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MORPHOLOGICAL STRATIFICATION IN DINKA: On the alternations of voice quality, vowel length and tone in the morphology of transitive verbal roots in a monosyllabic language*

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Dinka is a Western Nilotic language with three contrastive degrees of vowel length, two contrastive voice qualities in vowels, and three contrastive tones. Although to a large extent a monosyllabic language, Dinka has an elaborate morphology. In monosyllabic words the morphology is manifested solely by alternations among values of a number of phonological parameters of the root, including, among others, vowel length, voice quality, and tone. In this article the alternations of these three parameters are systematically set forth and described for the core of the derivational and inflectional morphology of transitive verbal roots in the Agar dialect of Dinka. Furthermore, it is argued that morphologically complex monosyllabic verb forms are analysable as configurations of morphological layers at which values of the phonological parameters are specified, such configurations being underlying phonological representations.

* This article is based on field work carried out during a number of trips to the Sudan between 1984 and 1990. I gratefully acknowledge financial support from the Danish Research Council for the Humanities and from the Scandinavian Institute of African Studies. I also wish to thank an anonymous referee for valuable comments.

The article was completed in February 1991 before my article "Vowel quality alternation in Dinka verb inflection", which appeared in *Phonology* 10:1-42 in 1993.

1. Introduction

Dinka, a major Western Nilotic language spoken in the Sudan, is to a large extent a monosyllabic language, but, unlike monosyllabic languages like Chinese and Vietnamese, it has an elaborate morphology. Thus, many monosyllabic words in Dinka are morphologically complex, the morphology of such words being manifested by way of morphophonological alternations in the root. In nouns these alternations are exponents of number inflection and case inflection, and in verbs they are exponents of derivation, of subject inflection, and of inflection for topic selection. The phonological parameters regularly involved in alternations are vowel length, tone, voice quality, vowel quality, and final consonant.

The morphophonological alternations have been touched on in some previous studies of Dinka, e.g., in Tucker [1939] and Nebel [1948], but the treatment given to them in those studies is phonologically inadequate, especially with regard to tone, vowel length, and voice quality. The reason for this inadequacy is that, until recently, the system of phonological contrasts in Dinka has remained unclear. However, using the phonological findings in Andersen [1987], it now seems possible to begin revealing the facts of Dinka morphophonology systematically and to state these facts accurately.

The purpose of the present article, then, is to initiate a systematic description of Dinka morphology. I have chosen to concentrate on what I believe to be the core of the morphology of transitive verbal roots. What I intend to show is how the parameters of vowel length, voice quality, and tone are utilized, and how each of these contributes to the radical, the derivational, and the inflectional information encoded in verb forms. Vowel quality alternation also plays a crucial role in the verbal morphology, but lack of space prevents me from dealing with it here. However, the omission of this parameter is also justified by the fact that the other parameters operate completely independently of it. The fifth parameter, consonant alternation, is largely confined to the nominal morphology and is not used productively in the verbal morphology. Therefore, this parameter will also be ignored here.

The dialect of Dinka described in this article is Agar, which is spoken in the Rumbek area of the southern Sudan. The generalizations are based on an examination of some 500 roots.

The facts to be presented suggest that the morphology of Dinka is organized as a system of layers, each of which may specify values of phonological parameters. A formal analysis of the morphological stratification might well turn up arguments that bear in interesting ways on current issues in phonological theory. However, at the present stage of research on Dinka, I find it more important to provide as complete a description of the language as possible than to dwell on theoretical problems.

The article is organized as follows. Section 2 gives a brief outline of the phonological system of Agar Dinka. Section 3 identifies a set of derivational and

inflectional categories of verb forms with a transitive root. Section 4 presents a phonological classification of such roots, a classification on which the morpho-phonological alternations are crucially dependent. Sections 5, 6, and 7 spell out the alternations for each of the parameters: voice quality, vowel length, and tone. Section 8, finally, summarizes the model of morphological stratification suggested by the facts of Dinka morphology.

2. Phonological contrasts in monosyllabic words

In this section I outline the system of phonological contrasts existing in monosyllabic words of Agar Dinka. For more details the reader should see Andersen [1987]. The symbols used in the present article are IPA symbols as of 1989 (see International Phonetic Association [1989]).

Most monosyllabic words have an initial consonant, a medial vowel, and a final consonant, while a few lack the initial consonant and/or the final consonant. Since stems of words with affixes have the same structure, monosyllabic words will also be referred to as stems.

The inventory of consonant phonemes is shown in (1).[1]

(1)

	labial	interdental	alveolar	palatal	velar	labiovelar
voiceless stop	*p*	*t̪*	*t*	*c*	*k*	
voiced stop	*b*	*d̪*	*d*	*ɟ*	*g*	
nasal	*m*	*n̪*	*n*	*ɲ*	*ŋ*	
voiced fricative					*(ɣ)*	
trill			*r*			
lateral			*l*			
glide				*j*		*w*

All consonants occur in stem-initial position. The voiced stops do not occur in stem-final position, except that they are allophones of the voiceless stops before a suffix vowel, and [ɣ] does not occur stem-finally at all.

Dinka has seven contrasting vowel qualities, distinguishing four degrees of height, as shown in (2).

(2)

i *u*
e *o*
ɛ *ɔ*
a

[1] As argued by Duerksen [1989], the phonemic character of [ɣ] is questionable.

There are three contrasting degrees of vowel length: short, half-long, and long. These are symbolized by a sequence of, respectively, one, two, and three identical vowel symbols. The ternary opposition is demonstrated by minimal triplets like those in (3) and (4).[2]

(3)	short	*à-wɛ̀c*[3]	'You are kicking it'	(D-kick:2S)
	half-long	*à-wɛ̀ec*	'He is kicking it'	(D-kick:3S)
	long	*à-weɛ̀ec*	'He is sweeping it'	(D-sweep:3S)
(4)	short	*à-bo̱k*	'It is being thrown at'	(D-throw:PAS)
	half-long	*à-bo̱ok*	'He is throwing it thither'	(D-throw:CF:3S)
	long	*à-boo̱ok*	'He is throwing repeatedly'	(D-throw:M:AP)

In addition to the monophthongs in (2), there are a number of diphthongs, which have the following characteristics: (i) the first component is a high vowel; (ii) three degrees of length are distinguished, just like in monophthongs; and (iii) the length is realized phonetically by the second component. With those characteristics, the diphthongs should be conceived of as being associated with the skeletal tier (the CV-tier) in the manner exemplified in (5).

(5) a.

/kuɑ̀c/
'leopard'

b.

/n̪iɑ̀ak/
'tomorrow'

c.

/luɛɛ̀ɛt̪/
'saliva'

That is, the second component of a diphthong is associated with the V-positions of the skeletal tier, and the first component is associated with the initial C-position together with the initial consonant. In addition, there are a couple of triphthongs, whose two first components are high vowels, and in which again the length is

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[2] The following abbreviations are used in interlinear glosses and some of them in the text as well:

1S/2S/3S = first/second/third person singular
1P/2P/3P = first/second/third person plural

ALL	= allative	CT	= having a circumstantial topic	NF	= non-finite
AP	= antipassive	D	= declarative	NTS	= having a non-topical subject
B	= benefactive	FUT	= future	PAS	= passive
BAP	= benefactive-antipassive	GEN	= genitive	PF	= perfect
C	= causative	LOC	= locative	PL	= plural
CF	= centrifugal	M	= multiplicative	PREP	= preposition
CP	= centripetal	NEG	= negation	PRO	= proform

[3] The morpheme */à /* is not a prefix but a proclitic particle, cf. section 3.1 below.

realized phonetically by the last component. In this case, then, the two first components should be conceived of as being associated with the initial C-postition, as in (6).

(6)

/juiə̰̂en/ 'rope'

Vowel quality and vowel composition are independent of vowel length. That is, all monophthongs and all final components of diphthongs and triphthongs can occur with any of the three degrees of length. However, the underlying contrast between *a* and *ɛ* seems to be neutralized in the phonetic representation if the vowel is short, in which case I use the symbol *a* to the exclusion of *ɛ*.

Vowels are realized with one of two voice qualities or phonation types: creaky /◌̰/ and breathy /◌̤/. The contrast between them is shown by the minimal pairs in (7)-(8). The subscript diacritics are used only once for each vowel, whatever the number of vowel symbols.

(7)	*à-wə̰̀ec*	'He is kicking it'	(D-kick:3S)
	à-wə̤̀ec	'He is kicking it hither'	(D-kick:CP:3S)
(8)	*à-tə̰̂ɛŋ*	'He is dusting'	(D-dust:AP)
	à-tə̤̂ɛŋ	'I am dusting for him'	(D-dust:BAP:1S)

Generally speaking, voice quality and vowel quality are independent parameters in the sense that they can combine freely. A major exception is that the vowel quality *u* can only be breathy, unless it is the first component of a diphthong or triphthong.

There are three contrasting tones: High /◌́/, Low /◌̀/, and Falling /◌̂/, the latter falling from the level of High to the level of Low. The contrast is shown by the minimal triplets in (9)-(10). The superscript diacritics are used only once for each vowel, whatever the number of vowel symbols.

(9)	H(igh)	*à-wə̤́ec*	'You are kicking it hither'	(D-kick:CP:2S)
	L(ow)	*à-wə̤̀ec*	'He is kicking it hither'	(D-kick:CP:3S)
	F(alling)	*à-wə̤̂ec*	'He is kicking'	(D-kick:AP)
(10)	H	*à-leə̤́er*	'You are rolling it hither'	(D-roll:CP:2S)
	L	*à-leə̤̀er*	'He is rolling it hither'	(D-roll:CP:3S)
	F	*à-leə̤̂er*	'He is rolling for him'	(D-roll:BAP:3S)

Tone is independent of vowel length (and of voice quality and vowel quality), except that the contrast between H and F seems to be neutralized on short vowels.

3. Morphological categories

In this section I define a set of morphological categories that is needed for a description of the set of verb forms that manifests a transitive verbal root. Note that by "morphological category" I do not mean a paradigmatic category like number or person, but a category of verb forms with a particular derivational or inflectional meaning. First, I give a brief outline of the structure of clauses, then I identify a set of derivational categories, and, finally, I identify a set of inflectional categories. While the derivational categories to be dealt with are certainly not the only ones that are pertinent to transitive verbal roots, the list of inflectional categories is virtually exhaustive, and not only so for the morphology of transitive roots, but also for the verbal morphology as a whole.

3.1. Clause structure. As a prerequisite to defining the morphological categories of the verb in Dinka, this subsection outlines some aspects of clause structure. A basic distinction is made between declarative and non-declarative clauses. Declarative clauses conform to the scheme shown in (11).

(11) Declarative Clause Scheme:

Topic Decl Neg Verb_{fin} Subject $\text{Object}_{\text{dir}}$ Verb_{nf} $\text{Object}_{\text{indir}}$ Adv

This clause scheme, which consists of a finite number of slots, indicates the relative order in which clause constituents occur if they are present. Actually, the scheme in (11) is not exhaustive, since more slots have to be recognized, but it is sufficient for the present purpose. Some examples are given in Table 1.

Table 1: Analysis of a sample of declarative clauses in terms of the clause scheme

	Topic	Decl	Neg	$Verb_{fin}$	Subject	Obj_{dir}	$Verb_{nf}$	Obj_{indir}	Adv
(a)	*mə̀riə̀al*$_i$	*ə̀*$_i$	*cə̀*	*bíi*	*ɖáaŋ-dɛ̀*$_i$	*mɛ̀t*	*ṭáat*	*tùik*	*ɲiə̀ak*
	Marial	D	NEG	FUT:NTS	boy-3S	child	beat:B:NF	woman	tomorrow
(b)	Ø$_i$	*ə̀*$_i$	—	*ṭɛ́ɛt*	Ø$_i$	—	—	—	—
		D		beat:AP					
(c)	*rɔ̀ɔr*$_i$	*ə̀a*$_i$	—	*bûuṭ*	Ø$_i$	*yɔ̀t*	—	*tùik*	—
	men	D:PL		build:B		house		woman	
(d)	Ø$_i$	*ə̀*$_i$	—	*wɛ̀ɛc*$_j$	Ø$_j$	Ø$_i$	—	—	—
		D		kick:3S					
(e)	*juiɛ̀ɛn*$_i$	*ə̀*$_i$	—	*cíin-ɛ̀*	—	*wɛ́ŋ*	*mɪ̃it*	—	Ø$_i$
	rope	D		PF-PAS:CT		cow	pull:NF		
(f)	*yɔ̀t*$_i$	*ə̀*$_i$	—	*leɛ́er*	*tùik*	*doɔ̀ot*	—	—	*ṭín*$_i$
	house	D		roll̃:NTS	woman	stone			PRO:LOC

" — " indicates an unfilled slot, " Ø " (zero) an empty trace. Subscripts indicate coreference among the topic, the declarative particle and a postverbal (zero or non-zero) constituent, or coreference between a verb and a postverbal zero subject.

Key: (a) 'Marial's boy will not beat the child for the woman tomorrow'
(b) 'He is beating'
(c) 'The men are building a house for the woman'
(d) 'He is kicking it'
(e) 'The cow has been pulled with the rope'
(f) 'The woman is rolling a stone in the house'

Any clause has a topic, which occurs clause-initially. The topic is a noun phrase in the absolutive case, but if it is anaphoric, i.e., pronominal and third person, it is normally covert, i.e., expressed by zero. Whether overt or covert, the topic controls number agreement of the obligatory declarative particle, which occurs immediately after the topic slot, and which is procliticized on the following constituent, i.e., on the optional negation particle or on the obligatory finite verb. Thus, the declarative particle is */ə̀-/* after a singular topic, and */ə́a-/* or */ə̀a-/* after a plural topic. The topic can bear any of at least the following grammatical relations: subject, direct object, adverbial, and possessor (see Andersen [1991]). Constituents which are not topicalized occur in positions after the finite verb. A non-topical subject occurs immediately after the finite verb, where it is a noun phrase in the genitive case, unless it is expressed by a verbal suffix or is expressed in the verb stem.[4] A non-topical direct object occurs immediately after the subject slot and has the absolutive case. Next comes another verbal slot, which may be filled by one or more non-finite verbs. These precede indirect objects,

[4] The absolutive case is the unmarked member of the case category and hence left unglossed in the interlinear gloss. The genitive case form is also left unglossed if it is identical with the absolutive case form, which it often is. When formally different, these two case forms differ solely in tone.

which have the absolutive case. Non-topical adverbials occur in the clause-final slot, where they are either prepositional phrases, adverbs, nouns in the locative case, or some other type of locative expression. In addition, topicalized place adverbials need a coreferential proform in this slot (see example (f) of Table 1).

Non-declarative clauses lack the declarative particle. Moreover, their constituent order possibilities are somewhat different from those of declarative clauses.[5] For instance, and that is what is relevant here, a topical subject follows the finite verb and has the genitive case (unless the clause contains the negation particle, in which case it immediately follows that particle and has the absolutive case). These differences between declarative and non-declarative clauses are exemplified by the subject topic clauses in (12) and the object topic clauses in (13), where the (a)-clauses are declarative, the (b)-clauses interrogative, and the (c)-clauses what may be called coordinative.

(12) Subject topic

a. *ɟó̤ à̰-kà̰c mḛ̀t̪*
dog D-bite child
'The dog is biting the child'

b. *ká̰c ɟò̤ mḛ̀t̪*
bite dog:GEN child
'Is the dog biting the child?'

c. *kṳ̀ ká̰c ɟò̤ mḛ̀t̪*
and bite dog:GEN child
'and the dog bit the child'

(13) Object topic

a. *mḛ̀t̪ à̰-kɛ̰́ɛc ɟò̤*
child D-bite:NTS dog:GEN
'The dog is biting the child'

b. *mḛ̀t̪ kɛ̰́ɛc ɟò̤*
child bite:NTS dog:GEN
'Is the dog biting the child?'

c. *kṳ̀* kɛ̰́ɛc *ɟò̤*
and bite:NTS dog:GEN
'and the dog bit him'

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[5] What is said about non-declarative clauses in this article does not apply to relative clauses (see Andersen [1991]).

3.2. Derivational categories. Dinka has a large number of derivational categories that are pertinent to transitive verbal roots, and all of these categories are expressed solely by root-internal alternations, i.e., by non-affixal modifications of the root. The derivational categories that I shall be dealing with, and all of which seem to be productive, are exemplified in (14) with a root meaning 'to pull'. The clauses in (14) all have a subject topic.

(14) a. Simple
dɔ̈ɔ̈k à-mɪ̈it wɛ̰ŋ
boy D-pull cow
'The boy is pulling the cow'

b. Centrifugal
dɔ̈ɔ̈k à-mɪ̈̃it wɛ̰ŋ
boy D-pull:CF cow
'The boy is pulling the cow thither'

c. Centripetal
dɔ̈ɔ̈k à-mɪ̈̀it wɛ̰ŋ
boy D-pull:CP cow
'The boy is pulling the cow hither'

d. Benefactive
dɔ̈ɔ̈k à-mɪ̈it wɛ̰ŋ mɔ̰c
boy D-pull:B cow man
'The boy is pulling the cow for the man'

e. Benefactive-antipassive
dɔ̈ɔ̈k à-mɪ̈̃it mɔ̰c
boy D-pull:BAP man
'The boy is pulling for the man'

f. Antipassive
dɔ̈ɔ̈k à-mɪ̈it
boy D-pull:AP
'The boy is pulling'

A *simple* stem, as in (14a), is a non-derived stem. As opposed to the other stems, which are derived, it expresses the root meaning without any modification. Like other transitive stems, it is strictly transitive; that is, it requires a direct object, although the latter may be covert if it has the topic position. In Tables 8-10 below, this derivational category is symbolized by "∅".

A *centrifugal* (CF) stem, as in (14b), basically indicates that the action is directed away from the deictic centre, which is typically the speaker. Conversely, a *centripetal* (CP) stem, as in (14c), indicates that the action is directed towards

the deictic centre. If a Goal is specified, as in (15), the stem must be either centrifugal or centripetal; that is, a simple stem cannot be used.

(15) a. *d̪ɔ̤̀ɔ̤k à̰̤-mḭ̤̂it t̪ɔ̤̀ɔ̤k ɣɔ̤́t*
boy D-pull:CF goat house:ALL
'The boy is pulling the goat in (thither)'

b. *d̪ɔ̤̀ɔ̤k à̰̤-mḭ̤̂it t̪ɔ̤̀ɔ̤k ɣɔ̤́t*
boy D-pull:CP goat house:ALL
'The boy is pulling the goat in (hither)'

Like simple stems, centrifugal stems and centripetal stems are monotransitive, and their direct object often has the same semantic role as the object of the corresponding simple stem, as it does in (14) and (15), viz. that of Patient. However, if the action is a movement of something which is different from the Patient, then what moves is typically made the object. This is illustrated by the set of examples in (16)-(17).

(16) a. *d̪ɔ̤̀ɔ̤k à̰̤-bɔ̤̀k dḭ́t*
boy D-throw bird
'The boy is throwing at the bird'

b. *d̪ɔ̤̀ɔ̤k à̰̤-bɔ̤́ok doɔ̤̀ot*
boy D-throw:CF stone
'The boy is throwing a stone thither'

c. *d̪ɔ̤̀ɔ̤k à̰̤-bɔ̤̀ok doɔ̤̀ot*
boy D-throw:CP stone
'The boy is throwing a stone hither'

(17) a. *ṯḭ̀ik à̰-ɲḭ̤à̰c à̰lâ̰at̪*
woman D-squeeze cloth
'The woman is wringing the cloth'

b. *ṯḭ̀ik à̰-ɲiɛ̤́ɛc pḭ̤̂iw*
woman D-squeeze:CF water
'The woman is squeezing water out thither'

c. *ṯḭ̀ik à̰-ɲiɛ̤̀ec pḭ̤̂iw*
woman D-squeeze:CP water
'The woman is squeezing water out hither'

A *benefactive* (B) stem, as in (14d), is ditransitive, taking a Beneficiary object in addition to the Patient object of a simple stem. Either of these semantic roles can be mapped onto the syntactic role of direct object, the other becoming an indirect object. Thus, we have variants like those in (18).

