔm</u>/<u>sɔmɛ</u>) to account for all of the facts. Thus, the two analyses come out again as being roughly equivalent in complexity, and the CVCV analysis is to be preferred for the same reasons as stated earlier.

7. VOWEL COPY AND REGRESSIVE VOWEL ASSIMILATION

In this chapter I describe the habitual suffix, which behaves differently from the reciprocal, causative, and applicative suffixes. I also describe an inflectional morpheme complex that cliticizes before verbs and adverbs. A new kind of rule is described in the process; viz., a rule of vowel copy, and one other inflectional rule is then described: a rule of regressive assimilation.

The goal of this chapter is to present an analysis in terms of the framework. Thus, no arguments in support of the analysis are attempted.

7.1 The habitual suffix: vowel copy to the right of the verb

The habitual suffix consists of the skeleton –gV. The vowel can be any vowel except [o] or [ɔ], depending totally on the tense–aspect inflection of the verb stem.

Chart (106) gives three TAM configurations of three verb stems and the consequent behavior of the habitual.

Observe that the final vowel of the stem is repeated in the habitual. I call this process vowel copy, whereby the final vowel as derived by tense–aspect morphology is repeated in the habitual suffix.

(106) Habitual

Tense	*'cut'*	*'stop'*	*'write'*
Pf:	a–téní–gi	a–mamé–ge	a–ɗundú–gu
	3s–cut:pf–hab		
Impf:	a–o–téna–ga	a–o–mama–ga	a–o–ɗundua–ga
	3s–ptp–cut:impf–hab		
Subj:	á–tɛnɛ–gɛ	á–mamɛ́–gɛ́	á–ɗundúɛ́–gɛ́
	3s–cut:subj–hab		

An analysis of the vowel copy phenomenon is facilitated by recourse to the arboreal framework of phonological representation. I first propose a rule of vowel copy as follows:

(107) Vowel copy Domain: post–TAM

    I. a. insert$_{def}$
       b. maximal$_{def}$
       c. structure
       d. same direction$_{def}$ (=rightward)
    II. secondary place node

That is, after the tense–aspect–mood configuration is derived, a secondary place node spreads rightward onto a free vowel. I illustrate with a partial derivation.

(108) Illustration of (107)

[stop:subj:habitual]

Inflectional Stratum

[mamɛ́]   input after TAM
                                                          configuration

$$
\left[\left[\begin{array}{c} \text{mamɛ́} \\ : \\ \circ \\ | \\ \circ \end{array}\right] \left[\begin{array}{c} \text{gV} \\ \\ \\ \\ \end{array}\right]\right]
$$ concatenation of habitual

place node

s-place node

$$
\left[\left[\begin{array}{c} \text{mamɛ́} \\ : \\ \circ \\ \vdash \\ \circ \end{array}\right] \left[\begin{array}{c} \text{gɛ́} \\ : \\ \circ \\ \dashv \\ \end{array}\right]\right]
$$ vowel copy (107)

place node

s-place node
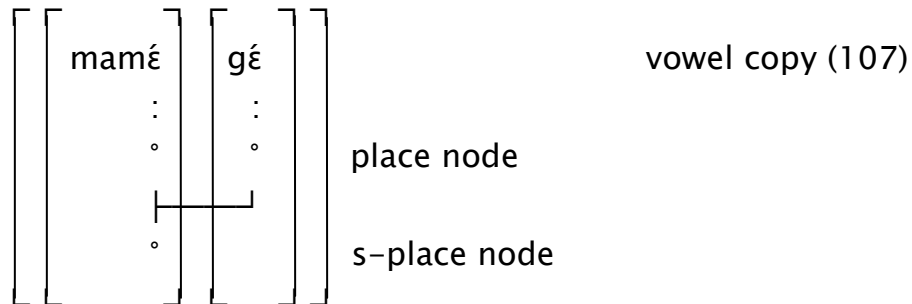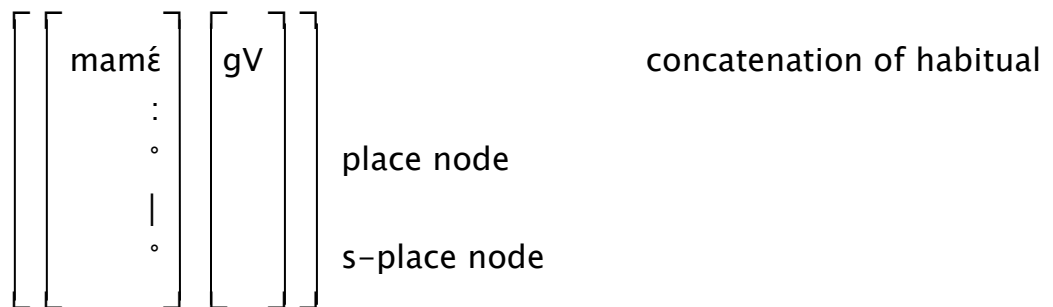
[mamɛ́gɛ́]   bracket erasure, output

7.2 The inflectional morpheme complex and vowel copy

Komo verbs are preceded by an inflectional morpheme complex
(or just 'morpheme complex') consisting of as many as three syllables
having the following features: (a) the vowel is the same in each syllable
and registers subject–person agreement, (b) each consonant registers

information about the clause, including in its maximal expansion, distant past or subordination, plural subject, and negative. These facts are a bit complex: I give an example in (109) of a maximal morpheme complex here in order to provide orientation.