(18) a. *mäkëër à-bûut yòt mòc*
Maker D-build:B house man

b. *mäkëër à-bûut mòc yòt*
Maker D-build:B man house
'Maker is building a house for the man'

An *antipassive* (AP) stem, as in (14f), is an intransitive stem which demotes the object of the corresponding simple stem to an optional adverbial. The latter is a prepositional phrase with the preposition /ë/ ~ /në/. In (19)-(20) the (a)-clauses contain a simple verb stem and an object Patient, the (b)-clauses contain an antipassive verb stem and an adverbial Patient, and the (c)-clauses contain an antipassive verb stem and no Patient.

(19) a. *mòc à-dëk mäaw*
man D-drink beer
'The man is drinking beer'

b. *mòc à-dëëk ë mäaw*
man D-drink:AP PREP beer
'The man is drinking beer'

c. *mòc à-dëëk*
man D-drink:AP
'The man is drinking'

(20) a. *mäkëër à-ṭër tɔɔ̀ɔŋ*
Maker D-sharpen spears
'Maker is sharpening spears'

b. *mäkëër à-ṭëɛr ë tɔɔ̀ɔŋ*
Maker D-sharpen:AP PREP spears
'Maker is sharpening spears'

c. *mäkëër à-ṭëɛr*
Maker D-sharpen:AP
'Maker is sharpening'

A *benefactive-antipassive* (BAP) stem, as in (14e), is a monotransitive stem that combines the syntactic effects of the benefactive and the antipassive. That is, a Beneficiary (direct) object is introduced, and the Patient object is eliminated. However, it is not clear whether this derivational category should be analysed morphologically as consisting of one or two derivational elements.

In summary, for many transitive roots there are at least six stem types, each of which has a distinct derivational status: a simple stem, a centrifugal stem, a centripetal stem, a benefactive stem, a benefactive-antipassive stem, and an antipassive stem.[6]

3.3. Inflectional categories. Any verb form belongs to some inflectional category, which is either non-finite or one among ten finite categories. The inflectional category of a verb is independent of its derivational category, except that, for logical reasons, one of the finite categories cannot combine with the antipassive category (cf. below). Some inflectional categories are expressed solely by non-affixal modifications of the root. Others are sometimes or always expressed by suffixes, but often suffixation is accompanied by non-affixal modifications of the root as well. Thus, both inflection and derivation involve root-internal alternations.

All finite categories express two types of information: subject information and topic information. Thus, a finite verb indicates whether the clause has a subject or not, or it expresses a pronominal subject. In each case the finite verb also gives some indication of the grammatical relation of the topic. Loosely speaking, therefore, a finite verb is inflected both for subject and for topic selection.

In clauses that have a subject and in which the subject is a noun phrase, the finite verb indicates whether the subject is topical or non-topical. Thus, one verb form is used in clauses with a subject topic, while a different verb form is used in clauses with an object topic or a circumstantial topic, the latter being a topic which is either an adverbial or a possessor. The topical subject form of the verb is the unmarked member of this binary opposition (cf. below), and it is, therefore, left unglossed in the interlinear gloss, labeled "Ø" (zero) in tables, and elsewhere referred to as "the (inflectionally) unmarked verb form". The non-topical subject form of the verb is glossed "NTS" in the interlinear gloss. In (21)-(26) the two inflectional categories are illustrated with the root 'to pull' for each of the six derivational categories introduced in section 3.2. Each set of examples consists of propositionally identical clauses with a subject topic (S-topic), an object topic (O-topic) and/or a circumstantial topic (C-topic).

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6 Other derivational categories are *inter alia* antipassive centrifugal, antipassive centripetal, multiplicative, antipassive multiplicative, reciprocal, and causative.

(21) Simple
S-topic *ḍɔ̈ɔ̈k à-mɪ̀it wɛ́ŋ nɛ̈ juiɛ̈en*
boy D-pull cow PREP rope

O-topic *wɛ́ŋ à-mɪ́ɪ̈it ḍɔ̈ɔ̈k nɛ̈ juiɛ̈en*
cow D-pull:NTS boy PREP rope

C-topic *juiɛ̈en à-mɪ́ɪ̈it ḍɔ̈ɔ̈k wɛ́ŋ*
rope D-pull:NTS boy cow
'The boy is pulling the cow with the rope'

(22) Centrifugal
S-topic *ḍɔ̈ɔ̈k à-mɪ̃ɪ̈it wɛ́ŋ nɛ̈ juiɛ̈en*
boy D-pull:CF cow PREP rope

O-topic *wɛ́ŋ à-mɪ́ɪ̈it ḍɔ̈ɔ̈k nɛ̈ juiɛ̈en*
cow D-pull:CF:NTS boy PREP rope

C-topic *juiɛ̈en à-mɪ́ɪ̈it ḍɔ̈ɔ̈k wɛ́ŋ*
rope D-pull:CF:NTS boy cow
'The boy is pulling the cow thither with the rope'

(23) Centripetal
S-topic *ḍɔ̈ɔ̈k à-mɪ̀ɪ̈it wɛ́ŋ nɛ̈ juiɛ̈en*
boy D-pull:CP cow PREP rope

O-topic *wɛ́ŋ à-mɪ́ɪ̈it ḍɔ̈ɔ̈k nɛ̈ juiɛ̈en*
cow D-pull:CP:NTS boy PREP rope

C-topic *juiɛ̈en à-mɪ́ɪ̈it ḍɔ̈ɔ̈k wɛ́ŋ*
rope D-pull:CP:NTS boy cow
'The boy is pulling the cow hither with the rope'

(24) Benefactive
S-topic *ḍɔ̈ɔ̈k à-mɪ̀ɪ̈it wɛ́ŋ mɔ̀c nɛ̈ juiɛ̈en*
boy D-pull:B cow man PREP rope

O-topic *wɛ́ŋ à-mɪ́ɪ̈it ḍɔ̈ɔ̈k mɔ̀c nɛ̈ juiɛ̈en*
cow D-pull:B:NTS boy man PREP rope

C-topic *juiɛ̈en à-mɪ́ɪ̈it ḍɔ̈ɔ̈k wɛ́ŋ mɔ̀c*
rope D-pull:B:NTS boy cow man
'The boy is pulling the cow for the man with the rope'

(25) Benefactive-antipassive

S-topic	*d̤ɔ̤̀ɔ̤k*	*à̰-mı̤̂ı̤t*	*m̰ɔ̀c*	*nè̤*	*juiê̤n*
	boy	D-pull:BAP	man	PREP	rope

O-topic	*m̰ɔ̀c*	*à̰-mı̤́ı̤t*	*d̤ɔ̤̀ɔ̤k*	*nè̤*	*juiê̤n*
	man	D-pull:BAP:NTS	boy	PREP	rope

C-topic	*juiê̤n*	*à̰-mı̤́ı̤t*	*d̤ɔ̤̀ɔ̤k*	*m̰ɔ̀c*
	rope	D-pull:BAP:NTS	boy	man

'The boy is pulling for the man with the rope'

(26) Antipassive

S-topic	*d̤ɔ̤̀ɔ̤k*	*à̰-m̰ı̤̀ıt*	*nè̤*	*juiê̤n*
	boy	D-pull:AP	PREP	rope

C-topic	*juiê̤n*	*à̰-mı̤́ı̤t*	*d̤ɔ̤̀ɔ̤k*
	rope	D-pull:AP:NTS	boy

'The boy is pulling with the rope'

The NTS-form of a verb always has a H tone. The other form may have any of the three tones, although only L and F occur in examples (21)-(26). This distribution of tones is the reason for considering the two forms marked and unmarked, respectively.

Note that the unmarked verb form is not restricted to clauses in which the subject is preverbal as in (21)-(26). As implied by the definition given above, this verb form is used whenever the subject is a topical noun phrase, whether it precedes the verb, as it does in declarative clauses, or follows the verb, as it does in non-declarative clauses. This state of affairs is illustrated in (27).

(27) a. *d̤ɔ̤̀ɔ̤k à̰-m̰ı̤̀ıt wɛ̰́ŋ*
boy D-pull cow
'The boy is pulling the cow'

b. *m̰ı̤̀ıt d̤ɔ̤̀ɔ̤k wɛ̰́ŋ*
pull boy cow
'Is the boy pulling the cow?'

c. *wɛ̰́ŋ à̰-mı̤́ı̤t d̤ɔ̤̀ɔ̤k*
cow D-pull:NTS boy
'The boy is pulling the cow'

d. *mı̤́ı̤t d̤ɔ̤̀ɔ̤k wɛ̰́ŋ*
pull:NTS boy cow
'Is the boy pulling the cow with it?'

In the interrogative clause (27b) the verb has the unmarked form, showing that the postverbal subject is topical just like the preverbal subject of the declarative clause (27a). In the interrogative clause (27d) the order of overt constituents is the same as in (27b), but the verb has the marked form, showing that the postverbal subject is non-topical as in the declarative clause (27c). However, while (27c) has an object topic, (27d) has a circumstantial topic, a fact which I shall not pursue further here.

A finite verb may alternatively indicate that the clause has no grammatical subject, i.e., that the clause is passive. In that case the verb also indicates whether the topic is a direct object or a circumstantial, although this distinction is neutralized if the verb is derived. Both of these inflectional categories are glossed "PAS" for "passive", and the category that cooccurs with a circumstantial topic is further glossed "CT". Examples (28)-(32) show propositionally identical clauses for each of the five transitive derivational categories. By virtue of being intransitive, a passive clause with an antipassive verb stem can only have a circumstantial topic, as in (33).

(28) Simple

O-topic	*wḛ́ŋ*	*à̰-mḭ̂it*	*nè̤*	*juiê̤en*
	cow	D-pull:PAS	PREP	rope
C-topic	*juiê̤en*	*à̰-mḭ̏it-è̤*	*wḛ́ŋ*	
	rope	D-pull-PAS:CT	cow	

'The cow is being pulled with the rope'

(29) Centrifugal

O-topic	*wḛ́ŋ*	*à̰-mḭ̏it-è̤*	*nè̤*	*juiê̤en*
	cow	D-pull:CF-PAS	PREP	rope
C-topic	*juiê̤en*	*à̰-mḭ̏it-è̤*	*wḛ́ŋ*	
	rope	D-pull:CF-PAS:CT	cow	

'The cow is being pulled thither with the rope'

(30) Centripetal

O-topic	*wḛ́ŋ*	*à̰-mḭ̏it-è̤*	*nè̤*	*juiê̤en*
	cow	D-pull:CP-PAS	PREP	rope
C-topic	*juiê̤en*	*à̰-mḭ̏it-è̤*	*wḛ́ŋ*	
	rope	D-pull:CP-PAS:CT	cow	

'The cow is being pulled hither with the rope'

(31) Benefactive

O-topic *wḛ́ŋ à̰-mî̤i̤t-è̤ mò̰c nè̤ juiê̤en*
cow D-pull:B-PAS man PREP rope

C-topic *juiê̤en à̰-mî̤i̤t-è̤ wḛ́ŋ mò̰c*
rope D-pull:B-PAS:CT cow man
'The cow is being pulled for the man with the rope'

(32) Benefactive-antipassive

O-topic *mò̰c à̰-mî̤i̤i̤t-è̤ nè̤ juiê̤en*
man D-pull:BAP-PAS PREP rope

C-topic *juiê̤en à̰-mî̤i̤i̤t-è̤ mò̰c*
rope D-pull:BAP-PAS:CT man
'The man is being pulled for with the rope'

(33) Antipassive

C-topic *juiê̤en à̰-mî̤i̤i̤t-è̤*
rope D-pull:AP-PAS:CT
'The rope is being pulled with'

As can be seen in (28)-(33), the O-topic passive form with a simple stem has no suffix, whereas a C-topic passive form has the suffix /-è̤/, as does an O-topic passive form with a derived stem (cf. also Table 2 below).

It should be noted that although the passive verb forms exclude the presence of a grammatical subject, they can cooccur with an Agent which has been demoted to an adverbial. Compare the O-topic clauses in (34) and in (35), where (a) is active, (b) is passive with a demoted Agent, and (c) is passive without an Agent.

(34) a. *mḛ̀t̪ à̰-t̪ɛ́ɛt tḭ̀ik*
child D-beat:NTS woman
'The woman is beating the child'

b. *mḛ̀t̪ à̰-t̪á̰t nè̤ tḭ̀ik*
child D-beat:PAS PREP woman
'The child is being beaten by the woman'

c. *mḛ̀t̪ à̰-t̪á̰t*
child D-beat:PAS
'The child is being beaten'

(35) a. *mò̰c à̰-kuḛ̈en mè̤t̰ ɣɔ̤́k*
man D-count:B:NTS child cows
'The child is counting the cows for the man'

b. *mò̰c à̰-kuḛ̂en-ḛ̀ ɣɔ̤́k nḛ̀ mè̤t̰*
man D-count:B-PAS cows PREP child
'The cows are being counted for the man by the child'

c. *mò̰c à̰-kuḛ̂en-ḛ̀ ɣɔ̤́k*
man D-count:B-PAS cows
'The cows are being counted for the man'

Instead of indicating that the clause has a subject or that it has no subject, the finite verb may express a pronominal subject. However, a pronominal subject is not always expressed by the verb. Therefore, before going into the details of subject inflection, it is necessary to outline under what circumstances a pronominal participant is given what kind of realization. The expression of a pronominal participant depends on four factors: (i) its grammatical relation, (ii) its position, (iii) its topicality, and (iv) the grammatical relation of the topic. The relevant distinctions are exemplified in (36) with the pronominal participants first person plural (lP) and third person singular (3S).

(36) a. Preverbal subject
1P *ɣô̰ok á̰a-mḭ̀it wḛ́ŋ*
1P D:PL-pull cow
'We are pulling the cow'

3S *(jḛ̂en) à̰-mḭ̀it wḛ́ŋ*
3S D-pull cow
'He is pulling the cow'

b. Preverbal object
1P *ɣô̰ok á̰a-mḭḭ́t wḛ̀ŋ*
1P D:PL-pull:NTS cow:GEN
'The cow is pulling us'

3S *(jḛ̂en) à̰-mḭḭ́t wḛ̀ŋ*
3S D-pull:NTS cow:GEN
'The cow is pulling him'

c. Postverbal non-topical subject with O-topic
1P *wɛ́ŋ*
cow
'We are pulling the cow'

3S *wɛ́ŋ à-mɪ̀it*
cow D-pull:3S
'He is pulling the cow'

d. Postverbal non-topical subject with C-topic
1P *juiɛ̀en à-mɪ́it yɔ́ok wɛ́ŋ*
rope D-pull:NTS 1P:GEN cow
'We are pulling the cow with the rope'

3S *juiɛ̀en à-mɪ́it jɛ́en wɛ́ŋ*
rope D-pull:NTS 3S:GEN cow
'He is pulling the cow with the rope'

e. Postverbal topical subject
1P *mɪ̀it-kʉ́ wɛ́ŋ*
pull-1P cow
'Shall we pull the cow?'

3S *mɪ̀it wɛ́ŋ*
pull:3S cow
'Is he pulling the cow?'

f. Postverbal object
1P *wɛ́ŋ à-mɪ̀it ô*
cow D-pull 1P
'The cow is pulling us'

3S *wɛ́ŋ à-mɪ̀it ɛ̂*
cow D-pull 3S
'The cow is pulling him'

A preverbal (and, hence, topical) pronominal participant (whether a subject or an object, or a circumstantial for that matter), as in (36a-b), is expressed by a pronoun (in the absolutive case), but is normally zero if third person (singular or plural). A postverbal non-topical subject of a clause with an O-topic, as in (36c), is expressed in the verb (either by a suffix or in the verb stem), as is a postverbal topical subject, as in (36e). A postverbal non-topical subject of a clause with a C-topic, as in (36d), is expressed by a pronoun (in the genitive case). Finally, a

postverbal (and, hence, non-topical) object, as in (36f), is expressed by a (segmentally reduced) pronoun (in the absolutive case).

The facts outlined above imply that in declarative clauses a pronominal subject is expressed in the verb if the topic is an object, and that in non-declarative clauses a pronominal subject is expressed in the verb if the topic is either an object or the subject itself. This, again, means that if intransitive, the verb cannot be inflected for the subject in declarative clauses but only in non-declarative clauses. The full range of subject inflection is illustrated by the paradigms in (37) for each of the six derivational categories. The transitive categories are exemplified by means of declarative clauses, and the antipassive (and hence intransitive) category is exemplified by means of coordinative clauses.

(37)

	Simple	Centrifugal
1S	*à-miɛɛ̀ɛt*	*à-miɛɛ̂ɛt*
2S	*à-mɪ̀it*	*à-miɛɛ̀ɛt-ɛ́*
3S	*à-mɪ̀̀it*	*à-mɪ̀̀it*
1P	*à-mɪ̀it-kʊ́*	*à-mɪ̀̀it-kʊ̀*
2P	*à-miɛ̀ɛt-kà*	*à-miɛɛ̀ɛt-kà*
3P	*à-mɪ̀it-kɛ́*	*à-mɪ̀̀it-kɛ̀*
	'I/...am/...pulling it'	'I/...am/...pulling it thither'

	Centripetal	Benefactive
1S	*à-miɛ̀ɛt*	*à-miɛ̂ɛt mɔ̀c*
2S	*à-mɪ́it*	*à-miɛ̀ɛt-ɛ́ mɔ̀c*
3S	*à-mɪ̀̀it*	*à-mɪ̂it mɔ̀c*
1P	*à-mɪ̀̀it-kʊ́*	*à-mɪ̂it-kʊ̀ mɔ̀c*
2P	*à-miɛ̀ɛt-kà*	*à-miɛ̂ɛt-kà mɔ̀c*
3P	*à-mɪ̀̀it-kɛ́*	*à-mɪ̂it-kɛ̀ mɔ̀c*
	'I/...am/...pulling it hither'	'I/...am/...pulling it for the man'

	Benefactive-antipassive	Antipassive
1S	*à-miɛɛ̂ɛt*	*kʊ̀ miɛɛ̀ɛt*
2S	*à-miɛɛ̀ɛt-ɛ́*	*kʊ̀ miɛɛ̀ɛt-ɛ́*
3S	*à-mɪ̀̀it*	*kʊ̀ mɪ̀̀it*
1P	*à-mɪ̀̀it-kʊ̀*	*kʊ̀ mɪ̀it-kʊ́*
2P	*à-miɛɛ̂ɛt-kà*	*kʊ̀ miɛ̀ɛt-kà*
3P	*à-mɪ̀̀it-kɛ̀*	*kʊ̀ mɪ̀it-kɛ́*
	'I/...am/...pulling for him'	'and I/...pulled'

As shown by the examples in (37) and as indicated in Table 2, the subject is sometimes expressed by a suffix, sometimes without. A plural subject is always expressed by a suffix, a second person singular subject is expressed by a suffix

unless the stem is either simple or centripetal, and a first or third person singular subject is never expressed by a suffix. In the absence of a suffix, the subject is expressed by the form of the verb stem, but suffixes may also affect the form of the stem. The tones of the plural suffixes are left unspecified in Table 2, the reason being that they vary according to the stem tone (cf. section 7.1 below).

Table 2. Verbal suffixes[7]

inflectional category	derivational category		
	simple	CP	CF B BAP AP
1S	Ø		
2S	Ø		-é
3S	Ø		
1P	-ku		
2P	-ka		
3P	-ke		
PAS	Ø	-è	
PAS:CT	-è		

The non-finite form of a verb is the form taken by the main verb of a clause in which the finite verb is an auxiliary. In (38), which illustrates each of the six derivational categories, the auxiliary verb is /ce/, which indicates the perfect tense-aspect.