(109) Komo morpheme complex

[ɗ é ɓ é k é] kóndi
 1 2 3 2 4 2 want:pf
'We did not want long ago.'
  1. distant past
  2. subject person vowel, here indicating first person agreement
  3. plural subject
  4. negative

As can be seen by the preceding example, vowel copy is also found in the inflectional morpheme complex.[52]

Chart (110) is a paradigm of the plural negative morpheme complex. (Note in the column on the right how [−ATR] spreads from a [−ATR] verb stem to the morpheme complex.)

---

[52] The morpheme complex can also stand alone in a clause without a following verb stem, as a sort of defective verb of being. For this reason, I cannot call it a *preverbal* morpheme complex.

  Plural negative morpheme complex standing alone

  ɓé-ké na   ɓangɔa.
  1p-neg with money
  'We don't have money (literally, we are not with money).'

(110) Plural negative morpheme complex: paradigm for 'want' and 'talk'

person	'want:pf'	'talk:pf'
1p:neg	ɓé-ké-kóndi	ɓɛ́-kɛ́-ɟ̂ɔngí
2p:neg	ɓó-kó-kóndi	ɓɔ́-kɔ́-ɟ̂ɔngí
3p:neg	ɓá-ká-kóndi	ɓá-ká-ɟ̂ɔngí

In contrast to (109), the subordinating <u>n</u>– and the distant past <u>d̠</u>–, only one of which may be present in a morpheme complex, may optionally take an [a], the default vowel (35).

(111) 'talk:pf' with distant past and subordinating morphemes

	distant past	subordination
1p	d̠ɛ́-ɓɛ-ɟ̂ɔngí	nɛ-ɓɛ-ɟ̂ɔngí
-or-	d̠á-ɓɛ-ɟ̂ɔngí	na-ɓɛ-ɟ̂ɔngí
2p	d̠ɔ́-ɓɔ-ɟ̂ɔngí	nɔ-ɓɔ-ɟ̂ɔngí
-or-	d̠á-ɓɔ-ɟ̂ɔngí	na-ɓɔ-ɟ̂ɔngí
3p	d̠á-ɓa-ɟ̂ɔngí	na-ɓá-ɟ̂ɔngí

When combining either the distant past or the subordinating morpheme with a negative morpheme, one can get the subject person vowel repeated two or three times.

(112) distant past with plural, negative

dp-1p:neg	d̠éɓéké-/d̠ɛ́ɓɛ́kɛ́-
-or-	d̠áɓéké-/d̠áɓɛ́kɛ́-
dp-2p:neg	d̠óɓókó-/d̠ɔ́ɓɔ́kɔ́-
-or-	d̠áɓókó-/d̠áɓɔ́kɔ́-
dp-3p:neg	d̠áɓáká-

To formulate a block of rules, I must first look at the morphology of morpheme complexes by providing a complete paradigm. (Note that

the third person subject vowel, being [a], does not vary since ATR is irrelevant for the vowel.[53])

(113) Non-subjunctive inflectional morpheme complexes

	positive		negative	
	singular	*plural*	*singular*	*plural*
1	ne-/nɛ-	ɓe-/ɓɛ-	ké-/kɛ́-	ɓéké-/ɓɛ́kɛ́-
2	o-/ ɔ-	ɓo-/ɓɔ-	kó-/kɔ́-	ɓókó-/ɓɔ́kɔ́-
3	a-	ɓá-	ká-	ɓáká-

Next, I give the complete paradigm for distant past morpheme complexes. (Note that in the plural and negative forms, the subject person vowel may optionally be repeated with the distant past morpheme.)

(114) Distant past morpheme complexes

	positive	
	singular	*plural*
1	ɗé-/ɗɛ́-	ɗéɓe-/ɗɛ́ɓɛ-
-or-	ɗáne-/ɗánɛ	ɗáɓe-/ɗáɓɛ-
-or-	ɗéne-/ɗɛ́nɛ-	
2	ɗó-/ɗɔ́-	ɗóɓo-/ɗɔ́ɓɔ-
-or-		ɗáɓo-/ɗáɓɔ-
3	ɗá-	ɗáɓa-

---

[53] There is a difference in tonal melody between subjunctive and non-subjunctive morpheme complexes (see Thomas (1992)).

<u>negative</u>

	singular	*plural*
1	ɗéké-/ɗɛ́kɛ́-	ɗéɓéké-/ɗɛ́ɓɛ́kɛ́-
-or-	ɗáké-/ɗákɛ́-	ɗáɓéké-/ɗáɓɛ́kɛ́-
2	ɗókó-/ɗɔ́kɔ́-	ɗóɓókó-/ɗɔ́ɓɔ́kɔ́-
-or-	ɗákó-/ɗákɔ́-	ɗáɓókó-/ɗáɓɔ́kɔ́-
3	ɗáká-	ɗáɓáká-

Subordinating morphemes behave in a manner similar to the distant past, again with optional repetition of the person vowel, but without a monosyllabic form of the first person singular positive subordinating morpheme complex (such as *<u>ne</u>-).

(115) Morpheme complexes with subordinating morpheme

<u>positive</u>

	singular	*plural*
1	nene-/nɛnɛ-	neɓe-/nɛɓɛ-
-or-	nane-/nanɛ	naɓe-/naɓɛ-
2	no-/nɔ-	noɓo-/nɔɓɔ-
-or-		naɓo-/naɓɔ-
3	na-	naɓá-

<u>negative</u>

	singular	*plural*
1	neké-/nɛkɛ́-	neɓéké-/nɛɓɛ́kɛ́-
-or-	naké-/nakɛ́-	naɓéké-/naɓɛ́kɛ́-
2	nakó-/nakɔ́-	naɓókó-/naɓɔ́kɔ́-
-or-	nokó-/nɔkɔ́-	noɓókó-/nɔɓɔ́kɔ́-
3	naká-	naɓáká-

I now suggest a block of interacting morphological and phonological rules that will derive a morpheme complex. In doing so, I follow the Word and Paradigm model of morphology as expressed in McCarthy (1981) and Anderson (1982), which I believe to be implicit in Archangeli and Pulleyblank (1986). In particular, I use a somewhat more constrained model of the morphological rule than McCarthy (1981:405), in that I place morphemes on autosegmental tiers and posit morphological insertion rules (only) of the form ø $\rightarrow$ A / X, where A is a string of elements and X is a morphological or phonological environment. In addition, I follow Anderson in allowing ordering, or layering (Anderson 1982:598 *et passim*) among such rules. The following rules are ordered as indicated for reasons that will become clear.

A. Begin with a single syllable CV skeleton for the inflectional morpheme complex.

B. If the subject is plural, insert the features for a [ɓ].

This then links to the C slot of the CV skeleton as in the following illustration:

(116) Plural

  [CV]   skeleton (A)

$$\begin{bmatrix} CV \\ ɓ \end{bmatrix}$$ insert features of a [ɓ] (B)

$$
\begin{bmatrix} CV \\ | \\ ɓ \end{bmatrix}
$$

association

C. If the clause is negative, right concatenate the non-skeletal
     features for a [k].

If there is a free consonant slot, then the features for a [k] links
to the open skeletal consonant position.

(117) Negative morpheme complex, partial derivation (the
       continuation follows)

neg   pl:neg

[CV]   [CV]   skeleton (A)

____   [ɓV]   plural (B) (as above)

$$
\begin{bmatrix} CV \\ \\ k \end{bmatrix} \quad \begin{bmatrix} CV \\ | \\ ɓk \end{bmatrix}
$$

right concatenate features of a
  [k] (C)

$$
\begin{bmatrix} CV \\ | \\ k \end{bmatrix} \quad \text{-----}
$$

association

D. At this point, vowel features associated with the subject
    person are prefixed.[54]

The vowel features are added as in (118) below.

(118) Subject person vowel features

Person features

first person: [–round]
second person: [+round]
third person: null

If the features for a [k] are still floating, then an additional CV skeleton is inserted within the brackets of the [k]. I propose then a morphologically conditioned rule, which I write as follows:

---

[54] I do this at this point in order to permit the [k] in step C to link leftwards across an unspecified vowel onto the initial subject consonant (e.g., if the subject is singular). This is a framework–internal problem. If vowel features were already linked to the subject morpheme skeleton at the time of concatenation of the negative [k], then structure would be created between those features. The anti–crossing constraint would block the [k] of the negative from linking leftwards onto the initial consonant of the skeleton.

To amplify: the anti–crossing constraint prevents lines of association from crossing. Thus, a line of association to a vowel feature G cannot cross the line of association of a consonant C to its feature F in order to link to vowel V_1 on the other side of the consonant, as shown in the example below. For details see Archangeli and Pulleyblank (1986:62).

```
V₁  C     V₂
 |     |
  [F]   [G]
```

(119) Syllable insertion

    I. c.   structure

    II. CV

    III. a.   ___⌋
                      morpheme complex

       b.   [+consonantal]

       c.   (free)

That is, a syllable (here, CV) is inserted within brackets containing an autosegmental [+consonantal].

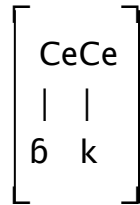   For a negative morpheme complex, a derivation thus far would look as follows:

(120) First person plural negative (continuation)

$$\begin{bmatrix} CV \\ | \\ \text{ɓ k} \end{bmatrix}$$ concatenation of negative

$$\begin{bmatrix} Ce \\ | \\ \text{ɓ k} \end{bmatrix}$$ insertion of person vowel features (118)

$$
\begin{bmatrix}
\text{CeCV} \\
\mid \quad \mid \\
\text{ɓ} \quad \text{k}
\end{bmatrix}
\qquad
\begin{matrix}
\text{syllable insertion (119),} \\
\quad\text{association}
\end{matrix}
$$
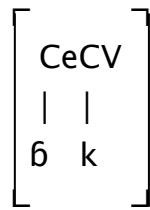
$$
\begin{bmatrix}
\text{CeCe} \\
\mid \quad \mid \\
\text{ɓ} \quad \text{k}
\end{bmatrix}
\qquad
\text{vowel copy (107), output}
$$

The following two steps concern the formation of the first person singular and the distant past:

E. If the clause is distant past, concatenate to the left the features for a [ɗ] in its own set of brackets (this is necessary to make CV insertion work).

If there is a free C slot on the morpheme complex up until now, then the [ɗ] features link to that slot, as in singular non-negative distant past configurations. In plural or negative configurations, such a slot is already linked. In this case, syllable insertion (119) operates, as in (121).

At this point vowel copy operates optionally, deriving, for example, <u>ɗáɓo–</u> or <u>ɗóɓo–</u>. What is interesting here is that the rule operates mandatorily to the right and optionally to the left, and that there is free variation as to whether the option is exercised even within an idiolect. To account for the free variation, vowel copy can have an optional bidirectional setting.