(38) a. Simple
ɖɔ̀ɔk à-cé wɛ́ŋ mĩ̀it
boy D-PF cow pull:NF
'The boy has pulled the cow'

b. Centrifugal
ɖɔ̀ɔk à-cé wɛ́ŋ mieɛ̂ɛt
boy D-PF cow pull:CF:NF
'The boy has pulled the cow thither'

[7] The third person plural suffix /-ke/ varies freely with /-ki/.

c. Centripetal
ɖɔ̈k à-cɛ́ wɛ́ŋ mieɛ̈et
boy D-PF cow pull:CP:NF
'The boy has pulled the cow hither'

d. Benefactive
ɖɔ̈k à-cɛ́ wɛ́ŋ miɛ̈et mɔ̀c
boy D-PF cow pull:B:NF man
'The boy has pulled the cow for the man'

e. Benefactive-antipassive
ɖɔ̈k à-cɛ́ mɔ̀c mieɛ̈et
boy D-PF man pull:BAP:NF
'The boy has pulled for the man'

f. Antipassive
ɖɔ̈k à-cɛ́ miɪ̈it
boy D-PF pull:AP:NF
'The boy has pulled'

The derivational information is carried by the main verb, and the inflectional information is carried by the auxiliary verb. The inflection of the auxiliary verb */cɛ̈/* is shown in (39).

(39) Ø *ɖɔ̈k à-cɛ́ wɛ́ŋ miɲ̈it*
boy D-PF cow pull:NF
'The boy has pulled the cow'

NTS *wɛ́ŋ à-cɪ̈i ɖɔ̈k miɲ̈it*
cow D-PF:NTS boy pull:NF
'The boy has pulled the cow'

1S *wɛ́ŋ à-cà miɲ̈it*
cow D-PF:1S pull:NF
'I have pulled the cow'

2S *wɛ́ŋ à-cá miɲ̈it*
cow D-PF:2S pull:NF
'You have pulled the cow'

3S *wɛ́ŋ à-cɛ̀ miɲ̈it*
cow D-PF:3S pull:NF
'He has pulled the cow'

1P *wɛ́ŋ à-cʊ̀uk mɪ̃̀it*
cow D-PF:1P pull:NF
'We have pulled the cow'

2P *wɛ́ŋ à-cə̂ak mɪ̃̀it*
cow D-PF:2P pull:NF
'You have pulled the cow'

3P *wɛ́ŋ à-cɪ̀ik mɪ̃̀it*
cow D-PF:3P pull:NF
'They have pulled the cow'

PAS *wɛ́ŋ à-cɪ̀i mɪ̃̀it*
cow D-PF:PAS pull:NF
'The cow has been pulled'

PAS:CT *juiɛ̀en à-cɪ̀in-ɛ̀ wɛ́ŋ mɪ̃̀it*
rope D-PF-PAS:CT cow pull:NF
'The cow has been pulled with the rope'

In summary, a verb is either finite or non-finite, and a finite verb is inflected for the grammatical relation of the topic and for either the presence/absence of a subject or the person and number of a postverbal pronominal subject. A verb form thus belongs to one of 11 inflectional categories as well as to one of (at least) 6 derivational categories.

4. Phonological classes of roots

The vowel length, the tone, and the voice quality of a verb stem with a transitive root are predictable from phonological properties of the root, but in rather intricate ways.

Within the set of simple stem forms that manifests a transitive root, the vowel alternates in length either between short (CVC) and half-long (CVVC) or between half-long (CVVC) and long (CVVVC). Synchronically, there seems to be no strong evidence that one of the two length alternants of a root is more basic than the other. Diachronically, however, as argued in Andersen [1990], the shorter alternants are in all likelihood the original ones. For convenience, then, I shall take the root vowels of the two length classes to be basically short and half-long, respectively.

Whether the root vowel is short or half-long, a simple stem can have any of the three tones. However, within the set of simple stems with a root of either length class, there is one and only one stem from which the tones of the other stems are predictable, viz. the non-finite stem. Hence, the tone of that stem can be taken to

be the tone of the root. In that way, either of the two length classes of roots falls into two tonal classes: The tone of a root with a short vowel is either F or L, and the tone of a root with a half-long vowel is either F or H.

The total of four length/tone classes of transitive verbal roots are exemplified by the pairs of simple stems in (40)-(43). The (a)-clauses contain the inflectionally unmarked stem, which manifests the basic length of the root vowel, but in which the tonal class distinction is neutralized. The (b)-clauses contain the non-finite stem, which manifests the non-basic length of the root vowel, but in which the tonal class of the root can be identified.

(40) Root class: CVC/F

a. *à-lɔ̀t mɔ̀c*
D-insult man
'He is insulting the man'

b. *à-cɛ́ mɔ̀c lɔ̂at*
D-PF man insult:NF
'He has insulted the man'

(41) Root class: CVC/L

a. *à-nàj ɲiɛ̀em*
D-plait hair
'She is plaiting the hair'

b. *à-cɛ́ ɲiɛ̀em nàaj*
D-PF hair plait:NF
'She has plaited the hair'

(42) Root class: CVVC/F

a. *à-jàaŋ lɛ́j*
D-skin animal
'He is skinning the animal'

b. *à-cɛ́ lɛ́j jaâaŋ*
D-PF animal skin:NF
'He has skinned the animal'

(43) Root class: CVVC/H

a. *à-ŋàaŋ àtìin*
D-open door
'He is opening the door'

b. *à-cé àtìin ŋaáaŋ*
D-PF door open:NF
'He has opened the door'

There is no voice quality alternation within the set of simple stems that manifests a given root. The stems exemplifying the four length/tone classes of roots in (40)-(43) have the creaky voice quality, but all of these classes also contain roots with the breathy voice quality, as shown by examples (44)-(47).

(44) Root class: CVC/F

a. *à-guàr ràp*
D-grind sorghum
'She is grinding sorghum'

b. *à-cé ràp guo̤or*
D-PF sorghum grind:NF
'She has ground sorghum'

(45) Root class: CVC/L

a. *à-mèr tò̤oŋ*
D-decorate pot
'She is decorating a pot'

b. *à-cé tò̤oŋ mèer*
D-PF pot decorate:NF
'She has decorated a pot'

(46) Root class: CVVC/F

a. *à-kɔ̤̀ɔ̤t pɪ̤̀ŋ*
D-scratch ground
'He is scratching the ground'

b. *à-cé pɪ̤̀ŋ kɔ̤ɔ̤t*
D-PF ground scratch:NF
'He has scratched the ground'

(47) Root class: CVVC/H
a. *à̰-cuè̤ec tò̤ɔɲ*
D-mould pot
'She is moulding a pot'

b. *à̰-cé̤ tò̤ɔɲ cueé̤ec*
D-PF pot mould:NF
'She has moulded a pot'

The relative distribution of the sampled roots among the eight length/tone/voice classes is shown in Table 3.

Table 3. Relative distribution of the sampled roots among the eight length/tone/voice classes.

Root class	%
CV̰C/F	26.4
CV̤C/F	14.1
CV̰C/L	10.1
CV̤C/L	3.2
CV̰VC/F	15.6
CV̤VC/F	9.5
CV̰VC/H	14.6
CV̤VC/H	6.5

Since the sampling was not based on phonological criteria, this distribution of approximately 500 roots is probably fairly representative of the total inventory of transitive verbal roots.

Given the length/tone/voice class of a root, the vowel length, the tone and the voice quality of any stem with that root are predictable as shown in Table 4.[8]

[8] Certain entries of Table 4 exhibit tonal variation, as described in section 7 below. I am not aware of any exceptions to the specifications of the table as far as root classes CVC/F and CVC/L are concerned. However, a few roots of class CVVC/H have a half-long rather than a short vowel in the non-finite form of the antipassive stem, for instance the roots */t̪a̰al/* 'to cook' and */ma̰at̪/* 'to smoke'. Moreover, some roots of class CVVC/F with the breathy voice quality have a half-long rather than a long vowel in the antipassive, e.g. the roots */kɔ̤ɔt̪/* 'to scratch' and */t̪ie̤ec/* 'to ask'.

Table 4. Vowel length, tone, and voice quality alternations.

length/ tone class	inflectional category	derivational category (and voice quality class)		
		simple	centrifugal	centripetal
cvc/F	Ø	cv̀c	cv́vc	cv̰̀vc
	NF	cv̂vc	cv́vc	cv̰̀vc
	NTS	cv́vc	cv́vc	cv̰́vc
	1S,3S	cv̀vc	cv́vc	cv̰̀vc
	2S	cv̀c	cv̀vc-v́	cv̰́vc
	1P,2P,3P	cv́c-cv̀	cv́vc-cv̀	cv̰̀vc-cv́
	PAS	cv́c	cv̂vc-v̀	cv̰̂vc-v̀
	PAS:CT	cv̂vc-v̀	cv̂vc-v̀	cv̰̂vc-v̀
cvc/L	Ø	cv̀c	cv̂vc	cv̰̀vc
	NF	cv̀vc	cv̂vc	cv̰̀vc
	NTS	cv́vc	cv́vc	cv̰́vc
	1S,3S	cv̀vc	cv̂vc	cv̰̀vc
	2S	cv̀c	cv̀vc-v́	cv̰́vc
	1P,2P,3P	cv́c-cv̀	cv̂vc-cv̀	cv̰̀vc-cv́
	PAS	cv́c	cv̂vc-v̀	cv̰̂vc-v̀
	PAS:CT	cv̂vc-v̀	cv̂vc-v̀	cv̰̂vc-v̀
cvvc/F	Ø	cv̀vc	cv̂vc	cv̰̀vc
	NF	cv̂vc	cv̂vc	cv̰̀vc
	NTS	cv́vc	cv́vc	cv̰́vc
	1S,3S	cv̀vc	cv̂vc	cv̰̀vc
	2S	cv̂vc	cv̀vc-v́	cv̰́vc
	1P,2P,3P	cv̀vc-cv́	cv̂vc-cv̀	cv̰̀vc-cv́
	PAS	cv̂vc	cv̂vc-v̀	cv̰̂vc-v̀
	PAS:CT	cv̂vc-v̀	cv̂vc-v̀	cv̰̂vc-v̀
cvvc/H	Ø	cv̀vc	cv́vc	cv̰̀vc
	NF	cv́vc	cv́vc	cv̰̀vc
	NTS	cv́vc	cv́vc	cv̰́vc
	1S,3S	cv̀vc	cv́vc	cv̰̀vc
	2S	cv́vc	cv̀vc-v́	cv̰́vc
	1P,2P,3P	cv̀vc-cv́	cv́vc-cv̀	cv̰̀vc-cv́
	PAS	cv́vc	cv̂vc-v̀	cv̰̂vc-v̀
	PAS:CT	cv̂vc-v̀	cv̂vc-v̀	cv̰̂vc-v̀

Table 4, continued.

length/ tone class	inflectional category	derivational category (and voice quality of class)			
		benefactive	benefactive-antipassive	antipassive	
				creaky root	breathy root
cvc/F	Ø	cV̰vc	cV̰vc	cV̰vc	
	NF	cV̰vc	cV̰vc	cV̀c	
	NTS	cV̰vc	cV̰vc	cV̰vc	
	1S,3S	cV̰vc	cV̰vc	cV̰vc	
	2S	cV̀vc-V́	cV̀vc-V́	cV̀vc-V́	
	1P,2P,3P	cV̰vc-cV̀	cV̰vc-cV̀	cV̰vc-cV̀	
	PAS	cV̰vc-V̀	cV̰vc-V̀		
	PAS:CT	cV̰vc-V̀	cV̰vc-V̀	cV̰vc-V̀	
cvc/L	Ø	cV̰vc	cV̰vc	cV̂vc	
	NF	cV̰vc	cV̰vc	cV̂vc	
	NTS	cV̰vc	cV̰vc	cV́vc	
	1S,3S	cV̰vc	cV̰vc	cV̂vc	
	2S	cV̀vc-V́	cV̀vc-V́	cV̀vc-V́	
	1P,2P,3P	cV̰vc-cV̀	cV̰vc-cV̀	cV̂vc-cV̀	
	PAS	cV̰vc-V̀	cV̰vc-V̀		
	PAS:CT	cV̰vc-V̀	cV̰vc-V̀	cV̂vc-V̀	
cvvc/F	Ø	cV̰vc	cvV̰vc	cV̀vc	cvV́vc
	NF	cV̰vc	cvV̰vc	cvV́vc	cvV̀vc
	NTS	cV́vc	cvV́vc	cvV́vc	cvV́vc
	1S,3S	cV̰vc	cvV̰vc	cvV̀vc	cvV́vc
	2S	cV̀vc-V́	cvV̀vc-V́	cvV̀vc-V́	cvV̀vc-V́
	1P,2P,3P	cV̰vc-cV̀	cvV̰vc-cV̀	cV̀vc-cV́	cvV́vc-cV̀
	PAS	cV̰vc-V̀	cvV̰vc-V̀		
	PAS:CT	cV̰vc-V̀	cvV̰vc-V̀	cvV̰vc-V̀	cvV̰vc-V̀
cvvc/H	Ø	cV́vc	cV́vc	cV̀c	
	NF	cV́vc	cV́vc	cV̀c	
	NTS	cV́vc	cV́vc	cV́vc	
	1S,3S	cV́vc	cV́vc	cV̀vc	
	2S	cV̀vc-V́	cV̀vc-V́	cV̀vc-V́	
	1P,2P,3P	cV́vc-cV̀	cV́vc-cV̀	cV́c-cV̀	
	PAS	cV̰vc-V̀	cV̰vc-V̀		
	PAS:CT	cV̰vc-V̀	cV̰vc-V̀	cV̰vc-V̀	

The table specifies the vowel length, the tone and the voice quality of a stem for all possible combination of root class, derivational category and inflectional category. Absence of a voice quality symbol in a stem in the table indicates that the voice quality of that stem is identical with the voice quality of the root.

The entries of Table 4 are exemplified in (48)-(51). Each length/tone class is exemplified with a creaky root, for which the total set of forms is given.

(48) *wɛ̰c* /F 'to kick'

	simple	CF	CP	B	BAP	AP
Ø	*wɛ̰̀c*	*wɛ̰́ec*	*wɛ̰̀ec*	*wɛ̰́ec*	*wɛ̰̂ec*	*wɛ̰̂ec*
NF	*wɛ̰̂ec*	*wɛ̰́ɛc*	*wɛ̰̀ɛc*	*wɛ̰́ɛc*	*wɛ̰̂ɛc*	*wɛ̰̀c*
NTS	*wɛ̰́ec*	*wɛ̰́ec*	*wɛ̰́ec*	*wɛ̰́ec*	*wɛ̰́ec*	*wɛ̰́ec*
1S	*wɛ̰̀ɛc*	*wɛ̰́ɛc*	*wɛ̰̀ɛc*	*wɛ̰́ɛc*	*wɛ̰̂ɛc*	*wɛ̰̂ɛc*
2S	*wɛ̰̀c*	*wɛ̰̀ɛc-ɛ́*	*wɛ̰́ec*	*wɛ̰̀ɛc-ɛ́*	*wɛ̰̀ɛc-ɛ́*	*wɛ̰̀ɛc-ɛ́*
3S	*wɛ̰̂ec*	*wɛ̰́ec*	*wɛ̰̂ec*	*wɛ̰́ec*	*wɛ̰̂ec*	*wɛ̰̂ec*
1P	*wɛ̰́c-kʉ̀*	*wɛ̰́ec-kʉ̀*	*wɛ̰̀ec-kʉ́*	*wɛ̰́ec-kʉ̀*	*wɛ̰̂ec-kʉ̀*	*wɛ̰̂ec-kʉ̀*
2P	*wɛ̰̀c-kà*	*wɛ̰́ɛc-kà*	*wɛ̰̀ɛc-ká*	*wɛ̰́ɛc-kà*	*wɛ̰̂ɛc-kà*	*wɛ̰̂ɛc-kà*
3P	*wɛ̰́c-kɛ̀*	*wɛ̰́ec-kɛ̀*	*wɛ̰̀ec-kɛ́*	*wɛ̰́ec-kɛ̀*	*wɛ̰̂ec-kɛ̀*	*wɛ̰̂ec-kɛ̀*
PAS	*wɛ̰́c*	*wɛ̰̂ec-ɛ̀*	*wɛ̰̂ec-ɛ̀*	*wɛ̰̂ec-ɛ̀*	*wɛ̰̂ec-ɛ̀*	
PAS:CT	*wɛ̰̂ec-ɛ̀*	*wɛ̰̂ec-ɛ̀*	*wɛ̰̂ec-ɛ̀*	*wɛ̰̂ec-ɛ̀*	*wɛ̰̂ec-ɛ̀*	*wɛ̰̂ec-ɛ̀*

(49) *tɛ̰ŋ* /L 'to dust'

	simple	CF	CP	B	BAP	AP
Ø	*tɛ̰̀ŋ*	*tɛ̰̂eŋ*	*tɛ̰̀eŋ*	*tɛ̰̂eŋ*	*tɛ̰̂eŋ*	*tɛ̰̂ɛŋ*
NF	*tɛ̰̂eŋ*	*tɛ̰̂ɛŋ*	*tɛ̰̀ɛŋ*	*tɛ̰̂ɛŋ*	*tɛ̰̂ɛŋ*	*tɛ̰̂ɛŋ*
NTS	*tɛ́eŋ*	*tɛ́eŋ*	*tɛ́eŋ*	*tɛ́eŋ*	*tɛ́eŋ*	*tɛ́eŋ*
1S	*tɛ̰̀ɛŋ*	*tɛ̰̂ɛŋ*	*tɛ̰̀ɛŋ*	*tɛ̰̂ɛŋ*	*tɛ̰̂ɛŋ*	*tɛ̰̂ɛŋ*
2S	*tɛ̰̀ŋ*	*tɛ̰̀ɛŋ-ɛ́*	*tɛ́eŋ*	*tɛ̰̀ɛŋ-ɛ́*	*tɛ̰̀ɛŋ-ɛ́*	*tɛ̰̀ɛŋ-ɛ́*
3S	*tɛ̰̀eŋ*	*tɛ̰̂eŋ*	*tɛ̰̀eŋ*	*tɛ̰̂eŋ*	*tɛ̰̂eŋ*	*tɛ̰̂eŋ*
1P	*tɛ́ŋ-kʉ̀*	*tɛ̰̂eŋ-kʉ̀*	*tɛ̰̀eŋ-kʉ́*	*tɛ̰̂eŋ-kʉ̀*	*tɛ̰̂eŋ-kʉ̀*	*tɛ̰̂eŋ-kʉ̀*
2P	*tɛ́ŋ-kà*	*tɛ̰̂ɛŋ-kà*	*tɛ̰̀ɛŋ-ká*	*tɛ̰̂ɛŋ-kà*	*tɛ̰̂ɛŋ-kà*	*tɛ̰̂ɛŋ-kà*
3P	*tɛ́ŋ-kɛ̀*	*tɛ̰̂eŋ-kɛ̀*	*tɛ̰̀eŋ-kɛ́*	*tɛ̰̂eŋ-kɛ̀*	*tɛ̰̂eŋ-kɛ̀*	*tɛ̰̂eŋ-kɛ̀*
PAS	*tɛ́ŋ*	*tɛ̰̂eŋ-ɛ̀*	*tɛ̰̂eŋ-ɛ̀*	*tɛ̰̂eŋ-ɛ̀*	*tɛ̰̂eŋ-ɛ̀*	
PAS:CT	*tɛ̰̂eŋ-ɛ̀*	*tɛ̰̂eŋ-ɛ̀*	*tɛ̰̂eŋ-ɛ̀*	*tɛ̰̂eŋ-ɛ̀*	*tɛ̰̂eŋ-ɛ̀*	*tɛ̰̂eŋ-ɛ̀*

(50) *lɛ̰er* /F 'to roll'

	simple	CF	CP	B	BAP	AP
Ø	*lɛ̰̀er*	*leɛ̰̂er*	*leɛ̰̀er*	*lɛ̰̂er*	*leɛ̰̂er*	*lɛ̰̀er*
NF	*leɛ̰̂er*	*leɛ̰̂ɛr*	*leɛ̰̀ɛr*	*lɛ̰̂ɛr*	*leɛ̰̂ɛr*	*leɛ́er*
NTS	*leɛ́er*	*leɛ́er*	*leɛ́er*	*lɛ́er*	*leɛ́er*	*leɛ́er*
1S	*leɛ̰̀ɛr*	*leɛ̰̂ɛr*	*leɛ̰̀ɛr*	*lɛ̰̂ɛr*	*leɛ̰̂ɛr*	*leɛ̰̀ɛr*
2S	*lɛ̰̂er*	*leɛ̰̀ɛr-ɛ́*	*leɛ́er*	*lɛ̰̀ɛr-ɛ́*	*leɛ̰̀ɛr-ɛ́*	*leɛ̰̀ɛr-ɛ́*
3S	*leɛ̰̀er*	*leɛ̰̂er*	*leɛ̰̀er*	*lɛ̰̂er*	*leɛ̰̂er*	*leɛ̰̀er*
1P	*lɛ̰̀er-kʉ́*	*leɛ̰̂er-kʉ̀*	*leɛ̰̀er-kʉ́*	*lɛ̰̂er-kʉ̀*	*leɛ̰̂er-kʉ̀*	*lɛ̰̀er-kʉ́*
2P	*lɛ̰̀ɛr-ká*	*leɛ̰̂ɛr-kà*	*leɛ̰̀ɛr-ká*	*lɛ̰̂er-kà*	*leɛ̰̂ɛr-kà*	*lɛ̰̀ɛr-ká*
3P	*lɛ̰̀er-kɛ́*	*leɛ̰̂er-kɛ̀*	*leɛ̰̀er-kɛ́*	*lɛ̰̂er-kɛ̀*	*leɛ̰̂er-kɛ̀*	*lɛ̰̀er-kɛ́*
PAS	*lɛ̰̂er*	*leɛ̰̂er-ɛ̀*	*leɛ̰̂er-ɛ̀*	*lɛ̰̂er-ɛ̀*	*leɛ̰̂er-ɛ̀*	
PAS:CT	*leɛ̰̂er-ɛ̀*	*leɛ̰̂er-ɛ̀*	*leɛ̰̂er-ɛ̀*	*lɛ̰̂er-ɛ̀*	*leɛ̰̂er-ɛ̀*	*leɛ̰̂er-ɛ̀*

(51) *tɛ̰em* /H 'to cut'

	simple	CF	CP	B	BAP	AP
Ø	*tɛ̀em*	*tɛ́ɛ̰m*	*tɛɛ̀m*	*tɛ́ɛm*	*tɛ́ɛm*	*tɛ̀m*
NF	*tɛ́ɛ̰m*	*tɛ́ɛ̰m*	*tɛɛ̀m*	*tɛ́ɛm*	*tɛ́ɛm*	*tɛ̀m*
NTS	*tɛ́ɛ̰m*	*tɛ́ɛ̰m*	*tɛ́ɛ̰m*	*tɛ́ɛm*	*tɛ́ɛm*	*tɛ́ɛm*
1S	*tɛɛ̀m*	*tɛ́ɛ̰m*	*tɛɛ̀m*	*tɛ́ɛm*	*tɛ́ɛm*	*tɛɛ̀m*
2S	*tɛ́ɛm*	*tɛɛ̀m-ɛ́*	*tɛ́ɛ̰m*	*tɛɛ̀m-ɛ́*	*tɛɛ̀m-ɛ́*	*tɛɛ̀m-ɛ́*
3S	*tɛɛ̀m*	*tɛ́ɛ̰m*	*tɛɛ̀m*	*tɛ́ɛm*	*tɛ́ɛm*	*tɛɛ̀m*
1P	*tɛɛ̀m-kʊ́*	*tɛ́ɛ̰m-kʊ̀*	*tɛɛ̀m-kʊ́*	*tɛ́ɛm-kʊ̀*	*tɛ́ɛm-kʊ̀*	*tɛ́m-kʊ̀*
2P	*tɛɛ̀m-kɐ́*	*tɛ́ɛ̰m-kɐ̀*	*tɛɛ̀m-kɐ́*	*tɛ́ɛm-kɐ̀*	*tɛ́ɛm-kɐ̀*	*tɐ́m-kɐ̀*
3P	*tɛɛ̀m-kɛ́*	*tɛ́ɛ̰m-kɛ̀*	*tɛɛ̀m-kɛ́*	*tɛ́ɛm-kɛ̀*	*tɛ́ɛm-kɛ̀*	*tɛ́m-kɛ̀*
PAS	*tɛ́ɛm*	*tɛɛ̂m-ɛ̀*	*tɛɛ̂m-ɛ̀*	*tɛɛ̂m-ɛ̀*	*tɛɛ̂m-ɛ̀*	
PAS:CT	*tɛɛ̂m-ɛ̀*	*tɛɛ̂m-ɛ̀*	*tɛɛ̂m-ɛ̀*	*tɛɛ̂m-ɛ̀*	*tɛɛ̂m-ɛ̀*	*tɛɛ̂m-ɛ̀*

In spite of the extensive utilization of the contrasts in voice quality, vowel length and tone for expressing morphological distinctions, morphologically distinct forms may be homonymous, the actual homonymy depending on the length/tone/voice class of the root. This homonymy may give rise to ambiguity, as in (52) and (53), whose verb belongs to root class CV̰C/F.

(52) a. *ɐ̀-pɪ̰̂ik*
D-push:AP
'He is pushing'

b. *ɐ̀-pɪ̰̂ik*
D-push:BAP:3S
'He is pushing for him'

(53) a. *ɐ̀-pɪ́ik* *ɖɔ̰̀k*
D-push:NTS boy
'The boy is pushing him'

b. *ɐ̀-pɪ́ik* *ɖɔ̰̀k*
D-push:CF boy
'He is pushing the boy thither'

c. *ɐ̀-pɪ́ik* *ɖɔ̰̀k*
D-push:CF:NTS boy
'The boy is pushing him thither'

d. *ɐ̀-pɪ́ik* *ɖɔ̰̀k*
D-push:CP:NTS boy
'The boy is pushing him hither'

e. *à̰-p̤í̤ik* *d̰ɔ̤̀ɔk*
D-push:BAP:NTS boy
'The boy is pushing for him'

The two clauses in (52) are grammatically distinct but phonetically identical, and so are the five clauses in (53). Thus, the intended reading of the examples given in this article, as indicated in the gloss, is not always the only possible reading.

In the following sections, the alternations in voice quality, vowel length and tone will be spelt out, and their respective contributions to derivation and inflection will be unravelled.

5. Voice quality alternation

In simple stems and in centrifugal stems, the voice quality is identical with the voice quality inherent in the root. Centripetal stems, benefactive stems and benefactive-antipassive stems, on the other hand, invariably have the breathy voice quality whether the voice quality of the root is breathy or creaky. Hence, if the root has the creaky voice, it exhibits voice quality alternation, as in (54).

(54) *ba̰r* /F 'to take along'

a. *wḛ́ŋ à̰-bɛ̰̀ɛr*
cow D-take.along:3S
'He is taking the cow along'

b. *wḛ́ŋ à̰-bɛ̰́ɛr*
cow D-take.along:CF:3S
'He is taking the cow along (going away)'

c. *wḛ́ŋ à̰-bɛ̤̀ɛr*
cow D-take.along:CP:3S
'He is bringing the cow along'

d. *wḛ́ŋ à̰-bɛ̤́ɛr* *mɔ̰̀c*
cow D-take.along:B:3S man
'He is taking the cow along to the man'

e. *mɔ̰̀c à̰-bɛ̤̀ɛr*
man D-take.along:BAP:3S
'He is taking something along to the man'

If, on the other hand, the root has the breathy voice, it does not exhibit any voice quality alternation, see example (55), which parallels example (54).

(55) *t̪a̤r* /F ‘to spear’

a. *lá̤j* *à̰-t̪ɛ̤̀ɛr*
animal D-spear:3S
‘He is spearing an animal’

b. *tɔ̰̀ŋ* *à̰-t̪ɛ̤́ɛr*
spear D-spear:CF:3S
‘He is throwing a spear thither’

c. *tɔ̰̀ŋ* *à̰-t̪ɛ̤̀ɛr*
spear D-spear:CP:3S
‘He is throwing a spear hither’

d. *tɔ̰̀ŋ* *à̰-t̪ɛ̤́ɛr* *mɔ̰̀c*
spear D-spear:B:3S man
‘He is throwing a spear for the man’

e. *mɔ̰̀c* *à̰-t̪ɛ̤̂ɛr*
man D-spear:BAP:3S
‘He is spearing for the man’

With antipassive stems, the situation is more complex. In (56)-(59) below, (a)-(b) contain simple stems which identify the length/tone class of the root in question, and (c)-(d) contain the inflectionally corresponding antipassive stems with that root, viz. the inflectionally unmarked form in (c), which is representative of all finite forms with respect to voice quality, and the non-finite form in (d). To a certain extent, antipassive stems are characterized by having the breathy voice. Thus all stem forms have the breathy voice in the antipassive if the root belongs to class CVVC/F, as in (56).

(56) a. *à̰-lḛ̀er* *tò̤oɲ*
D-roll pot
‘He is rolling the pot’

b. *à̰-cé̤* *tò̤oɲ* *leḛ̂er*
D-PF pot roll:NF
‘He has rolled the pot’

c. *à̰-lè̤er*
D-roll:AP
‘He is rolling (something)’

d. *à-cé̱ leé̱er*
D-PF roll:AP:NF
'He has rolled (something)'

However, if the root belongs to class CVC/F, as in (57), or to class CVVC/H, as in (58), then the non-finite stem retains the voice quality inherent in the root.

(57) a. *à-wè̱c dɔ̱́ɔk*
D-kick ball
'He is kicking a ball'

b. *à-cé̱ dɔ̱́ɔk wê̱ec*
D-PF ball kick:NF
'He has kicked a ball'

c. *à-wê̱ec*
D-kick:AP
'He is kicking'

d. *à-cé̱ wè̱c*
D-PF kick:AP:NF
'He has kicked'

(58) a. *à-tè̱em tì̱im*
D-cut tree
'He is cutting a tree'

b. *à-cé̱ tì̱im teé̱em*
D-PF tree cut:NF
'He has cut a tree'

c. *à-tè̱m*
D-cut:AP
'He is cutting'

d. *à-cé̱ tè̱m*
D-PF cut:AP:NF
'He has cut'

Moreover, if the root belongs to class CVC/L, then all forms of the antipassive stem retain the voice quality inherent in the root, as in (59).

(59) a. *à̰-tḛ̀ŋ à̰lâ̰at̪*
D-dust cloth
'She is dusting the cloth'

b. *à̰-cé̤ à̰lâ̰at̪ tḛ̀eŋ*
D-PF cloth dust:NF
'She has dusted the cloth'

c. *à̰-tɛ̰̂ɛŋ*
D-dust:AP
'She is dusting'

d. *à̰-cé̤ tḛ̂eŋ*
D-PF dust:AP:NF
'She has dusted'

The distribution of voice qualities is summarized in Table 5.

Table 5. Voice quality alternation.

root class	derivational (and inflectional) categories			
	simple, centrifugal	centripetal, benefactive, benefactive-antipassive	antipassive	
			finite	non-finite
CVC/F	inherent	breathy	breathy	inherent
CVC/L	inherent	breathy	inherent	inherent
CVVC/F	inherent	breathy	breathy	breathy
CVVC/H	inherent	breathy	breathy	inherent

As can be seen in the table, some morphological categories are characterized by the breathy voice, whereas no morphological categories are characterized by the creaky voice. Thus, although the voice quality inherent in the root is either creaky or breathy, we only find alternation between inherently creaky voice and breathy voice, and no alternation between inherently breathy voice and creaky voice. In fact, this state of affairs extends to all parts of the morphology. Clearly, therefore, the breathy voice is the marked member of the voice quality opposition. Since this opposition is a binary one, the creaky voice quality can be analysed as unspecified voice quality in the phonological representation of the root. Given this analysis, the morphological categories characterized by the

breathy voice specify the voice quality as [+breathy]. If neither the root nor any morphological category specifies the voice quality, then the latter gets the default value [-breathy], i.e., creaky, in the phonetic representation. This analysis implies that the phonological representation is stratified into a root layer and a derivational layer such that the voice quality parameter may be specified at either of them, at both of them, or at neither of them. All of these possibilities are exemplified in (61), which represents the word forms in (60).

(60)	a.	*wə̀ec*	'Is he kicking it?'	(kick:3S)	(CV̰C/F)
	b.	*ṯə̈̀ɛr*	'Is he spearing it?'	(spear:3S)	(CV̤C/F)
	c.	*wə̀ec*	'Is he kicking it hither?'	(kick:CP:3S)	(CV̰C/F)
	d.	*ṯə̈̀ɛr*	'Is he throwing it hither?'	(spear:CP:3S)	(CV̤C/F)

(61)

	a.	b.	c.	d.
phonetic representation	[-breathy]	[+breathy]	[+breathy]	[+breathy]
derivational layer			[+breathy]	[+breathy]
root layer		[+breathy]		[+breathy]

As we shall see in the following sections, a similarly stratified representation is also suggested by alternations in the other phonological parameters.

6. Vowel length alternation

6.1. Vowel length in simple stems. In simple stems, as mentioned in section 4, the vowel length alternates between short and half-long (root classes CVC/F and CVC/L) or between half-long and long (root classes CVVC/F and CVVC/H). The alternation between short and half-long stem vowels is exemplified in (62), that between half-long and long stem vowels in (63).

(62)	Ø	*à-dɔ̰̀m wɛ́ŋ*	'He is catching a cow'
	NF	*à-cɛ́ wɛ́ŋ dɔ̰̂om*	'He has caught a cow'
	NTS	*à-dɔ̰̃ɔm ḍɔ̤̀ɔk*	'The boy is catching it'
	1S	*à-dà̰am*	'I am catching it'
	2S	*à-dɔ̰̀m*	'You are catching it'
	3S	*à-dɔ̰̂ɔm*	'He is catching it'
	1P	*à-dɔ̰́m-kṳ̀*	'We are catching it'
	2P	*à-dɔ̰́m-kà̤*	'You are catching it'
	3P	*à-dɔ̰́m-kɛ̀*	'They are catching it'
	PAS	*à-dɔ̰́m*	'It is being caught'
	PAS:CT	*à-dɔ̰̂ɔm-ɛ̀ wɛ́ŋ*	'The cow is being caught with it'

(63)			
	Ø	*à-cɔ̀ɔl mɛ̀t*	'He is calling the child'
	NF	*à-cɛ́ mɛ̀t cɔɔ̀ɔl*	'He has called the child'
	NTS	*à-cɔɔ́ɔl tɪ̀ik*	'The woman is calling him'
	1S	*à-caà̀al*	'I am calling him'
	2S	*à-cɔ̀ɔl*	'You are calling him'
	3S	*à-cɔɔ̀ɔl*	'He is calling him'
	1P	*à-cɔ̀ɔl-kʊ́*	'We are calling him'
	2P	*à-cà̀al-ká*	'You are calling him'
	3P	*à-cɔ̀ɔl-kɛ́*	'They are calling him'
	PAS	*à-cɔ̀ɔl*	'He is being called'
	PAS:CT	*à-cɔɔ̀ɔl-ɛ̀ mɛ̀t tɪ́n*	'The child is being called there'

In both cases, the shorter alternant occurs when the inflectional category is Ø, 2S, 1P, 2P, 3P or PAS, and the longer alternant occurs when the inflectional category is NF, NTS, 1S, 3S or PAS:CT. Therefore, the following generalization seems obvious: Whatever the root class, one subset of inflectional categories occurs with a stem vowel that is one degree longer than the stem vowel occurring with the complementary subset of inflectional categories. If the shorter alternants are taken as basic, then the longer alternants can be analysed as resulting from the addition of one degree of length (one mora) to the length of the root vowel. Thus, the inflectional categories NF, NTS, 1S, 3S and PAS:CT contribute one mora to the skeletal tier.

6.2. Vowel length in transitive derived stems. While vowel length is an exponent of inflection in simple stems, there is no length alternation within the set of forms that manifests a derived stem, unless the latter is antipassive. That is, centrifugal stems, centripetal stems, benefactive stems, and benefactive-antipassive stems are inflected without vowel length alternation. In such stems, as we shall see, vowel length is an exponent of derivation.

The vowels of centrifugal stems and of centripetal stems are one degree longer than the corresponding root vowels. That is, they are either half-long, as in (64), or long, as in (65).

(64)	Simple		
	Ø	*à-pɪ̀ik wɛ́ŋ*	'He is pushing a cow'
	NF	*à-cɛ́ wɛ́ŋ pɪ̂ik*	'He has pushed a cow'

Centrifugal

Ø	*à-pɪ́ik wɛ́ŋ*	'He is pushing a cow thither'
NF	*à-cɛ́ wɛ́ŋ pɪɛ́ek*	'He has pushed a cow thither'
NTS	*à-pɪ́ik ɖɔ̀ɔk*	'The boy is pushing it thither'
1S	*à-pɪɛ́ek*	'I am pushing it thither'
2S	*à-pɪɛ̀ek-ɛ́*	'You are pushing it thither'
3S	*à-pɪ́ik*	'He is pushing it thither'
1P	*à-pɪ́ik-kʊ̀*	'We are pushing it thither'
2P	*à-pɪɛ́ek-kà*	'You are pushing it thither'
3P	*à-pɪ́ik-kɛ̀*	'They are pushing it thither'
PAS	*à-pɪ̂ik-ɛ̀*	'It is being pushed thither'

Centripetal

Ø	*à-pɪ̀ik wɛ́ŋ*	'He is pushing a cow hither'
NF	*à-cɛ́ wɛ́ŋ pɪɛ̀ek*	'He has pushed a cow hither'
NTS	*à-pɪ́ik ɖɔ̀ɔk*	'The boy is pushing it hither'
1S	*à-pɪɛ̀ek*	'I am pushing it hither'
2S	*à-pɪ́ik*	'You are pushing it hither'
3S	*à-pɪ̀ik*	'He is pushing it hither'
1P	*à-pɪ̀ik-kʊ́*	'We are pushing it hither'
2P	*à-pɪɛ̀ek-kà*	'You are pushing it hither'
3P	*à-pɪ̀ik-kɛ́*	'They are pushing it hither'
PAS	*à-pɪ̂ik-ɛ̀*	'It is being pushed hither'

(65) Simple

Ø	*à-tɔ̀ɔc mɛ̀t*	'He is sending a child'
NF	*à-cɛ́ mɛ̀t tɔɔ́c*	'He has sent a child'

Centrifugal

Ø	*à-tɔɔ́c mɛ̀t*	'He is sending a child thither'
NF	*à-cɛ́ mɛ̀t tuɔɔ́ɔc*	'He has sent a child thither'
NTS	*à-tɔɔ́c bàŋ*	'The chief is sending him thither'
1S	*à-tuɔɔ́ɔc*	'I am sending him thither'
2S	*à-tuɔɔ̀ɔc-ɛ́*	'You are sending him thither'
3S	*à-tɔɔ́c*	'He is sending him thither'
1P	*à-tɔɔ́c-kʊ̀*	'We are sending him thither'
2P	*à-tuɔɔ́ɔc-kà*	'You are sending him thither'
3P	*à-tɔɔ́c-kɛ̀*	'They are sending him thither'
PAS	*à-tɔɔ̂c-ɛ̀*	'He is being sent thither'

Centripetal

Ø	*à-tuùuc mèt*	'He is sending a child hither'
NF	*à-cé mèt tuoòoc*	'He has sent a child hither'
NTS	*à-tuúuc bàn*	'The chief is sending him hither'
1S	*à-tuoòoc*	'I am sending him hither'
2S	*à-tuúuc*	'You are sending him hither'
3S	*à-tuùuc*	'He is sending him hither'
1P	*à-tuùuc-kú*	'We are sending him hither'
2P	*à-tuoòoc-ká*	'You are sending him hither'
3P	*à-tuùuc-ké*	'They are sending him hither'
PAS	*à-tuûuc-è*	'He is being sent hither'

Centrifugal and centripetal stems thus involve the same phenomenon as that which is involved in the inflection of simple stems, viz. that one mora is added to the root. But this time the additional mora is contributed by the derivational categories in question and not by inflectional categories.