(121) Partial derivation of a second person plural distant past
morpheme complex

[ɓV]   derived plural subject

[ɓo]   subject person vowel features insertion   (118)

$$\begin{bmatrix} \begin{bmatrix} \begin{bmatrix} \\ ɗ \end{bmatrix} & \begin{bmatrix} ɓo \end{bmatrix} \end{bmatrix} \end{bmatrix}$$ concatenation of distant past

$$\begin{bmatrix} \begin{bmatrix} CV \\ | \\ ɗ \end{bmatrix} & \begin{bmatrix} ɓo \end{bmatrix} \end{bmatrix}$$ syllable insertion (119), association

(122) Vowel copy, modified

  I. c. structure
    d. bidirectional (optional)
       ELSE (same direction)
  II. secondary place node

I continue with the next step in morpheme complex derivation.

F. If the subject is first person and the first C slot is empty, fill it
with the features of an <u>n</u>–.

This is in fact a morphologically conditioned rule that inserts the feature [+nasal] onto a free consonant slot in the first person morphological environment.

(123) Default first person singular nasal insertion

    II. [+nasal]
    III. trigger/target conditions

      – C V ⎤
           ⎦ first person singular subject

      – (free)

A derivation at this point would look like the following:

(124) Derivation of first person non-singular non-negative

$$
\begin{bmatrix} CV \\[1em] \\ 1s \end{bmatrix} \rightarrow \begin{bmatrix} CV \\[1em] [+nas] \end{bmatrix} \quad \text{first person singular (123)}
$$

$$
\rightarrow \quad [nV] \quad \text{redundancy/default rules}
$$

The previous two steps may be optionally reversed in order to account for the free variation of the first person singular distant past (ɗáne-/ɗánɛ-, ɗé-/ɗɛ́-, or ɗéne-/ɗɛ́nɛ-).

(125) First person singular distant past

    [CV]   skeleton (A)

    ––––   plural (B)

    ––––   negative (C)

    [Ce]   person vowel (D)

    [ɗe]   distant past (E), output

(126) First person singular distant past, steps E and F reversed

    [CV]   skeleton (A)

    ––––   plural (B)

    ––––   negative (C)

    [Ce]   person vowel (D)

    [ne]   first person (F)

$$\left[\left[\left[\quad\right]\left[\begin{array}{c}\text{Ce}\\|\\\text{n}\end{array}\right.\right]\right.$$ distant past (E)

$$\left[\left[\begin{array}{c}\text{CV}\\\\\text{ɗ}\end{array}\right]\left[\begin{array}{c}\text{Ce}\\\\\text{n}\end{array}\right]\right]$$ syllable insertion
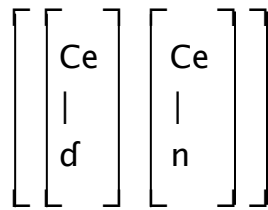
$$\left[\left[\begin{array}{c} Ce \\ | \\ ɗ \end{array}\right]\left[\begin{array}{c} Ce \\ | \\ n \end{array}\right]\right] \qquad \text{association, vowel copy}$$

[ɗene] output

G. If the verb is in a subordinate clause, concatenate to the left the features of an <u>n</u>– within its own set of brackets.

If these features cannot link, then syllable insertion adds an extra syllable left.

(127) Subordinating morpheme

sub:1s	*sub:3s*	
[CV]	[CV]	skeleton (A)
[Ce]	[Ca]	person vowel (D)
[ne]	____	first person (F)
[[ne][ne]]	[na]	subordinating morpheme (G), syllable insertion, theme vowel spreading
[nene]	[na]	output

I note two things about the subordinating morpheme.

– As in the distant past, vowel copy is optional to the left. This confirms the optional bidirectional setting in the rule of vowel copy.

– Unlike the distant past, there is no monosyllabic form of the first person singular (<u>nene</u>–/<u>nane</u>/ *<u>ne</u>–). Thus, concatenation of the subordinating morpheme must follow first person singular subject formation (123).

Thus, with the preceding algorithm, I have accounted for the derivation of the inflectional morpheme complex.

Two problems remain, however. One involves tone, which I discuss in Thomas (1992). The other is that there is no way at present of preventing vowel copy back from an object prefix or stem to a lexically unspecified third person subject. The solution to this is to consider the inflectional morpheme complex to be a clitic rather than a prefix, as demonstrated in the following examples.

(128) Inflectional morpheme complex as a clitic

No verb:
ɓé-ké   na   ɓangɔa.
1p-neg   with   money
'We don't have money.'

Cliticized to an adverb:
ɔ   phɔtɔ   óáni
2s   still   here
'2s are still here.'

Cliticized to an adverb, which precedes a verb:
ɓa-kpá   ɓâ   gotó   o-bika
pl-person   3p   again   ptp-come:impf
'The people are coming again.'

Thus, I propose that the inflectional morpheme complex is a clitic that is derived independently of the verb stem. In Thomas (1992), I show that tone is assigned to the inflectional morpheme complex as a partial function of the TAM configuration of the verb. Therefore, I put inflectional morpheme complex concatenation in the same stratum as TAM configuration.

Chart (129) summarizes the inflectional morpheme complex derivation process up to this point:

(129) Summary of inflectional morpheme complex derivation

  A. Insertion of CV skeleton.

  B. Plural [ɓ] concatenation.

  C. Negative [k] concatenation (with possible skeletal CV insertion).

  D. Insertion of person-specific vowel features (118). Vowel copy (107) operates at this point.

Vowel copy was made obligatory to the right and optional to the left in order to allow the default vowel [a] to appear in the syllable containing the distant past morpheme.