It might be suggested that no stem can have a vowel length that is more than one degree longer than the length of the root vowel, and that this is the reason why no additional length for inflectional categories shows up in centrifugal and centripetal stems. It is true, of course, that no length can be added to a long vowel, at least phonetically, since no vowel can be more than three morae long in Dinka. However, stems whose vowel is two degrees longer than the root vowel do actually occur, though not with any of the derivational categories dealt with in this article. For instance, multiplicative stems and causative stems with CVC/F roots have a long vowel, as in (66) and (67), respectively.

(66) Simple

Ø *dòɔk à-bòk diɛ̀ɛt*
boy D-throw birds

NF *dòɔk à-cé diɛ̀ɛt bôok*
boy D-PF birds throw:NF
'The boy is throwing/has thrown at the birds'

Multiplicative

Ø *dòɔk à-boóok diɛ̀ɛt*
boy D-throw:M birds

NF *dòɔk à-cé diɛ̀ɛt bɔóɔk*
boy D-PF birds throw:M:NF
'The boy is throwing/has thrown repeatedly at the birds'

(67) Simple

Ø	*dɔ̀ɔk*	*à-dɛ̀k*	*wáal*
	boy	D-drink	medicine

NF *dɔ̀ɔk à-cɛ́ wáal dɛ̂ek*
boy D-PF medicine drink:NF
'The boy is drinking/has drunk medicine'

Causative

Ø	*mɔ̀c*	*à-deɛ̂ek*	*dɔ̀ɔk*	*ɛ̀*	*wáal*
	man	D-drink:C	boy	PREP	medicine

NF *mɔ̀c à-cɛ́ dɔ̀ɔk dɛɛ̂ɛk ɛ̀ wáal*
man D-PF boy drink:C:NF PREP medicine
'The man is making/has made the boy drink medicine'

Therefore, there is no evidence that inflectional categories make any contribution to the vowel length parameter in centrifugal and centripetal stems, not even underlyingly.

Benefactive stems invariably have a half-long vowel whether the root vowel is short, as in (68), or half-long, as in (69).

(68) Simple

Ø	*à-bùt ɣòt*	'He is building a house'
NF	*à-cɛ́ ɣòt bùut*	'He has built a house'

Benefactive

Ø	*à-bûut ûik ɣòt*	'He is building a house for the woman'
NF	*à-cɛ́ ûik buôot ɣòt*	'He has built a house for the woman'
NTS	*à-búut márìàal ɣòt*	'Marial is building a house for her'
1S	*à-buôot ɣòt*	'I am building a house for her'
2S	*à-buòot-ɛ́ ɣòt*	'You are building a house for her'
3S	*à-bûut ɣòt*	'He is building a house for her'
1P	*à-bûut-kù ɣòt*	'We are building a house for her'
2P	*à-buôot-kà ɣòt*	'You are building a house for her'
3P	*à-bûut-kɛ̀ ɣòt*	'They are building a house for her'
PAS	*à-bûut-ɛ̀ ɣòt*	'A house is being built for her'

(69) Simple

Ø	*à-kuɛ̀en ɣɔ́k*	'He is counting cows'
NF	*à-cɛ́ ɣɔ́k kueɛ́en*	'He has counted cows'

Benefactive

Ø	*à-kuɛ̈ɛ̈n ɣɔ̈k mɔ̀c*	'He is counting cows for the man'
NF	*à-cɛ́ ɣɔ̈k kuɛ̈ɛn mɔ̀c*	'He has counted cows for the man'
NTS	*á-kuɛ̈ɛn ɖɔ̈ɔk mɔ̀c*	'The boy is counting them for the man'
1S	*á-kuɛ̈ɛn mɔ̀c*	'I am counting them for the man'
2S	*á-kuɛ̈ɛn-ɛ́ mɔ̀c*	'You are counting them for the man'
3S	*á-kuɛ̈ɛn mɔ̀c*	'He is counting them for the man'
1P	*á-kuɛ̈ɛn-kù mɔ̀c*	'We are counting them for the man'
2P	*á-kuɛ̈ɛn-kà mɔ̀c*	'You are counting them for the man'
3P	*á-kuɛ̈ɛn-kɛ̀ mɔ̀c*	'They are counting them for the man'
PAS	*á-kuɛ̈ɛn-ɛ̀ mɔ̀c*	'They are being counted for the man'

The half-long vowel of a benefactive stem with a short root vowel could be analysed as resulting from the addition of one mora to the root. However, this analysis would miss the generalization that benefactive stems are always half-long. The only way of making this generalization explicit is to let the benefactive category *per se* provide the half-long vowel length and to let this length suppress the length of the root vowel.

In benefactive-antipassive stems, the vowel length is dependent on the length/tone class of the root, but not in the same way as with centrifugal and centripetal stems. If the benefactive-antipassive stem is derived from a root with a short vowel, then its vowel is half-long whether the root belongs to tone class F, as in (70), or to tone class L, as in (71).

(70) Simple

Ø	*à-ɟɔ̈t ŋ̀im*	'He is lifting the wood'
NF	*à-cɛ́ ŋ̀im ɟɔ̈ɔt*	'He has lifted the wood'

Benefactive-antipassive

Ø	*à-ɟɔ̈ɔ̈t ŋ̀ik*	'He is lifting for the woman'
NF	*à-cɛ́ ŋ̀ik ɟɔ̈ɔ̈t*	'He has lifted for the woman'
NTS	*à-ɟɔ́ɔ̈t ɖɔ̈ɔk*	'The boy is lifting for her'
1S	*à-ɟɔ̈ɔ̈t*	'I am lifting for her'
2S	*à-ɟɔ̈ɔt-ɛ́*	'You are lifting for her'
3S	*à-ɟɔ̈ɔ̈t*	'He is lifting for her'
1P	*à-ɟɔ̈ɔ̈t-kù*	'We are lifting for her'
2P	*à-ɟɔ̈ɔt-kà*	'You are lifting for her'
3P	*à-ɟɔ̈ɔ̈t-kɛ̀*	'They are lifting for her'
PAS	*à-ɟɔ̈ɔ̈t-ɛ̀*	'She is being lifted for'

(71) Simple

Ø	*à-nàj àt iǫ́ol*	'She is plaiting a net'
NF	*à-cé̱ àt iǫ́ol nàaj*	'She has plaited a net'

Benefactive-antipassive

Ø	*à-nɛ̂ɛj mɔ̀c*	'She is plaiting for the man'
NF	*à-cé̱ mɔ̀c nâaj*	'She has plaited for the man'
NTS	*à-nɛ́ɛj tù̱ik*	'The woman is plaiting for him'
1S	*à-nâaj*	'I am plaiting for him'
2S	*à-nàaj-é̱*	'You are plaiting for him'
3S	*à-nɛ̂ɛj*	'He is plaiting for him'
1P	*à-nɛ̂ɛj-kù̱*	'We are plaiting for him'
2P	*à-nâaj-kà̱*	'You are plaiting for him'
3P	*à-nɛ̂ɛj-kɛ̀*	'They are plaiting for him'
PAS	*à-nɛ̂ɛj-ɛ̀*	'He is being plaited for'

However, if the root vowel is half-long, then the vowel of the benefactive-antipassive stem is long if the root belongs to tone class F, as in (72), but half-long if the root belongs to tone class H, as in (73).

(72) Simple

Ø	*à-rà̱ak wɛ́ŋ*	'She is milking a cow'
NF	*à-cé̱ wɛ́ŋ raâak*	'She has milked a cow'

Benefactive-antipassive

Ø	*à-rɛɛ̂ɛk mɛ̀t*	'She is milking for the child'
NF	*à-cé̱ mɛ̀t raâak*	'She has milked for the child'
NTS	*à-rɛɛ́ɛk tù̱ik*	'The woman is milking for him'
1S	*à-raâak*	'I am milking for him'
2S	*à-raà̱ak-é̱*	'You are milking for him'
3S	*à-rɛɛ̂ɛk*	'He is milking for him'
1P	*à-rɛɛ̂ɛk-kù̱*	'We are milking for him'
2P	*à-raâak-kà̱*	'You are milking for him'
3P	*à-rɛɛ̂ɛk-kɛ̀*	'They are milking for him'
PAS	*à-rɛɛ̂ɛk-ɛ̀*	'He is being milked for'

(73) Simple

Ø	*à-lɔ̀ɔk àlâat*	'She is washing the cloth'
NF	*à-cé̱ àlâat lɔɔ́ɔk*	'She has washed the cloth'

Benefactive-antipassive		
Ø	*à-lo̱ok mo̱c*	'She is washing for the man'
NF	*à-cé mo̱c lo̱ɔk*	'She has washed for the man'
NTS	*à-lo̱ok tu̱ik*	'The woman is washing for him'
1S	*à-lo̱ɔk*	'I am washing for him'
2S	*à-lɔ̱ɔk-é*	'You are washing for him'
3S	*à-lo̱ok*	'He is washing for him'
1P	*à-lo̱ok-kù*	'We are washing for him'
2P	*à-lo̱ɔk-kà*	'You are washing for him'
3P	*à-lo̱ok-kè*	'They are washing for him'
PAS	*à-lo̱ok-è*	'He is being washed for'

With this distribution of vowel lengths, no full-scale generalization is possible. What seems to be the case, therefore, is that for each individual length/tone class of roots the benefactive-antipassive category provides a particular vowel length, which suppresses the length of the root vowel, and which happens to be the same for three of the four root classes.

6.3. Vowel length in antipassive stems. With antipassive stems, the situation is more complex. According to the length/tone class and to some extent the voice quality of the root, the set of finite antipassive stems with that root is either constant with respect to vowel length like other derived stem categories or exhibits vowel length alternation of the same type as in simple stems. Moreover, the vowel length of the nonfinite antipassive stem follows separate rules.

With roots belonging to class CVC/F, all finite antipassive stems have a half-long vowel, whereas the non-finite stem has a short vowel:

(74)

Simple		
Ø	*à-mɔ̀c la̱j*	'He is shooting an animal'
NF	*à-cé̱ la̱j mo̱oc*	'He has shot an animal'

Antipassive		
Ø	*à-mu̱uc*	'He is shooting'
NF	*à-cé̱ mɔ̀c*	'He has shot'
NTS	*à-mu̱uc mà-kè̱er*	'Maker is shooting with it'
1S	*muo̱oc*	'Shall I shoot?'
2S	*muɔ̱oc-é*	'Shoot!'
3S	*mu̱uc*	'Is he shooting?'
1P	*mu̱uc-kù*	'Shall we shoot?'
2P	*muo̱oc-kà*	'Shoot!'
3P	*mu̱uc-kè*	'Are they shooting?'
PAS:CT	*à-mu̱uc-è*	'It is being shot with'

The other length/tone class of roots with a short vowel, class CVC/L, behaves in the same way, except that the non-finite stem also has a half-long vowel.

(75) Simple

Ø	*à-bùt yòt*	'He is building a house'
NF	*à-cé yòt bùut*	'He has built a house'

Antipassive

Ø	*à-buôot*	'He is building'
NF	*à-cé bûut*	'He has built'
NTS	*à-bûut màkêer*	'Maker is building with it'
1S	*buôot*	'Shall I build?'
2S	*buòot-é*	'Build!'
3S	*bûut*	'Is he building?'
1P	*bûut-kù*	'Shall we build?'
2P	*buôot-kà*	'Build!'
3P	*bûut-kè*	'Are they building?'
PAS	*à-bûut-è*	'It is being built with'

With roots belonging to class CVVC/F, the vowel length of antipassive stems is dependent on the voice quality of the root. If the latter is creaky, the vowel of the antipassive stem is either half-long or long, depending on the inflectional category. As shown in (76), the vowel is half-long if the inflectional category is Ø, 1P, 2P, or 3P, and long if the inflectional category is NF, 1S, 2S, 3S or PAS:CT.

(76) Simple

Ø	*à-ràak wéŋ*	'She is milking a cow'
NF	*à-cé wéŋ raâak*	'She has milked a cow''

Antipassive

Ø	*à-rɔ̀ɔk*	'She is milking'
NF	*à-cé rɔɔ́ɔk*	'She has milked'
NTS	*à-rɔɔ́ɔk ùik*	'The woman is milking with it'
1S	*raàak*	'Shall I milk?'
2S	*raàak-é*	'Milk!'
3S	*rɔɔ̀ɔk*	'Is she milking?'
1P	*rɔ̀ɔk-kú*	'Shall we milk?'
2P	*ràak-ká*	'Milk!'
3P	*rɔ̀ɔk-ké*	'Are they milking?'
PAS:CT	*à-rɔɔ̂ɔk-è*	'It is being milked with'

Breathy roots of the same length/tone class are realized with a long vowel throughout the inflection of the antipassive stem, as in (77).

(77) Simple

Ø	*à-lòom ríiŋ*	'He is taking the meat'
NF	*à-cé ríiŋ loòom*	'He has taken the meat'

Antipassive

Ø	*à-loóom*	'He is taking'
NF	*à-cé loòom*	'He has taken'
NTS	*à-loóom tùik*	'The woman has taken with it'
1S	*lɔ́ɔ́m*	'Shall I take?'
2S	*lɔ́ɔ̀m-é*	'Take!'
3S	*loóom*	'Is he taking?'
1P	*loóom-kù*	'Shall we take?'
2P	*lɔ́ɔ́m-kà*	'Take!'
3P	*loóom-kè*	'Are they taking?'
PAS:CT	*à-loòom-è*	'It is being taken with'

With roots belonging to class CVVC/H, finally, the vowel length of antipassive stems again depends on the inflectional category. As shown in (78), the vowel is short if the inflectional category is Ø, NF, 1P, 2P or 3P, and half-long if the inflectional category is 1S, 2S, 3S or PAS:CT.

(78) Simple

Ø	*à-lɔ̀ɔk mèt*	'She is washing the child'
NF	*à-cé mèt lɔ́ɔ́k*	'She has washed the child'

Antipassive

Ø	*à-lɔ̀k*	'She is washing'
NF	*à-cé lɔ̀k*	'She has washed'
NTS	*à-lóok tùik*	'The woman is washing with it'
1S	*lɔ̀ɔk*	'Shall I wash?'
2S	*lɔ̀ɔk-é*	'Wash!'
3S	*lòok*	'Is he washing?'
1P	*lɔ́k-kù*	'Shall we wash?'
2P	*lɔ́k-kà*	'Wash!'
3P	*lɔ́k-kè*	'Are they washing?'
PAS:CT	*à-lòok-è*	'It is being washed with'

The vowel length alternation illustrated by (76) and (78) above is of the same type as that of simple stems: With some inflectional categories the vowel is one degree longer than the vowel of the other inflectional categories. Moreover, the distribution of the two length alternants is almost the same in simple stems and antipassive stems: In both of these derivational categories the shorter alternant occurs if the inflectional category is Ø, lP, 2P, or 3P, and the longer alternant occurs if the inflectional category is NTS, lS, 3S, or PAS:CT. Disagreement

between the two derivational categories exists only for the inflectional categories 2S and NF. 2S takes the shorter alternant in simple stems, but the longer alternant in antipassive stems. This difference, however, is evidently related to the fact that 2S is expressed by a suffix in antipassive forms but not in simple forms. What remains is NF, but this inflectional category is aberrant on all phonological parameters in antipassive stems and must therefore be treated separately anyway.

The similarities between vowel length alternation in antipassive stems and simple stems suggest that a distinction must be made between a derivational layer and an inflectional layer with respect to vowel length in antipassive stems. At the derivational layer the antipassive category provides a particular vowel length, which is dependent on the root class, and which suppresses the length of the root vowel. And at the inflectional layer some inflectional categories provide an additional mora to the vowel length provided by the antipassive category.

Notice, furthermore, that liability to vowel length alternation within the set of finite antipassive forms of a given root correlates with tone. Thus, vowel length alternation occurs when the tone of, for instance, the inflectionally unmarked form is L, as in (76) and (78), but not when the tone of that form is H or F, as in (74), (75), and (77). This correlation is hardly a coincidence, since simple transitive stems also have L on the unmarked form, and, in fact, the correlation also seems to hold for non-antipassive intransitive stems, which are not dealt with in this article. Hence, the possibility for inflectional categories to provide an extra mora in antipassive stems seems to be conditioned by the presence of an L tone, which—as we shall see in the next section—is itself provided by the antipassive category as such. On this analysis, then, the presence versus absence of vowel length alternation in antipassive stems is actually not dependent on the root class, although, at first sight, it might appear to be.

6.4. Morphological representation of vowel length. In conclusion, the length of the stem vowel of a given verb form is the product of a particular configuration of vowel length at three morphological layers, viz. the root layer, the derivational layer, and the inflectional layer. Symbolizing vowel length with an integer that indicates the number of morae, the vowel length inherent in a root is either 1 or 2. At the derivational layer, as indicated in Table 6, a derivational morpheme either provides an additional mora, +1, or it provides a value from the set {1,2,3}, which takes precedence over the value of the root layer in terms of phonetic realization. At the inflectional layer, as indicated in Table 7, an inflectional morpheme may provide an additional mora, so that, in the phonetic representation, the vowel length is one degree longer than that of the root layer in case of a simple stem or than that of the derivational layer in case of an antipassive stem.

Table 6. Derivational vowel length

Root class	Derivational category					
	CF	CP	B	BAP	AP	AP:NF
CVC/F	+1	+1	2	2	2	1
CVC/L	+1	+1	2	2	2	2
CV̰VC/F	+1	+1	2	3	2	3
CV̤VC/F	+1	+1	2	3	3	3
CVVC/H	+1	+1	2	2	2	1

Table 7. Inflectional vowel length

Inflectional category	Derivational category	
	Ø	AP L-toned
Ø		
NF	+1	
NTS	+1	+1
1S	+1	+1
2S		+1
3S	+1	+1
1P		
2P		
3P		
PAS		
PAS:CT	+1	+1

The morphological stratification of vowel length is exemplified in (80), which represents the word forms in (79).

(79)

a.	*le̤e̤r*	'Is he rolling?'	(roll:AP:3S)	(CVVC/F)
b.	*lɛ̰er*	'Roll it!'	(roll:2S)	(CVVC/F)
c.	*le̤ɛ̰er*	'Is he rolling it?'	(roll:3S)	(CVVC/F)
d.	*le̤ɛ̰er*	'Is he rolling it thither?'	(roll:CF:3S)	(CVVC/F)
e.	*të̤em*	'Is he cutting for him?'	(cut:BAP:3S)	(CVVC/H)

(80)

	a.	b.	c.	d.	e.
phonetic representation	3	2	3	3	2
inflectional layer	+1		+1		
derivational layer	2			+1	2
root layer	2	2	2	2	2

7. Tone alternation

Looking at the distribution of tones as displayed in Table 4 above, no clear pattern immediately emerges. What is clear is the negative fact that tone does not correlate uniquely with any of the three morphological parameters: root class, derivational status, or inflectional status. Thus, no root class is characterized by a particular stem tone across derivational categories and across inflectional categories, and no derivational category is characterized by a particular stem tone across root classes and across inflectional categories. Similarly, nine of the eleven inflectional categories do not have invariant stem tones across root classes and across derivational categories. Tonal constancy occurs only with the inflectional categories NTS, which always has a H stem tone, and PAS:CT, which always has a F stem tone. In these two cases, then, the tone is clearly inflectional rather than derivational or radical, but in all other cases the function of tone is not immediately clear. However, as shown in the following subsections, a closer examination of the facts reveals that each instance of a surface tone can actually be attributed to a particular morphological layer.

7.1 Contextually determined tones. Some tones of some verb forms can be analysed as being determined by the context. Four types of contextually determined tones will be distinguished below, but common to all of them is that the determining context is partly phonological and partly grammatical.

Consider first the tonal behaviour of finite verb forms in clauses in which the topic is a subject noun phrase. If the verb has a short vowel, its tone is variable, as can be observed in (81), where the stem is simple, and in (82), where the stem is antipassive. Thus, the tone is L in the positive declarative (a)-clauses, but H in the negative declarative (b)-clauses and in the (positive) non-declarative (c)-clauses.

(81) a. *mə̀rìə̀al ə̀-nə̀k tɔ̀ɔk*
Marial D-kill goat
'Marial is killing a goat'

b. *mə̀rìə̀al ə̀-cɛ̀ nə́k tɔ̀ɔk*
Marial D-NEG kill goat
'Marial is not killing a goat'

c. *nə́k mə́rìə̀al tɔ̀ɔk*
kill Marial:GEN goat
'Is Marial killing a goat?'

(82) a. *t̪ḭ̀ik* *à̰-t̪à̤t*
woman D-cook:AP
'The woman is cooking'

b. *t̪ḭ̀ik* *à̰-cè̤* *t̪á̤t*
woman D-NEG cook:AP
'The woman is not cooking'

c. *t̪á̤t* *t̪ḭ̀ik*
cook:AP woman
'Is the woman cooking?'

Notice that negative declarative clauses and non-declarative clauses share another formal property which distinguishes them from positive declarative clauses, viz. the absence of a declarative particle immediately before the finite verb. In negative declarative clauses the negation particle intervenes between the declarative particle and the verb, and in non-declarative clauses there is no declarative particle at all. Thus, it is possible to analyse the tonal alternation as being a contextually determined variation rather than as reflecting two distinct inflectional categories: The tone is L when the verb is immediately preceded by a declarative particle, and H otherwise. This analysis is supported by the fact that the tonal alternation is restricted to verbs with a short vowel. Thus, for instance, the tone is invariably L in (83), where the vowel is half-long.

(83) a. *t̪ḭ̀ik* *à̰-t̪à̰al* *rí̤iŋ*
woman D-cook meat
'The woman is cooking meat'

b. *t̪ḭ̀ik* *à̰-cè̤* *t̪à̰al* *rí̤iŋ*
woman D-NEG cook meat
'The woman is not cooking meat'

c. *t̪à̰al* *t̪ḭ̀ik* *rí̤iŋ*
cook woman meat
'Is the woman cooking meat?'

However, it should also be noted that the presence of a short stem vowel is not a sufficient condition for the occurrence of the L ~ H variation: The verb must belong to the inflectionally unmarked category. Thus, no variation occurs with the second person singular /CVC/ form in (84), whose tone is invariably L, and with the passive /CVC/ form in (85), whose tone is invariably H.

(84) a. *t̪ɔ̤̀ɔ̤k à̰-nà̤k*
goat D-kill:2S
'You are killing the goat'

b. *nà̤k t̪ɔ̤̀ɔ̤k*
kill:2S goat
'Kill the goat!'

(85) a. *t̪ɔ̤̀ɔ̤k à̰-ná̤k*
goat D-kill:PAS
'The goat is being killed'

b. *t̪ɔ̤̀ɔ̤k à̰-cè̤ ná̤k*
goat D-NEG kill:PAS
'The goat is not being killed'

Given the contextual determination of the L ~ H variation in inflectionally unmarked verb forms with a short vowel, the next question is what the basic or underlying tone of such verb forms is, if any. This question cannot be answered conclusively unless we extend our attention to verb forms with intransitive roots. Here we find that the variation L ~ H contrasts with H, i.e., there are inflectionally unmarked verb forms with a short vowel that have H in all contexts. One example is shown in (86).

(86) a. *tḭ̀ik à̰-lɔ̰́*
woman D-go
'The woman is going'

b. *tḭ̀ik à̰-cè̤ lɔ̰́*
woman D-NEG go
'The woman is not going'

c. *lɔ̰́ tḭ̀ik*
go woman
'Is the woman going?'

The verb stem in (86) lacks a final consonant, and, in fact, so do all other verb stems with a short vowel and an invariable H tone in the unmarked form. Therefore, it might be suggested that the invariable H tone is due to this property. However, there is at least one verb which also lacks a stem-final consonant but which does exhibit the L ~ H variation, viz. the verb shown in (87).

(87) a. *t̪ḭ̀ik* *à̰-tọ̤̀*
woman D-be present
'The woman is present'

b. *t̪ḭ̀ik* *à̰-cẹ̤̀* *tọ̤́*
woman D-NEG be present
'The woman is not present'

c. *tọ̤́* *t̪ḭ̀ik*
be present woman
'Is the woman present?'

Hence, the underlying tone of L ~ H stems must be L rather than H, since if it were H, it would be indistinguishable from the tone of stems that do not exhibit the L ~ H variation. That is the reason why, in Table 4 above, L rather than H was chosen as the tone characterizing the forms in question.

Another type of contextually determined tone is constituted by the stem tones that occur in verb forms with the second person singular H-toned suffix /-ẹ̤́/ or the passive L-toned suffix /-ẹ̤̀/. Whenever second person singular is expressed by the suffix /-ẹ̤́/, the stem tone is L. This is illustrated by the centrifugal stems in (88) for each of the four length/tone classes of roots.

(88) CF-2S

CVC/F	*wɛ̰̀ɛc-ẹ̤́*	'Kick it thither!'
CVC/L	*tɛ̰̀ɛŋ-ẹ̤́*	'Dust it thither!'
CVVC/F	*lɛɛ̰̀ɛr-ẹ̤́*	'Roll it thither!'
CVVC/H	*tɛɛ̰̀ɛm-ẹ̤́*	'Cut it thither!'

Similarly, whenever the passive is expressed by the suffix /-ẹ̤̀/, the stem tone is F, as illustrated by the centrifugal stems in (89).

(89) CF-PAS

CVC/F	*à̰-wḛ̂ec-ẹ̤̀*	'It is being kicked thither'
CVC/L	*à̰-tḛ̂eŋ-ẹ̤̀*	'It is being dusted thither'
CVVC/F	*à̰-leḛ̂er-ẹ̤̀*	'It is being rolled thither'
CVVC/H	*à̰-teḛ̂em-ẹ̤̀*	'It is being cut thither'

In these cases the stem tone can readily be analysed as determined by the suffix. Note, however, that there are phonologically identical but grammatically different suffixes which do not determine the stem tone. Thus, as shown by the nouns

in (90)-(91), the demonstrative suffix /-ḛ́/ 'that' can combine with either L or F, and the demonstrative suffix /-ḛ̀/ 'this' can combine with any of the three tones.

(90)	L	*tṵ̀im-ḛ́*	'that tree'
	F	*lâ̰an-ḛ́*	'that animal'
(91)	L	*tṵ̀im-ḛ̀*	'this tree'
	F	*lâ̰an-ḛ̀*	'this animal'
	H	*ḍɔ́ɔŋ-ḛ̀*	'this boy'

Hence, the context that determines the stem tones in (88)-(89) is not purely phonological.

A third type of contextually determined tones occurs on the plural subject suffixes /-*kṵ, -kạ, -kẹ*/. The tone of these suffixes is H if the stem tone is L, and L if the stem tone is H or F. This correlation is exemplified by the first person plural forms in (92)-(93).

(92) 1P

CVC/F	*à̰-wḛ́c-kṵ*	'We are kicking it'
CVC/L	*à̰-tḛ́ŋ-kṵ*	'We are dusting it'
CVVC/F	*à̰-lɛ̰̀er-kṵ́*	'We are rolling it'
CVVC/H	*à̰-tɛ̰̀em-kṵ́*	'We are cutting it'

(93) BAP-1P

CVC/F	*à̰-wḛ̂ec-kṵ*	'We are kicking for him'
CVC/L	*à̰-tḛ̂eŋ-kṵ*	'We are dusting for him'
CVVC/F	*à̰-leḛ̂er-kṵ*	'We are rolling for him'
CVVC/H	*à̰-tḛ́em-kṵ*	'We are cutting for him'

Since the suffix tones are predictable from the stem tones, while the reverse is not true, the suffix tones must be analysed as determined by the stem tones. Note again, however, that the determining context is not purely phonological. Thus, the demonstrative suffixes /-*ká̰*/ 'those' and /-*kà̰*/ 'these', which are homonymous with the 2P suffix /-*kạ*/ 'you', are tonally distinct, and, as shown in (94)-(95), /-*ká̰*/ can combine with either L or F, and /-*kà̰*/ can combine with any of L, F, and H.

(94)	L	*kṵ̀ur-ká̰*	'those stones'
	F	*kɔ̰̂ɔc-ká̰*	'those people'

(95)

L	*kụ̈ur-kạ̈*	'these stones'
F	*kɔ̰̂ɔc-kạ̈*	'these people'
H	*ṛụ́un-kạ̈*	'these years'

The last type of contextually determined tone occurs in verb forms with the skeletal shape /CVC-CV/, i.e., in forms with a short stem vowel and a plural subject suffix. The stem tone of such forms is always H (and the suffix tone, hence, always L, cf. the preceding paragraph). In general, a verb form with a plural subject suffix has the same stem tone as the corresponding first person singular and third person singular forms. This fact is illustrated in (96)-(98), where the stem tones are H, L, and F, respectively.

(96) Centrifugal

3S	*a̰-wɛ́ec*	'He is kicking it thither'
1P	*a̰-wɛ́ec-kụ̈*	'We are kicking it thither'

(97) Centripetal

3S	*a̰-wɛ̀ec*	'He is kicking it hither'
1P	*a̰-wɛ̀ec-kṵ̈*	'We are kicking it hither'

(98) Benefactive-antipassive

3S	*a̰-wɛ̰̂ec*	'He is kicking for him'
1P	*a̰-wɛ̰̂ec-kụ̈*	'We are kicking for him'

/CVC-CV/ forms constitute an exception to the tonal constancy exemplified in (96)-(98), as can be observed in (99)-(100).

(99) Simple

3S	*a̰-wɛ̀ec*	'He is kicking it'
1P	*a̰-wɛ́c-kụ̈*	'We are kicking it'

(100) Antipassive

3S	*kụ̈ tɛ̀em*	'and he cut'
1P	*kụ̈ tɛ́m-kụ̈*	'and we cut'

In (99)-(100) the 1P forms have a H stem tone, while the 3S forms have a L stem tone. It may, therefore, be suggested that, although /CVC-CV/ forms surface with H on the stem, their underlying stem tone is L, the H surface tone being due to

the short stem vowel and the /CV/-subject suffix. This analysis will be adopted, since, as we saw in (81)-(87) above, verb stems with a short vowel are in fact liable to contextual determination in a manner that verb stems with other vowel lengths are not. Again, however, /CV̀C-CV́/ is not excluded for purely phonological reasons, since nouns may have this shape, as shown in (101).

(101) *lɛ̀c-ká* 'those teeth'

As may have been noticed, the grammatical part of the context that determines a tone makes reference to the inflectional category of the verb form in question, while no reference is made to the derivational category or to the root class. This means that the contextually determined tones reflect inflectional categories, although they are not direct exponents of them.

By definition, the contextually determined stem tones are not inherent in the stem. Therefore, they should be disregarded in any attempt to analyse the other stem tones as being exponents of either the root, the derivational category, or the inflectional category of the verb form in question. This requirement is taken into account in Table 8, which shows the stem tones of all relevant combinations of root class, derivational category, and inflectional category, but in which the contextually determined tones are enclosed in parentheses.

Table 8. Stem tones

Inflectional category	Root class and derivational category											
	CVC/F						CVC/L					
	Ø	CF	CP	B	BAP	AP	Ø	CF	CP	B	BAP	AP
Ø	L/(H)	H	L	H	F	F	L/(H)	F	L	F	F	F
NF	F	H	L	H	F	L	L	F	L	F	F	F
NTS	H	H	H	H	H	H	H	H	H	H	H	H
1S	L	H	L	H	F	F	L	F	L	F	F	F
2S	L	(L)	H	(L)	(L)	(L)	L	(L)	H	(L)	(L)	(L)
3S	L	H	L	H	F	F	L	F	L	F	F	F
1P	(H)	H	L/H	H	F	F	(H)	F	L/H	F	F	F
2P	(H)	H	L/H	H	F	F	(H)	F	L/H	F	F	F
3P	(H)	H	L/H	H	F	F	(H)	F	L/H	F	F	F
PAS	H	(F)	(F)	(F)	(F)		H	(F)	(F)	(F)	(F)	
PAS:CT	(F)	(F)	(F)	(F)	(F)	(F)	(F)	(F)	(F)	(F)	(F)	(F)

Table 8, continued.

Inflectional category	Root class and derivational category												
	CVVC/F							CVVC/H					
	Ø	CF	CP	B	BAP	AP_1	AP_2	Ø	CF	CP	B	BAP	AP
Ø	L	F	L	F	F	L	H	L	H	L	H	H	L/(H)
NF	F	F	L	F	F	H	L	H	H	L	H	H	L
NTS	H	H	H	H	H	H	H	H	H	H	H	H	H
1S	L	F	L	F	F	L	H	L	H	L	H	H	L
2S	F	(L)	H	(L)	(L)	(L)	(L)	H	(L)	H	(L)	(L)	(L)
3S	L	F	L	F	F	L	H	L	H	L	H	H	L
1P	L	F	L/H	F	F	L	H	L	H	L/H	H	H	(H)
2P	L	F	L/H	F	F	L	H	L	H	L/H	H	H	(H)
3P	L	F	L/H	F	F	L	H	L	H	L/H	H	H	(H)
PAS	F	(F)	(F)	(F)	(F)			H	(F)	(F)	(F)	(F)	
PAS:CT	(F)	(F)	(F)	(F)	(F)	(F)	(F)	(F)	(F)	(F)	(F)	(F)	(F)

AP_1=AP with creaky root. AP_2=AP with breathy root.

7.2. Tones of simple stems. Consider now the tones of simple stems, disregarding the contextually determined tones. Since simple stems are non-derived, only the root class and the inflectional category can be relevant to the analysis of their tones. The problem is, then, to what extent the tone of a given stem form can be attributed to either the root or the inflectional category.

In section 4 it was stated that the tones of the set of simple stems that manifests a given root are predictable from the tone of the non-finite form. The latter tone, which is either F, L, or H, is shown for each of the four length/tone classes of roots by the examples in (102).

(102) NF

CVC/F	*à-cè wêec*	'He has kicked it'	(D-PF:3S kick:NF)
CVC/L	*à-cè tèeŋ*	'He has dusted it'	(D-PF:3S dust:NF)
CVVC/F	*à-cè leêer*	'He has rolled it'	(D-PF:3S roll:NF)
CVVC/H	*à-cè teéem*	'He has cut it'	(D-PF:3S cut:NF)

As can be seen by examining Table 8, there is no other form from which the whole set of tones is predictable. That is why, in section 4, the root classes were named after the tones of the non-finite forms. The lexical representation of a root must, of course, contain information as to its tonal class, but the question is whether this information should be posited in terms of an arbitrary label or in

terms of an actual underlying tone. In other words, should the tones of the non-finite forms be considered root tones? Before answering this question, let us look at the tones of the other forms with simple stems.

Some inflectional categories are characterized by a particular tone irrespective of the length/tone class of the root. The unmarked form, the first person singular form and the third person singular form always have L, as in examples (103)-(105), where "X" symbolizes an overt noun phrase.

(103) Ø

CVC/F	*à-wɛ̀c X*	'He is kicking X'
CVC/L	*à-tɛ̀ŋ X*	'He is dusting X'
CVVC/F	*à-lɛ̀er X*	'He is rolling X'
CVVC/H	*à-tɛ̀em X*	'He is cutting X'

(104) 1S

CVC/F	*à-wɛ̀ɛc*	'I am kicking it'
CVC/L	*à-tɛ̀ɛŋ*	'I am dusting it'
CVVC/F	*à-lɛɛ̀ɛr*	'I am rolling it'
CVVC/H	*à-tɛɛ̀ɛm*	'I am cutting it'

(105) 3S

CVC/F	*à-wɛ̀ec*	'He is kicking it'
CVC/L	*à-tɛ̀eŋ*	'He is dusting it'
CVVC/F	*à-leɛ̀er*	'He is rolling it'
CVVC/H	*à-teɛ̀em*	'He is cutting it'

L also characterizes stems with plural subject suffixes, provided that the H stem tone of /CVC-CV/ forms is contextually determined, as argued in the previous subsection. The following examples are third person plural forms.

(106) 3P

CVC/F	*à-wɛ́c-kɛ̀*	'They are kicking it'
CVC/L	*à-tɛ́ŋ-kɛ̀*	'They are dusting it'
CVVC/F	*à-lɛ̀er-kɛ́*	'They are rolling it'
CVVC/H	*à-tɛ̀em-kɛ́*	'They are cutting it'

Similarly, the NTS form always has a H tone, as shown in (107).

(107) NTS

CVC/F	*à-wɛ̰ec X*	'X is kicking it'
CVC/L	*à-tɛ̰eŋ X*	'X is dusting it'
CVVC/F	*à-leɛ̰er X*	'X is rolling it'
CVVC/H	*à-teɛ̰em X*	'X is cutting it'

In these cases, obviously, the tone cannot be an exponent of the root, but must be an exponent of the inflectional categories in question.

The remaining inflectional categories, 2S and PAS, have L and H, respectively, if the root vowel is short, and both of them have F in root class CVVC/F and H in root class CVVC/H. This situation is exemplified in (108)-(109).

(108) 2S

CVC/F	*à-wɛ̰̀c*	'You are kicking it'
CVC/L	*à-tɛ̰̀ŋ*	'You are dusting it'
CVVC/F	*à-lɛ̰̂er*	'You are rolling it'
CVVC/H	*à-tɛ̰̂em*	'You are cutting it'

(109) PAS

CVC/F	*à-wɛ̰́c*	'It is being kicked'
CVC/L	*à-tɛ̰́ŋ*	'It is being dusted'
CVVC/F	*à-lɛ̰̂er*	'It is being rolled'
CVVC/H	*à-tɛ̰̂em*	'It is being cut'

In stems with a short root vowel the tone of these two inflectional categories is independent of the tonal class of the root and must, therefore, be inflectional. In stems with a half-long root vowel, on the other hand, the tone is dependent on the tonal class of the root, and, moreover, it is identical with the tone of the non-finite form. This identity could be considered coincidental, of course, but it could also be considered noncoincidental and hence something to be explained. In the latter case the only obvious explanation is that the tones of the forms in question are root tones rather than inflectional tones. This is the analysis that will be adopted here.

7.3. Tones of derived stems. Consider next the tones of derived stems, again disregarding contextually determined tones. As can be observed in Table 8, two inflectional categories exhibit tonal constancy. One is the NTS category, which, as

already noticed, is characterized by H throughout the morphological system. The other is the 2S category, which will be dealt with below. All other inflectional categories are not tonally constant, their tones varying according to the derivational category and the root class. Notice, however, that apart from the non-finite category of antipassive stems, all inflectional categories have the same tone for any given combination of derivational category and root class. That is, their tones characterize the derivational category *cum* root class, and hence they cannot be inflectional. Observe, furthermore, that these tones are often different from the root tones as defined in section 7.2 above. Hence, they must be derivational rather than radical. The derivational tones and their dependence on the root class are illustrated in (110)-(117) below. Unless otherwise indicated, the examples are 3S forms.

In centrifugal stems the tone is H if the root class is CVC/F or CVVC/H, and F if the root class is CVC/L or CVVC/F.

(110) Centrifugal

CVC/F	à-wɛ̰ec	'He is kicking it thither'
CVC/L	à-tɛ̰eŋ	'He is dusting it thither'
CVVC/F	à-leɛ̰er	'He is rolling it thither'
CVVC/H	à-teɛ́em	'He is cutting it thither'

With benefactive stems the distribution of tones is the same as with centrifugal stems.

(111) Benefactive

CVC/F	*à-wɛ̰ec mɔ̰c*	'He is kicking it for the man'
CVC/L	*à-tɛ̰eŋ mɔ̰c*	'He is dusting it for the man'
CVVC/F	*à-lɛ̰er mɔ̰c*	'He is rolling it for the man'
CVVC/H	*à-tɛ́em mɔ̰c*	'He is cutting it for the man'

In benefactive-antipassive stems the tone is H if the root class is CVVC/H, and F otherwise.