  E. Distant past concatenation (with a possible CV insertion).

  F. Default first person singular nasal insertion (may be reversed with the previous step).

  G. Subordinating morpheme concatenation (with possible skeletal CV insertion).

The crucial steps of this process are E and F, which are reversed in order to account for alternative forms of the first person distant past inflectional morpheme complex. This was demonstrated in (125) and (126).

7.3 Regressive vowel assimilation

I am now ready to discuss regressive vowel assimilation. This phenomenon occurs only in the context of vowel-initial verb stems, where the last prefix vowel can assimilate in height to the initial stem vowel, if both vowels have the same value of backness.

In (130), I display this phenomenon in the context of a front vowel-initial stem. Here, assimilation spreads back to a first person subject clitic in the perfective. Such spreading from the verb stem is blocked by the participle formative in the imperfective.

(130) Regressive vowel assimilation: front vowel–initial stem

| ni–íánígi | o–íánígi |
| 1s–think:pf | 2s–think:pf |

| 'I thought' | 'you thought' |

| ne–o–íanaga | o–o–íanaga |
| 1s–ptp–think:impf | 2s–ptp–think:impf |

| 'I am thinking' | 'you are thinking' |

With a back vowel–initial stem, spreading may regress in the second person through the back vowel participle formative to the subject clitic.

(131) Regressive vowel assimilation: back vowel–initial stem

| ne–úbi | u–úbi |
| 1s–know:pf | 2s–know:pf |

| 'I know' | 'you know' |

| ne–u–úba | u–u–úba |
| 1s–ptp–know:impf | 2s–ptp–know:impf |

| 'I know' | 'you know' |

In the next example, the third person plural object can optionally include the features of a [ɓ], which surface when linked to the vowel-initial stem. This [ɓ] blocks regressive vowel assimilation.

(132) Regressive vowel assimilation: blocked by the optional third
person plural object [ɓ]

něɓúbi	ǒɓúbi
1s:3p:know:pf	2s:3p:know:pf
'I know them'	'you know them'

Chart (132) above also demonstrates that vowel assimilation takes place after concatenation of the third plural object prefix. Otherwise, *ǔɓúbi would result, in the example on the right.

In the following examples, I show this phenomenon in the context of the second person singular object prefix, but again blocked from spreading to the participle formative and to inflectional morpheme complexes by an intervening consonant.

(133) Regressive vowel assimilation: object prefix

ne–ko–ísi	ne–ku–úbi	ne–o–ku–úba
1s–2s–eat:cs:pf	1s–2s–know:pf	1s–ptp–2s–know:impf
'I fed you'	'I knew you'	'I know you'

Regressive vowel assimilation differs from vowel copy, in that the former spreads only leftward and is blocked by a consonant, while the latter is optionally bidirectional and is not blocked by consonants. In the second row of the following examples are cases where both rules take place in the same form.

(134) Comparison of regressive vowel assimilation and vowel copy

ɗé-ɓé-ké-bebí   ɗó-ɓó-kó-kóndi
dp-1p-neg-praise:pf   dp-2p-neg-know:pf

'we did not praise long ago'   'you did not want it long ago'

ɗé-ɓé-kí-íánígi   ɗó-ɓó-kú-úbi
dp-1p-neg-think:pf   dp-2p-neg-know:pf

'we did not think long ago'   'you did not know long

The preceding examples show that, regardless of the prefix or clitic—be it participle formative, subject, or object—the vowel immediately preceding a vowel-initial stem assimilates in height to that vowel, if they are linked to the same value of [round]. Such assimilation spreads leftward until it encounters a consonant, at which point it is blocked from further spreading.

The problem about writing a rule is that normally consonants are transparent to processes involving vowels. The challenge then is to find a node dominating both consonant and vowel features, so that a consonant blocks the rule's spread. In the phonological tree framework I am using ((19), page 36), such a node is the place node. I now propose a rule of regressive vowel assimilation for Komo:

(135) Regressive vowel assimilation

    I. a. minimal
       c. structure
       d. opposite direction

   II. Place node

  III. trigger/target condition: [αround]
         (same value of [round] on both vowels)

The following comments apply to (135).

- The rule is minimal, scanning supralaryngeal nodes.

This causes the rule to be blocked by a consonant. This is somewhat of a paradox: as I interpret the Archangeli and Pulleyblank (1986) framework, a maximal rule, having to do with vowels, skips over any consonant. Here it appears that a minimal rule is needed to cause the rule to be blocked by a consonant.

- The rule inserts structure, that is, lines of association from the argument, which is a place node, leftward (see the next comment) onto an adjacent supralaryngeal node (see below).

- The rule operates in the opposite direction, since presumably nodes would associate in a left to right direction.

Possibly, the directionality parameter is undefined for arguments that are not features.

- The vowels involved in the rule have the same value of [round], since the rule only works in an environment of uniform roundness.

- Trigger and target are both linked (at least to some value of [round]).

As well, I assume that there is a repair strategy in the language that delinks the previous place node from the target vowel after the regressive assimilation rule has taken place.

I represent the rule graphically in (136), using front vowels as examples. Here the 'alpha' of the rule would be a '+'.