(112) Benefactive-antipassive

CVC/F	*à-wɛ̂ec*	'He is kicking for him'
CVC/L	*à-tɛ̂eŋ*	'He is dusting for him'
CVVC/F	*à-leɛ̂er*	'He is rolling for him'
CVVC/H	*à-tɛ́em*	'He is cutting for him'

Centripetal stems differ tonally from the other categories of derived stems in three principled ways. First, the derivational tone of centripetal stems is always L and, thus, independent of the root class.

(113) Centripetal

CVC/F	*à̰-wɛ̰̀ec*	'He is kicking it hither'
CVC/L	*à̰-tɛ̰̀eŋ*	'He is dusting it hither'
CVVC/F	*à̰-leɛ̰̀er*	'He is rolling it hither'
CVVC/H	*à̰-teɛ̰̀em*	'He is cutting it hither'

Second, centripetal stems exhibit some tonal variation. Thus, if the stem is followed by a plural suffix, its tone varies freely between L and H, as in (114).

(114) *à̰-wɛ̰̀ec-kɛ̰́* ~ *à̰-wɛ̰́ec-kɛ̰̀* 'They are kicking it hither'

Third, the 2S form of a centripetal stem lacks the suffix /-ɛ̰́/, and hence its stem tone is not contextually determined. In this case the stem tone is invariably H.

(115) Centripetal

CVC/F	*wɛ̰́ec*	'Kick it hither!'
CVC/L	*tɛ̰́eŋ*	'Dust it hither!'
CVVC/F	*leɛ̰́er*	'Roll it hither!'
CVVC/H	*teɛ̰́em*	'Cut it hither!'

This H tone must be inflectional, since it is different from the derivational L tone that otherwise characterizes centripetal stems.

In the antipassive, the stem tone of finite forms is F in classes CVC/F and CVC/L, L in the creaky subclass of class CVVC/F, H in the breathy subclass of class CVVC/F, and L in class CVVC/H.

(116) Antipassive

CVC/F	*kṳ̰ wɛ̰̂ec*	'and he kicked'
CVC/L	*kṳ̰ tɛ̰̂eŋ*	'and he dusted'
CṼVC/F	*kṳ̰ leɛ̰̀er*	'and he rolled'
CṼVC/F	*kṳ̰ peɛ̰́en*	'and he refused to give'
CVVC/H	*kṳ̰ tɛ̰̀em*	'and he cut'

The non-finite forms of antipassive stems exhibit a different distribution of tones.

In class CVC/F the tone is L, in class CVC/L it is F, in the creaky subclass of class CVVC/F it is H, in the breathy subclass of CVVC/F it is L, and in class CVVC/H it is L.

(117) Antipassive

CVC/F	à-cḛ́ wɛ̰̀c	'He has kicked'
CVC/L	à-cḛ́ tɛ̰̂eŋ	'He has dusted'
CV̰VC/F	à-cḛ́ leḛ́er	'He has rolled'
CV̤VC/F	à-cḛ́ peɛ̤̀en	'He has refused to give'
CVVC/H	à-cḛ́ tɛ̰̀m	'He has cut'

In the antipassive the non-finite form thus differs from the finite forms on all of the three parameters of alternation considered here, viz. voice quality, vowel length, and tone.

7.4. Morphological representation of tones. In the previous subsections the tones of verb stems were variously attributed to the root, the derivational category, the inflectional category, or the context. The distribution of the stem tones in terms of these morphological parameters is shown in Tables 9 and 10.

Table 9. Root tones and derivational tones

Root class		Derivational category					
		Ø	CF	CP	B	BAP	AP
CVC/F		F	H	L	H	F	F
CVC/L		L	F	L	F	F	F
CVVC/F	CV̰VC CV̤VC	F	F	L	F	F	L H
CVVC/H		H	H	L	H	H	L

Table 10. Inflectional tones and contextually determined tones

Inflectional category	Derivational category and root class					
	Ø		CF	CP	B	BAP
	CVC	CVVC				
Ø	L/(H)	L	—	—	—	—
NF	—	—	—	—	—	—
NTS	H	H	H	H	H	H
1S	L	L	—	—	—	—
2S	L	—	(L)	H	(L)	(L)
3S	L	L	—	—	—	—
1P	(H)	L	—	—	—	—
2P	(H)	L	—	—	—	—
3P	(H)	L	—	—	—	—
PAS	H	—	(F)	(F)	(F)	(F)
PAS:CT	(F)	(F)	(F)	(F)	(F)	(F)

Inflectional category	Derivational category and root class				
	AP				
	CVC/F	CVC/L	CV̰VC/F	CV̤VC/F	CVVC/H
Ø	—	—	—	—	—/(H)
NF	L	F	H	L	L
NTS	H	H	H	H	H
1S	—	—	—	—	—
2S	(L)	(L)	(L)	(L)	(L)
3S	—	—	—	—	—
1P	—	—	—	—	(H)
2P	—	—	—	—	(H)
3P	—	—	—	—	(H)
PAS	—	—	—	—	—
PAS:CT	(F)	(F)	(F)	(F)	(F)

*Tone symbols in parentheses indicate contextually determined tones.

From Table 9, which shows the root tones and the derivational tones, it is clear that, in general, the derivational tones are dependent on the root class. Table 10 shows the inflectional tones and the contextually determined tones. As can be seen, inflectional categories are not always characterized tonally, while roots and

derived derivational categories always are. Only two inflectional categories, NTS and PAS:CT, always provide their own tones. For all other inflectional categories the presence or absence of a tone is dependent on the derivational status and/or the root class of the stem.

The analysis summarized in Tables 9 and 10 implies that some stems have more than one tone underlyingly, although only one tone is realized phonetically. Thus, all stems have a root tone, and all derived stems also have a derivational tone. In addition, some stems have an inflectional tone and/or a contextually determined tone. Assume that these four types of tones are stratified as in (118).

(118) Tonal layers
- 4 Contextually determined tone
- 3 Inflectional tone
- 2 Derivational tone
- 1 Root tone

Given this model of tonal stratification, with the root tone at the deepest layer, the tone that is realized phonetically is the most shallow one among those actually present underlyingly. The model is illustrated by the examples in (119).

(119)

	a.	b.	c.	d.
	lɛ̂er	*wɛ́ɛc*	*wɛ́ec*	*wɛ̀c*
4	—	—	—	—
3	—	—	H	L
2	—	H	L	—
1	F	F	F	F
	roll:2S	kick:CF:1S	kick:CP:2S	kick:2S
	CṼVC/F	CṼC/F	CṼC/F	CṼC/F
	'Roll it!'	'Shall I kick it thither?'	'Kick it hither!'	'Kick it!'

	e.	f.
	wɛ́c-kṵ	*tɛ́m-kṵ*
4	H L	H L
3	L —	— —
2	—	L
1	F	H
	kick-1P	cut:AP-1P
	CṼC/F	CṼVC/H
	'Shall we kick it?'	'Shall we cut?'

The stem tone that is realized phonetically is radical in (119a), derivational in (119b), inflectional in (119c-d), and contextually determined in (119e-f).

The non-finite forms of antipassive stems do not have the tones that otherwise characterize antipassive forms, but tones that are directly dependent on the root class. Thus, they appear not to distinguish between inflectional tone and derivational tone. This is not surprising, however, since these forms behave in the same way with respect to voice quality and vowel length, as we saw in sections 5 and 6.

In summary, alternations in the phonological parameters of voice quality, vowel length, and tone all suggest a model of morphological stratification that has separate layers for radical, derivational, and inflectional information. Using this model of morphological stratification, the example in (120) will have the underlying phonological representation shown in (121) as far as the parameters of voice quality, vowel length and tone are concerned.

(120) *wə̤̀ec*
kick:CP:2S
'Kick it hither!'

(121)

		voice	*length*	*tone*
inflectional layer	(2S)	—	—	H
derivational layer	(CP)	[+breathy]	+1	L
root layer	('kick')	—	1	F

The phonetic realization of (121) will be a half-long vowel (whose two morae are provided by the root and the derivational morpheme, respectively) with a breathy voice quality (provided by the derivational morpheme) and a H tone (which is provided by the inflectional morpheme, and which suppresses the tone provided by the derivational morpheme, that tone itself suppressing the tone provided by the root).

8. Conclusion

Although monosyllabic verb forms in Dinka are morphologically complex units, the morphemes that make them up have no linear order. Instead, such words can be analysed as consisting of a set of morphological layers, each of which represents a morpheme by means of a set of phonological parameter values. The phonological parameters that may be involved in this representation are vowel quality, final consonant, vowel length, voice quality, and tone, although only the last three of these have been dealt with in the present article. The morphological layers are simultaneous but "vertically" ordered, with the root as the "deepest" layer, optionally followed by a derivational layer, followed by an inflectional layer. This configuration of layers constitutes the underlying phono-

logical representation of the word.

Some phonological parameters may have a value at more than one layer simultaneously, in which case the most "shallow" value is the one that is realized phonetically. In the case of the vowel length parameter, the phonetic realization may alternatively be cumulative. The voice quality parameter may have no value at all, in which case a default value is realized phonetically. As for the tone parameter, the context may induce a value which suppresses any morphologically provided value.

A parameter value involved in expressing a derivational or inflectional morpheme may be dependent on parameter values at a deeper layer. Thus, a derivational or inflectional morpheme may exhibit phonologically conditioned allomorphy. This conditioning may hold between a derivational morpheme and the root, between an inflectional morpheme and a derivational morpheme, and between an inflectional morpheme and the root of a non-derived stem, but apparently not between an inflectional morpheme and the root of a derived stem if the non-finite forms of antipassive stems are disregarded. Thus, there may be a principle to the effect that no conditioning can hold across the derivational layer. The nonfinite forms of antipassive stems are an exception to this principle, but since these forms often differ from the corresponding finite forms on several phonological parameters, they should probably be analysed as having merged derivation and inflection into one morphological layer, and in that case the principle may be exceptionless after all.

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LANGUAGE TYPOLOGY AND RECONSTRUCTION: THE PRENASALIZED STOPS OF KISI

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The findings of language typologists can contribute to understanding synchronic variation where no diachronic facts are available. By establishing what happens universally, one can extrapolate as to the past and perhaps as to the future of a language on the basis of synchronic evidence. One approach within such a framework concentrates on a typologically unusual or marked feature on the assumption that its derivation may be established from less highly marked features. This paper discusses the typologically unusual prenasalized stops of Kisi, a Mel language belonging to the Southern Branch of (West) Atlantic. The approach adopted here is based on the process-oriented framework developed by Joseph Greenberg.

1. Introduction*

Nasality has provided phonologists with data challenging to both description and theory. Its prominence and manifest realizations attest to its pervasiveness and functional versatility. Nasality appears in nearly all languages [Maddieson 1984] and is relatively stable over time [Ohala 1974], making it a valuable focus for diachronic studies.

Nasality is, of course, important for one of the better researched features of the Atlantic languages, consonant alternation [cf. Anderson 1976]. In most Atlantic languages consonants alternate depending on phonological [Manjaku, Doneux

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1969] or morphosyntactic factors [Fula, Arnott 1970]. Nasality typically characterizes at least one member of a series, often in the form of pre-nasalization. Below appears one such set of alternations from Fulfulde (Fula, Maasina dialect), showing consonants which change in noun forms. The first line shows the two-way alternations common to the voiceless consonants, and the second line shows the three-way alternations for the voiced consonants, the third member of which is a prenasalized stop.

(1) Initial consonant alternation in Fulfulde [Fagerberg-Diallo 1984:3]

two-way:	*f-p*	*s-c*	*h-k*	
three-way:	*w-b-mb*	*r-d-nd*	*w-g-ŋg*	*y-j-nj*

Sapir [1971] documents the full variety of consonant alternation in Atlantic.

Although it only hints at consonant alternation [Dalby 1966]), Kisi is of special interest because of the pervasiveness of nasality [Childs 1991]. Kisi has full series of both nasals and prenasalized stops, as well as progressive, anticipatory, and "spontaneous" nasalization (a situation where no nearby nasal segment is present to contribute its nasality). In addition, nasality may be used for morphological contrasts and is used expressively for emphasis. Prenasalized stops are of particular interest because of their highly marked nature and for that reason form the focus of this inquiry.

1.1. Issues and approach. The process-oriented approach of Joseph Greenberg [e.g., 1969, 1974] views functionally similar yet formally contrasting systems as representing different stages in the diachronic evolution of that system. This approach has been applied, for example, to noun class systems in general [Greenberg 1977] and to Southern Atlantic noun class markers in particular [Childs 1983].

Greenberg's approach has also been applied with good effect to prenasalized stops. Herbert [1986], for example, takes a universally marked feature, prenasalization,[1] and looks at its evolution in the languages of South America, sub-Saharan Africa, and Oceania, adopting Greenberg's "dynamicization of subtypologies".

> In this method we take just one subtype within a typology of universal application. Such a subtype will usually be defined by the presence of a marked feature. By comparison of changes in historically independent examples, whether such changes are deduced from internal reconstruction, the comparative method, or direct historical attestation, we seek to construct a dynamic life history of the changes which such a type undergoes from its origination to its disappearance [Greenberg 1974:67].

[1] Prenasalized segments can be considered marked for many reasons [Herbert 1986: 23-51], most of which are directly attributable to their often non-unitary status, that is, to their interpretation as underlying clusters.

One caveat should be advanced before proceeding: we have to be wary of slavishly accepting a feature as marked within a language family or within an area. The feature's markedness may be based on statistical universals, whose generalizations may not hold in the smaller sphere. This may be the case with respect to nasality in languages from this part of the world. Bole-Richard [1985:5] has characterized nasality within Niger-Congo as unstable, and this instability can lead to violations of universals. For example, Stewart's [1976] reconstructed nasal vowels and postulated subsequent development in Volta-Congo violate two of Ferguson's [1963] universals. Herbert himself warns us not to use universal processes as guides to reconstruction or for claims of genetic relatedness [1986:269-70]. Nonetheless, I will claim that the facts of Kisi call for just such a treatment. In the absence of other evidence, synchronic or diachronic, typological findings serve as a starting point. Corroboration must be sought in further comparative work [Heine 1980:109], of which this discussion forms a first stage.

1.2. Course of the discussion. I first present the facts of Kisi, discussing nasality in general and prenasalized stops in particular. I then situate these facts within the framework of Herbert [1986 (especially 271ff.)] and delineate how the prenasalized stops of Kisi might have arisen. I conclude by summarizing these findings and by indicating future directions of investigation.

2. Nasality in Kisi

2.1. Segmental inventory. In the following chart appear the consonants and canonical syllable structure of Kisi.

(2) Consonantal inventory

	Lab	Alv	Pal	Vel	Lab-Vel	Glot
Stops						
Nasals	*m*	*n*	*ɲ*	*ŋ*	*ŋm*	
Prenasal.	*mb*	*nd*	*ɲj*	*ŋg*	*ŋmgb*	
Voiced	*b*	*d*			*(gb)*	
Voiceless	*p*	*t*	*c*	*k*	*kp*	
Fricatives	*f*	*s*				*h*
Liquids		*l*				
Glides			*y*		*w*	

(3) Syllable structure

$$C\ (G)\ V\ \left(\left\{\begin{matrix} L \\ V \\ N \end{matrix}\right\}\right)$$

L = *l*
G = *y w*
N = *m ŋ (*n, ɲ, ŋm)*

Kisi allows no consonant clusters, as shown above, and medial prenasalized stops are never ambisyllabic. In fact, no internal evidence suggests that medial prenasalized stops should be interpreted as representing more than one segment.

With regard to Kisi's prenasalized stops and voiced stops, distributional facts hint that they may once have been more closely related. An earlier system likely contained one series of stops with each phoneme having a voiced and a prenasalized allophone.[2] Synchronically, prenasalized stops are rare initially, while voiced stops are even rarer medially. Voiceless stops, on the other hand, are not restricted to initial position; they occur freely in medial position, where they contrast with prenasalized stops. The current (phonemic) prenasalized stops were, thus, once medial allophones of the voiced stops. This situation no longer obtains because the three most common prenasalized stops now appear initially and contrast with voiced stops there.

(4) Initial prenasalized stops

mbòmà	'hammock'	(*bòm*	'uncle')
ndá	'there'	(*dáàmà*	'only')
ŋgàá	'three'	(*kàà*	'taboo')

When voiced stops do appear medially, they appear in the more expressive part of the lexicon, containing adverbs and ideophones, as shown in (5a). Other words with medial voiced stops are body parts or animal names transparently involving reduplication (5b). The fact that the stops appear medially via fossilized morphology underscores their rarity in medial position.

(5) Medial voiced stops[3]

a.	*cóbé*	adv.	'a little, a short time'
	dóŋdóŋ	idph.	'quietly'
b.	*dádá*	n.	'chin'
	búbù	n.	'pig'

[2] That there is no phonemic voiced velar stop in the language synchronically poses no problem for this hypothesis. The prenasalized velar stop is related to an earlier voiced velar stop. The voicing contrast there has been neutralized in favor of the voiceless alternant [Childs 1983]. Similar evidence can be used to explain the presence of palatal and labialvelar prenasalized stops, despite the lack of (phonemic) voiced stops in those places of articulation.

[3] The labialvelar voiced stop *gb* is of extremely limited distribution and is not included in the following discussion. In general, I focus on the more widely distributed sounds.

Alternations between voiced and prenasalized stops also show the relatedness of the two series. For example, in rapid speech voiced stops may change to prenasalized stops [Childs 1991].

Another piece of evidence relating prenasalized stops to voiced stops is the nativization of *g*-initial words (Kisi has no (phonemic) *g*, See footnote 2). The usual pattern is for speakers to pronounce such words with an initial [k], but for some speakers, the word for 'guava' begins with a prenasalized stop.

(6) Nativization of *g*-initial words
'guava' → *ŋgòìyàwèílέŋ* (cf. *kùlàwèílέŋ* 'guava')

Further evidence supporting the hypothesis that Kisi prenasalized stops were once allophones of voiced stops comes from universal tendencies. Prenasalized stops are generally related to stops rather than to nasals [Maddieson 1984:67-68, Herbert 1986].

2.2. Nasal processes. Herbert has already established the marked nature of prenasalized stops, and the facts of Kisi support this claim, as has been demonstrated above and as will be shown below. To determine how they arose in the language, it is necessary to examine a number of different synchronic processes, all related to the spreading of nasality.

(7) Nasal processes in Kisi
Progressive nasalization of vowels and glides
Anticipatory nasalization of vowels by ŋin codas
Nasalization spread at morpheme boundaries
Nasal cluster reduction and place assimilation
Expressive nasalization

Progressive nasalization of vowels and glides. Nasal consonants cause following tautosyllabic vowels and glides to be nasalized.

(8) Progressive nasalization

nūū	'my (*o*-class)'
mūĩyo	'mosquito'
ɲãsɔɔ	'scratch, write'
ŋɔ̃ɔ̃	'burned'
ŋmūẽĩyo	'crab'

The rule has no exceptions, even nasalizing ideophones with the appropriate structural description. The process, of course, does not take place with prenasalized stops since the latter part of these sounds is oral.

Anticipatory nasalization of vowels by *ŋ* in codas. Vowels are also nasalized before a nasal, the more expected direction for nasalization [Ruhlen 1978:223, Hombert 1986]. Herbert suggests that the process is universal: "Opposing the phonological process which nasalizes vowels after certain nasals, there is a universal phonetic process, more or less applicable in every language, which nasalizes vowels before syllable coda nasals" [1986:198]. What is unusual about Kisi is that only the velar nasal nasalizes preceding vowels, while a coda m does not. (Note that no other nasals appear in Kisi codas, see the display of Kisi syllable structure in (3)).

(9) Anticipatory nasalization by *ŋ*[4] but not by *m*

a.	*yĩŋ*	'boil'	
	pulũŋ	'bathe'	
	lẽẽŋ	'gecko'	
b.	*pim*	'be full'	(**pĩm*)
	lom	'burn'	(**lõm*)

All of the words in (9a) have phonetically nasal vowels preceding the nasal, while those in (9b) do not.