This rule scans for two adjacent supralaryngeal nodes dominated by rhyme nodes. If there is an intervening non-empty consonant, then the place node is not able to link to an adjacent vowel because of the

existence of a supralaryngeal node on the intervening consonant. The anti-crossing constraint then prevents the rule from applying.[55]

(136) Graphic representation of (135), making 'alpha' = '+'
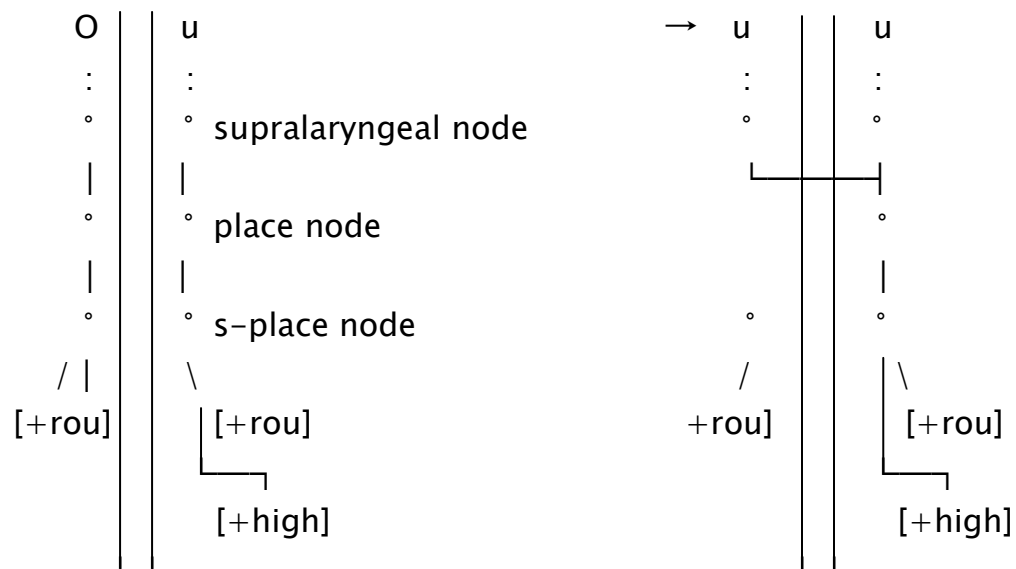
I now show a sample derivation where regressive assimilation must apply twice. The first applies inflectionally in formation of the participle; the second to post-lexically in concatenation of the subject clitic.

(137) Derivation of <u>uuúba</u> 'you know (imperfective)', ignoring tone
  [2s]   [know:impf]
  [O]   [uba] input from the derivational stratum,
            imperfective inflection
  [O] [[O][uba]] participle prefix
  [O] [[u][uba]] regressive assimilation
  [O]   [uuba] bracket erasure
    [[O][uuba]] concatenation of subject clitic

---

[55] See the previous footnote.

    [[u][uuba]] regressive assimilation

      [uuuba]   bracket erasure, output

7.4 Conclusions

In this chapter, I first noted a rule of vowel copy that operates with regard to the habitual suffix.

Then I exhibited the process of the derivation of the inflectional morpheme complex. I suggested an analysis whereby there is a sequence of morphological rules and morphologically–triggered phonological rules that act in concert to derive an inflectional morpheme complex. Vowel copy also played a role in this process.

Next, I demonstrated a rule of regressive vowel assimilation that is typologically noteworthy in that it is blocked by consonants. Regressive vowel assimilation was typologically interesting in that it was the second Komo rule that made reference to a place node as an argument to a rule. (The other such rule was the rule of nasal assimilation.)

8. CONCLUSION AND SUMMARY

8.1 Typological findings

The Komo community utilizes a language game of syllable reversal throughout a word called "kimasa" (section 2.2). This feature of the language was used in this thesis as a diagnostic of Komo syllable structure. As such, it provided evidence regarding the independence of tonal melody from segmental phonology and even syllable structure in that, while syllables and the segments they dominate reverse, the tonal melody does not. As a matter for further research, this language game could also be used to diagnose what constitutes a word. For example, should adverbs found between an inflectional morpheme complex and the main verb be considered as clitics or as incorporated adverbs (an example is in (128))? Do such adverbs reverse separately or with the whole word? Unfortunately, I have not yet been able to obtain such data. Finally, <u>kimasa</u> is the transformed Swahili word <u>samaki</u> 'fish'. Does this fish language extend from the southern parts of Komo land where I have seen it spoken, into the Lega-speaking area to the south? If so, it could be a useful bit of methodology (perhaps even introducible) for some Bantu languages.

Labiality, which for vowels is interpreted as protrusion of the lips, or rounding, can spread to a nasal consonant, where it is interpreted as closure of the lips. The result is an alternation between [n] and [m] in the third person singular object prefix and the nominalizing prefix (or the Bantu noun-class 9 prefix), when preceding a vowel-initial verb stem (chapter 2, page 22ff). This is a reversal of what seems to be the more typical case, where labiality spreads from consonants to vowels (Odden 1991). This has implications for hierarchical models of phonological features; viz., [labial] must be

multiply attached to both the place node and the secondary (or vowel) place node.

Komo has default [+ATR] (chapter 4). This analysis was necessary to account for behavior of affixes in the environment of an adjacent low vowel in a stem (i.e., such vowels surface as [+ATR] vowels). This seems to be somewhat unusual for Bantu seven vowel languages. Kimatuumbi, a Bantu language of Tanzania, apparently has default [–ATR] and five [–ATR] vowels: two high, two mid, and [a]. Only [i] and [u] are [+ATR] (Odden 1991:283). Bira, which is closely related to Komo, appears to exhibit similar features (Kutsch Lojenga, personal communication).

Komo has default [–high]. This analysis optimized the description of the third person plural object prefix in the presence of third person subject agreement (section 5.1), as well as the description of perfective endings of some verb stems (section 5.2).

The low vowel, [a], is lexically unspecified, an empty nucleus. Such an analysis of [a], together with the analysis of default [+ATR] and [–high], provides a simple explanation of how Swahili loan words are pronounced in Komo (section 3.2). It makes a description of elision nearly rule-free (section 3.4), and it accounts in a straightforward manner for the behavior of the third person subject prefixes, when a third person plural object prefix is superimposed (section 5.1). In section 3.4 and 7.2, it is the default vowel, if optional vowel copy does not occur in first and second person forms of the inflectional morpheme complexes of more than one syllable. These attributes of [a] are surprising in that [i] is usually the least marked vowel in other languages (Kean 1975; Archangeli and Pulleyblank 1986:A–353).

8.2 Impact on theory

My analysis demonstrates that a framework that favors insertion rules over deletion rules leads to an unusual account of the skeletal

structure of verb roots and verb suffixes (chapter 6); viz., the root is frequently CV or CVCV, suffixes are V, CV, or skeletally empty, while the feature content of verb suffixes and tense-aspect-mood morphemes occupy autosegmental tiers. This does, however, seem counter-intuitive in that, on the face of things, the most usual verb root appears to be CVC and suffixes appear to be V or VC. The implication for the theory is that, either such analyses have to be accepted (i.e., surface facts do not always mirror underlying structures), or that the theory needs modification.

Komo has an inflectional morpheme complex associated with verbs that displays the distinctly un-Bantu characteristic of using vowel copy, the copied vowel agreeing with the person of the subject. The surface result reminds one of Semitic languages, where consonants and vowels are associated with different morphemes and occupy different morphemic tiers (McCarthy 1981). Using the Word and Paradigm model of morphology (Anderson 1982; McCarthy 1981; implicit in Archangeli and Pulleyblank 1986), I proposed an algorithm that derives Komo inflectional morpheme complexes in a straightforward manner (chapter 7). The algorithm consisted of an ordered, layered set of morphological insertions that were, in one case, crucially ordered. The need for the power of the Word and Paradigm model was upheld by the Komo data.

I used a parametric framework for rule description, as advanced by Archangeli and Pulleyblank (1986), and used Goldsmith (1990) with regard to metrical rules. The advantages of such a framework are: (a) severe constraints on the class of possible phonological rules are implicit in the formalism; (b) rules of Komo can be easily grouped into taxonomic categories by certain features apparent in their description, as in (138).

(138) A taxonomy of phonological rules with Komo examples

Rule type	Crucial parts of the rule	Examples
Default	all parameters at default settings no part III	[+ATR] [−high]
Redundancy	context sensitivity in rule part III	default [labial] (context=[+rou])
Harmony	l. c. structure	[−ATR] [+high]
Copy	s–place node	vowel copy
Assimilation	place node	nasal assimilation regressive vowel assimilation

I feel that the precision offered by Archangeli and Pulleyblank's (1986) notational convention gives it a future with regard to phonological analysis. However, certain questions have arisen in this study that call for further elaboration and clarification.

(a) The rule parameter *maximal* needs further elaboration.

In the rule of regressive vowel assimilation (section 7.3), a vowel assimilates in height to the vowel on its right. The process is blocked by a consonant, so it must be a place node that spreads, since a consonant does not dominate an s–place node or a vowel feature. Such a rule cannot be maximal, because, in the Archangeli and Pulleyblank (1986) framework, only rhyme nodes are scanned for vowel features. Assuming that a *minimal* rule is the correct setting, so that the rule scans supralaryngeal nodes (which immediately dominate place nodes), the theory then ends up with a *minimal* rule being more restrictive on adjacency (i.e., defining consonants as adjacent for the purpose of the rule) than a *maximal* rule (i.e., consonants are skipped by the rule). This is an unlikely consequence, given the semantics of *maximal* and *minimal*, especially when—for Khalka Mongolian—a *minimal* rule may

skip over a vowel (see example (14, page 27). Perhaps what is needed is to give the maximal/minimal parameter more clarity, where the nodes or tier to be scanned by a rule are precisely defined in the statement of the rule.

(b) The notion of trigger/target needs better definition.

It was not always clear what constituted a trigger and what constituted a target. Perhaps a better term for part III of a rule would be 'environment constraints', or even the traditional term, 'structural description'.

Taken as a whole, however, the notational conventions and rule constraints of Archangeli and Pulleyblank (1986) were useful in describing a large set of phenomena in one language. The features of Komo largely support this framework.

APPENDIX

APPENDIX. RESIDUE: ATR IN MULTISYLLABIC MONOMORPHEMIC WORDS AND IN BORROWED WORDS

There are two bits of related residue in the analysis of default ATR. The first is that there are two monomorphemic words in my data base, ɔmíɔ 'fire stick' and sɔ́ŋgɔɗɔmíɔ 'earthworm', which have [−ATR] vowels on both sides of a high front vowel. There are no such attested cases of [−ATR] vowels occurring on both sides of a [u] or [a].

What is problematic about these words is that normally an [i] would be expected to block ATR harmony in the analysis I have adopted, since it is lexically-specified as [+high]. Thus, all except the final vowels of these words would be expected to be [+ATR] by default, after [−ATR] harmony is blocked.

Before I make or rule out any analyses based on these two forms alone, I would like to first present the other bit of residue, which consists of the pronunciation of foreign proper nouns.

In such words all mid vowels are [−ATR]. Here is some data from a list of borrowings of Biblical names from Greek, which are totally foreign to Komo (unlike ɟéso 'Jesus').

(139) Transliterations of Biblical proper nouns

Name	Transliteration
Apollonia	apɔlɔnía
Claudius	kɔɔdíɔ
Eubulus	ɛubúɔ
Fortunatus	ɸɔɔtunátɔ
Areopagus	aɛɔpágɔ
Corban	kɔɔɓánɛ

A possible analysis would be to propose an early stratum where monomorphemic multisyllabic nouns are derived. To such a stratum, foreign words, <u>ɔmíɔ</u> 'match', and <u>sɔ́ŋgɔdɔmíɔ</u> 'earthworm' would be assigned. They would be lexically assigned the value [–ATR]. And, as such, it could have a context-sensitive redundancy rule as follows:

(140) Redundant ATR Domain: pre-concatenation

    II. [–ATR]

    III. – [αround] (or [–low])
        – three or more syllables or a foreign word
        – [–high]

I note here that other analyses are possible, and particularly due to the game-like nature of the foreign word data and the paucity of internal evidence (only two forms), I regard my proposal here as tentative.

REFERENCES

Anderson, Stephen R. 1982. Where's morphology? In *Linguistic Inquiry* 13.4:571–612. Cambridge, MA: MIT Press.

Archangeli, Diana, and Douglas Pulleyblank. 1986. The content and structure of phonological representation. Unpublished manuscript, University of Southern California.

Chinchor, N. 1978. On the treatment of Mongolian vowel harmony. In *Northeast Linguistics Society* IX, City University of New York Forum, New York.

Clements, George N. 1985. The geometry of phonological features. In *Phonology Yearbook* 2:225–252. Cambridge, UK: Cambridge University Press.

Clements, George N. 1990. Place of articulation in consonants and vowels: a unified theory. B. Laks et A. Rialland (eds.), *L'architecture et la géométrie des représentations phonologiques*. Paris: Centre nationale de recherches sociales.

Goldsmith, John. 1976. *Autosegmental phonology.* Doctoral dissertation, Massachusetts Institute of Technology.

Goldsmith, John. 1990. *Autosegmental and metrical phonology*. Cambridge, UK: Basil Blackwell.

Guthrie, Malcolm. 1948. *The Classification of the Bantu languages.* London: Dawsons of Pall Mall (reprinted 1967).

Harries, Lyndon. 1958. Kumu: a sub-Bantu language. In *Kongo-Overzee* 24:264–296, Belgium.

Kean, Mary-Louise. 1975. The theory of markedness in generative grammar. Doctoral dissertation, Massachusetts Institute of Technology.

Kutsch Lojenga, Constance, and Timothy Raymond. 1985. A linguistic picture of northeastern Zaire: Bera – Bila – Bele – Komo. Unpublished manuscript. Nairobi: Summer Institute of Linguistics.

Maddieson, Ian, and Peter Ladefoged. 1989. Multiply articulated segments and the feature hierarchy. In *Working Papers in Phonetics* 72. University of California at Los Angeles.

Mahieu, Wauthier de. 1975. *Les structures sociales du groupe komo dans leur élaboration symbolique.* Doctoral dissertation. Katholieke Universiteit te Leuven.

Mahieu, Wauthier de. 1980. *Structures et symboles: les structures sociales du groupe Komo du Zaïre dans leur élaboration symbolique.* London: International African Institute.

Mahieu, Wauthier de. 1985. *Qui a obstrué la cascade?* Cambridge, UK: Cambridge University Press.

McCarthy, John J. 1981. A prosodic theory of nonconcatenative morphology. In *Linguistic Inquiry* 12:373–418. Cambridge, MA: MIT Press.

Meeussen, A. E. 1967. Bantu grammatical reconstructions. In *Africana Linguistica* III:79–128. Annales, Sciences Humaines 61. Tervuren: Musée royal de l'Afrique central.

Meyer, James, and Timothy Raymond. 1981. *La phonologie de la langue eBhele.* Lubumbashi: Centre d'études linguistiques théoriques et appliquées, Université nationale du Zaïre.

Mohanan, K. P. 1982. The theory of lexical phonology. *Indiana University Linguistics Club.* Bloomington, IN: IU Press.

Mohanan, K. P. 1986. *Lexical phonology.* Dordrecht: Reidel.

Odden, David. 1991. Vowel geometry, In *Phonology* 8:261–289. Cambridge, UK: Cambridge University Press.

Packenham, Thomas. 1991. *The scramble for Africa*. New York: Random House.

Piggott, Glyne. 1988. A parametric approach to nasal harmony. In *Features, segmental structure, and harmony processes*, Part I., Harry van der Hulst and Norval Smith editors, Dordrecht: Foris Publications.

Pulleyblank, Douglas. 1986. *Tone in lexical phonology.* Dordrecht: Reidel.

Steriade, D. 1979. Vowel harmony in Khalkha Mongolian. In *Massachusetts Institute of Technology Working Papers in Linguistics,* vol. 1.

Thomas, John Paul. 1991. Reflexes of Bantu noun-class prefixes in Komo. (paper presented at the *22nd Annual Conference on African Linguistics*, University of Nairobi, July 15–19.)

Thomas, John Paul. 1992. Tone in Komo. In *Work papers of the Summer Institute of Linguistics*: University of North Dakota session.

Thomas, John Paul. n.d. Dependent clause constructions in Komo, (in preparation).