Nasal vowels may be the source for the nasal portion of prenasalized stops. Presumably it is only the first, more general, process of progressive nasalization that is responsible. If medial voiced stops are to be **pre**nasalized, progressive nasalization (10a) is the more likely source. Anticipatory nasalization (10b) would require an additional step deleting the conditioning element, followed by progressive nasalization.

(10) Prenasalized stops from vowel nasalization

a. NVC → N$\tilde{\text{V}}$C → NVNC ("NC" = prenasalized stop)

b. CVŋC → C$\tilde{\text{V}}$ŋC → C$\tilde{\text{V}}$C → CVNC

The second process, furthermore, is unlikely in that nasalization first spreads to the left, followed by deletion of the conditioning element, then spreads to the right, an unlikely scenario. Note the unexpected fact that vowels are nasalized only by the velar nasal; this fact will be important in establishing the actual process by which prenasalized stops arose. Other possible sources for prenasalization are discussed below.

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[4] Mukarovsky also notices nasalization before velar nasals, attributing it to the influence of neighboring Mande languages [1958:144].

The spread of nasalization at morpheme boundaries. An earlier paper [Childs 1985] discusses nasal spreading within the noun class system. The rule has greater applicability than indicated there, applying at other morphosyntactic boundaries [Childs, To appear]. Nasality in a coda (here both m and ŋ) spreads onto the onset of a following syllable, creating a prenasalized stop when the onset is filled with a liquid (11a) or glide (11b), or is empty (11c).

(11) Junctural progressive nasalization (/Onset strengthening)

a. Onsets filled with *l*

cìŋ + léŋ → cìŋndéŋ 'tooth'
tooth Suf

yìyăŋndáŋ làŋ → yìyăŋndáŋ ndàŋ 'these thoughts'
thoughts these

lɛ̀ 'anymore'
ò húŋ [nd]ɛ̀ lé 'He doesn't come anymore.'
he come anymore Neg

b. Onsets filled with glides

húŋ wɔ̀ → húŋ ndɔ̀ 'Come (polite)!'
come Prt

cúm yá → cúm ɲjá 'Wait for me!'
wait me

hìŋ yɛ̀ → hìŋ ɲjɛ̀ 'come (question)'
come Q

c. Empty onsets (generally restricted to nominal morphology)

yìŋ + é → yìŋndé 'hair'
hair Suf

hĕm + ó → hĕmndó 'gourd'

Here the process is transparent and synchronically active. Prenasalized stops appear when morphemes end in a nasal and following morphemes have empty onsets or begin with a glide or liquid. Nasality once again is progressive, spreading rightward. This process, then, represents a synchronically active route for the development of prenasalized stops.

Nasal cluster reduction and place assimilation. A third category of processes characterizes the homorganicity of nasal sequences, when the first

element is the velar nasal. The velar nasal assimilates to the place of articulation of the following segment and can even disappear completely. (All of the intermediate forms in (12) are possible.)

(12) Place assimilation and nasal cluster reduction

a. *tuŋ + o* → *tuŋndo* → *tunndo* → *tuundo* → *tundo* 'dog'
dog Suf

b. *tɔm + o* → *tɔmndo* → *tɔmdo* 'monkey'

Rarely does the velar nasal retain its place of articulation in such environments. In all stages of the example in (12a), the prenasalized stop is present. This illustrates how the conditioning environment for the appearance of a prenasalized stop may disappear and how the requisite homorganicity develops. As shown in the second example (12b), the bilabial nasal is unaffected in the same environment, although the prenasalized stop may lose its initial nasal component in rapid speech.

Expressive nasalization. Expressive nasalization may also produce pre-nasalized stops. The second person singular pronoun nùm has two emphatic forms, *nùmbó* and *nùŋgó*.

(13) Kisi emphatic pronouns

nùmbó híŋ 'Did you come?'
nùŋgó híŋ 'Did you come?'

The prenasalized element gives the word more prominence, as would be expected if it were to be emphasized. These emphatic forms may be the result of an emphatic suffix, *ó*, followed by the strengthening observed in (11).

This situation parallels one found in Swahili where the emphatic form of the copula *ni* is *ndi* (roughly speaking).

(14) Emphatic forms in Swahili[5]

Non-emphatic		Emphatic	
ni ninyi	→	*ndinyi*	'It is you (pl).'
Cop you (pl)			
ni hao	→	*ndio*	'It is they.'
ni hapa	→	*ndipo*	'It is here.'

[5] All examples were used by native speakers of Swahili in Malindi, Kenya. The latter two also appear as standard forms in the Swahili textbook by Hinnebusch & Mirza [1979].

The same explanation of emphasis may be available for the unexpected presence of [mb] in the Kisi form *mbo*, representing the combination of the conjunction mi with the third person singular pronoun *o*. The paradigm in (15) shows that for all other persons the results are unremarkable when the conjunctions and personal pronouns combine.

(15) The conjunction *mi* and subject pronouns

	Singular	Plural
1st	*mi* (*mi* + *i*)	*miŋ* (*mi* + *ŋ*)
2nd	*ma* (*mi* + *a*)	*mila* (*mi* + *la*)
3rd	*mbo* (*mi* + *o*)	*ma* (*mi* + *a*)

Yet the third person singular form is not an easily analyzable combination of conjunction and pronoun, as is the case with all of the other pronouns. In that it is a prenasalized rather than a simple nasal parallels the use of prenasalization for emphasis above. In fact, the conjunction mi functions to emphasize a following clause. This secondary function thus suggests why it is the prenasalized stop, rather than the simple nasal, that appears. For example, to underscore the fact that one is really leaving one would not say, *í kúɛ̀* 'I'm going', or even *yá í kúɛ̀* 'As for me, I'm going', but rather *mí kúɛ̀* 'I'm going!'. (That it is only the third person with the prenasalized form may be related to the fact that the pronoun is [o], phonetically identical (on the segmental level) to the emphatic particle.) Thus, we see that expressiveness may also be a factor in the creation of prenasalized stops, albeit in a less systematic manner.

2.3. Summary and evaluation. In (16) appear four generalizations that can be made about Kisi nasalization.

(16) Kisi nasalization patterns

i. Synchronically phonemic prenasalized stops were once allophones of voiced stops in medial position.

ii. Nasality is progressive, the exception being vowel nasalization before the velar nasal, the source always being a (full) nasal.

iii. Prenasalized stops appear morpheme initially as a junctural phenomenon.

iv. Emphasis may selectively strengthen nasals to prenasalized stops.

The picture that emerges from these facts features one obscured diachronic process and three active synchronic processes, one of which runs counter to the

progressive trend in the language. The third of these, expressive nasalization, can be discarded as unimportant because of its lack of systematicity and because it relates prenasalized stops to nasals rather than to voiced stops.

A reasonable ordering of the other facts, however, can be produced within the framework of Herbert [1986], many of whose insights have already been recalled above. According to Herbert, prenasalized stops arise in basically two ways, both of which can be identified in Kisi:

1) nasal abutment (one segment from two);
2) environmental shielding (one segment changes).

"Nasal abutment" requires that a nasal consonant be adjacent to an oral consonant, a possibility consistent with the morphosyntactic processes of Kisi outlined above, e.g., the suffixation of noun class markers to noun stems. In this scenario Kisi prenasalized stops originated in consonant clusters, a nasal followed by a voiced stop, which eventually united in single segments.

"Environmental shielding" partially protects or maintains the nasality or orality of underlying single consonantal segments. In this development pre-nasalized stops arise from single segments. For example, an oral stop after a nasal vowel becomes a prenasalized stop rather than a fully nasal stop, preserving its orality. Were it to become a fully nasal stop, there would be no contrast between nasal and non-nasal stops after nasal vowels; only nasals would appear.[6] This scenario, however, typically requires that vowel nasality be phonemic. In the case of Kisi, environmental shielding cannot be invoked because the language has no contrastive vowel nasality, despite the suggestive evidence from phonetic nasalization.

What is more suggestive is the evidence from anticipatory nasalization triggered by the velar nasal, especially in that it contrasts with the more general progressive pattern and in that ŋ behaves so differently from the bilabial nasal. The velar nasal alternates with ø, while the bilabial nasal does not.[7] The bilabial nasal in Kisi codas does not nasalize vowels as does the velar nasal. As shown above in (12), unlike its velar counterpart, the bilabial nasal does not assimilate to following segments, nor does it disappear.

The velar nasal, in fact, represents formerly nasal vowels in Kisi. Earlier nasal vowels have become sequences of vowel and velar nasal, an unusual development but one that seems motivated by the facts of Kisi and by comparative data. Early French writers even transcribed nasal vowels in Kisi words (French has contrastively nasalized vowels).

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6 Environmental shielding can also lead to *post*nasalized segments, e.g., [bm].

7 Kay Williamson [1990 p.c.] sees the persistence of [m] as further evidence for the claim that *m* is the primary nasal consonant in Niger-Congo.

(17) Anticipatory nasalization by the velar nasal

Phonemic	Transcribed	
tàbíláŋ	*tambittã* [Schaeffner 1951]	'long drums'
kòówáŋ	*kowã* [Paulme 1954]	'blood'
lèèláŋ	*lirã* [Paulme 1954]	'horns'

Contrastive vowel nasalization is common throughout Atlantic, found in languages closely related to Kisi [Childs 1990]. In some instances the syllable-final velar nasal even appears as a Kisi innovation. Furthermore, in nearby (unrelated) languages the velar nasal exhibits comparable behavior [Tourville 1990].

If Kisi once possessed contrastive vowel nasality, then environmental shielding is the process at work rather than nasal abutment. Abutment is responsible for prenasalized stops at morpheme boundaries but cannot account for the phonemic prenasalized stops appearing morpheme internally. Further support for shielding is found in the unitary behavior of Kisi's prenasalized stops noted previously.

On the basis of the internal facts of Kisi and the findings of Herbert, we can now posit that phonemic prenasalized stops arose to protect medial voiced stops from becoming fully nasal, i.e., the first process rather than the second in (18).

(18) The development of prenasalized stops

$$C\tilde{V}CV \rightarrow C\tilde{V}NCV$$
$$*C\tilde{V}CV \rightarrow C\tilde{V}NV$$

Interestingly, the loss of contrastive vowel nasalization, the original source for prenasalized stops, has led to abutment, a new source for prenasalized stops. Earlier nasal vowels are now realized as a vowel followed by a velar nasal; the velar nasal now causes prenasalization on many following segments. This analysis shows that in Kisi we have the partial linking of what Herbert sees as typologically distinct processes.

It is possible to speculate on why the velar nasal replaced nasal vowels, and the answer seems to be a functional one, to preserve the nasality registered on vowels, which had since moved rightward. If we assume bisyllabic CVCV stems, medial nasal vowels, at least when followed by a voiced segment, could lose their nasality and have it register (phonetically) on a following segment, producing a prenasalized stop. However, stem-finally there was no such recourse for the rightward migrating nasality. The result was a velar nasal, the least (perceptually) distinct of all the nasals. What precipitated this rightward movement of nasality? Perhaps it was the fact that nasality had begun spreading from preceding nasal consonants, another wave of nasality to obscure stop contrasts. It may even be that the synchronically active process of progressive nasalization in Kisi may

already be laying the groundwork for further developments; phonetically nasal vowels may portend a new batch of prenasalized stops.

3. Conclusion and further work

This paper has shown that, although no direct source for the phonemic prenasalized stops of Kisi exists, synchronic evidence coupled with Herbert's findings shows how they might have arisen. What superficially seemed to be the source—abutment—turns out to be a recapitulation of an earlier process of shielding.

There are indeed limits to the validity of internal reconstruction, especially its validity at any extensive time depth [Heine 1980]. Further intensive work on related languages will reveal the validity of this paper's claims. Comparative work should prove fruitful despite the lack of relatedness among languages within Atlantic. Although these languages seldom have phonemic prenasalized stops, nasal processes are abundant.

The processes identified in Kisi may also be present in related languages. Their presence will help to guide reconstruction and, thus, further assess the internal relatedness of Atlantic, as well as Atlantic's relatedness to Niger-Congo. The diachronic picture that emerges contributes to recent work on reconstructing nasality more generally within Niger-Congo [e.g., Stewart 1976, Bole-Richard 1985, Hombert 1986, Williamson 1987]

The discussion above has also shown the usefulness of Greenberg's techniques, especially as they have been employed by Herbert with respect to prenasalized stops. While there must be some wariness at using statistical universals to guide reconstruction, the absence of other data sometimes necessitates pursuing such a course. If the hypotheses advanced above are later proven to be incorrect, at the least they will have stimulated interest in a neglected set of languages.

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ON THE SYNTAX OF POSSESSOR RAISING IN SWAHILI*

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Traditionally Possessor Raising (PR) in Swahili is included with a variety of sentence types as an instance of the Nominal Construction and more recently defended as a member of that class. This study has two major goals: first, it demonstrates that PR has syntactic distributional patterns which argue against its inclusion in the Nominal Construction. Secondly, it addresses a central question: what features of an explicit grammar explain the syntactic properties associated with PR? After showing that the inferentially based proposals in Hinnebusch and Kirsner [1980] and in Scotton [1981] do not adequately characterize PR nor accommodate its syntax, semantics or interpretation, we present a Government Binding treatment of PR's syntax. Finally, we provide a summary of our cross-linguistic research on PR's interpretation.

1. The Problem*

Traditional Swahili grammarians like Ashton [1944], Loogman [1965], and Polomé [1967] assemble sentences containing bare postverbal nominals into a natural class labelled here the NOMINAL CONSTRUCTION, adopting Ashton's terminology. By bare nominal they mean a postverbal nominal which is not morphologically related to the verb through the use of a verbal extension or prepositional case marker. Included within the Nominal Construction is Possessor

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Raising (PR), which often conveys an inalienable possession inter-pretation as in the Swahili sentences below.

(1) a. *ni-li-m-songoa Juma shingo*[1]
I-PST-1-twist 1Juma 9neck
'I twisted Juma's neck.'

b. *Juma a-li-m-kata Asha kidole*
1Juma 1-PST-1-cut 1Asha 7finger
'Juma cut Asha's finger.'

We focus on PR for several reasons. First, as we show in section 2, PR shows a range of particular syntactic properties which we take as a challenge to characterize. Our account of PR is given in section 5. Secondly, these properties set PR apart from other members of the Nominal Construction as we shall see in section 3. Finally, section 4 shows that the properties of PR are not adequately characterized in the treatments of this construction given in Hinnebusch and Kirsner [1980] and Scotton [1981], which assume the grammatical coherence of the Nominal Construction and which attempt to provide a semantic/pragmatic account, outside sentence grammar, for the inalienable interpretation associated with PR.

2. The Syntactic Properties of PR

We adopt the term "host" to refer to the inanimate bare nominal which is semantically related to the possessor and to the verb. Nevertheless, no morphological marking links the host to the possessor or to the verb. In fact, under PR the possessor assumes the canonical object properties usually associated with the host. This section presents the kinds of behaviors PR permits the possessor.

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[1] The numbers preceding nouns and their modifiers indicate noun class affiliation. Verbal morphology for third person will display numbers according to noun classes. First and second persons will be glossed by the corresponding English pronoun. Other abbrevitions used here are the following:

APPL	applicative	PST	past	S	singular
CAUS	causative	PRES	present	P	plural
PASS	passive	STAT	completion/resultant state (Ashton, p.37)		
REL	relative				

Generally the transcriptions of the languages other than Swahili include the glosses of the cited sources.

2.1. Agreement. Agreement provides an excellent example of the possessor's elevated status. Normally, say in the genitival (quasi-)paraphrase of PR in which the host heads the NP, the host controls the object marker, as in (2a) and (3a).[2] But under PR, the possessor controls the object marker, as in (2b-c), (3b-c).

(2) a. *Juma a-li-(ki)-ata kidole cha Asha*
1Juma 1-PST-(7)-cut 7finger 7-of 1Asha
'Juma cut Asha's finger.'

b. *Juma a-li-m-kata Asha kidole*
1Juma 1-PST-1-cut 1Asha 7finger
'Juma cut Asha's finger.'

c. **Juma a-li-(ki)-kata Asha kidole*
'Juma cut Asha's finger.'

(3) a. *ni-li-(zi)-chana nywele za Adija*
I-PST-(10)-comb 10hair 10-of 1Adija
'I combed Adija's hair.'

b. *ni-li-m-chana Adija nywele*
I-PST-1-comb 1Adija 10hair
'I combed Adija's hair.'

c. **ni-li-(zi)-chana Adija nywele*
'I cut Adija's hair.'

2.2. NP Movement. In the passive construction the host-headed genitival NP becomes the subject of a passive verb, as shown in (4a) and (5a). But under PR the possessor, not the host, assumes that position.

(4) a. *miguu ya mtoto a-li-funik-wa*
4legs 4-of 1child 1-PST-cover-PASS
'The legs of the child were covered.'

b. *mtoto a-li-funik-wa miguu*
1child 1-PST-cover-PASS 4legs
'The child's legs were covered.'

---

[2] In Swahili, inanimate objects optionally agree with the verb, while object agreemeent is obligatorily present when the object is from one of the animate noun classes.

c. **miguu i-li-funik-wa mtoto*
4legs 4-PST-cover-PASS 1child
'The child's legs were covered.'

(5) a. *kidole cha Asha ki-li-kat-wa na Juma*
7finger 7-of 1Asha 7-PST-cut-PASS by 1Juma
'Asha's finger was cut by Juma.'

b. *Asha a-li-kat-wa kidole na Juma*
1Asha 1-PST-cut-PASS 7finger by 1Juma
'Asha's finger was cut by Juma.'

c. **kidole ki-li-kat-wa Asha na Juma*
7finger 7-PST-cut-PASS 1Asha by 1Juma
'Asha's finger was cut by Juma.'

2.3. Relativization. Yet the host shows mobility with respect to A' movement in that it, as well as the possessor, may head a relative clause, as (6) and (7) illustrate.

(6) a. *miguu a-li-yo-m-funika mtoto*
4legs 1-PST-4REL-1-cover 1child
'The legs of the child which s/he covered'

b. *mtoto a-li-ye-m-funika miguu*
1child 1-PST-1REL-1-cover 4legs
'The child whose legs s/he covered'

(7) a. *kidole ni-li-cho-m-kata msichana*
7finger I-PST-7REL-1-cut 1-girl
'The finger of the girl which I cut'

b. *msichana ni-li-ye-m-kata kidole*
1-girl I-PST-1REL-1-cut 7finger
'The girl whose finger I cut'

2.4. Subject position. PR occurs postverbally, not in subject position.

(8) a. *a-li-m-funika mtoto miguu*
1-PST-1- cover 1child 4legs
'S/he covered the child's legs.'

b. **mtoto miguu a-li-funik-wa*
1child 4legs 1-PST-covered-PASS
'The child's legs were covered.'

In summary, Possessor Raising in Swahili is characterized as follows:

(9) (i) no morphology introduces the host;
(ii) only the possessor agrees with the verb, passivizes and is adjacent to the verb;
(iii) PR fails in subject position, and
(iv) both the host and the possessor may head a relative clause.

3. PR and the Nominal Class

This section presents evidence that sentence tokens cited as members of the Nominal Construction differ in one respect or another from the properties of PR as given in (9). Our demonstration will often hinge on a comparison of the contrasting behavior of the host in PR and its counterpart in the Nominal Construction.

Sentences like those in (10) through (14) are often cited as members of the Nominal Construction; (10) and (11) contain bare postverbal instrumentals; (12) is an instance of Locative Inversion, a construction in which a locative phrase is preposed showing subject agreement with the verb and the verb's logical subject occurs postverbally[3]; examples (13) and (14) contain a postverbal nominal which, according to Ashton, "adds some detail in respect to the action or state expressed by the [intransitive] verb, whether in time, place, manner or reason, etc." (p. 299).

(10) *Juma a-li-m-piga mzizi jiwe* [Whiteley 1972:18]
1Juma 1-PST-1-hit 1thief 5stone
'Juma hit the old man with a stone.'

(11) *Juma a-li-u-ka-za mzigo kamba* [Scotton 1981:162]
1Juma 1-PST-3-tie-CAUS 3load 9rope
'Juma tied the load with a rope.'

(12) *sokoni ku-na-uza wanawake* [Scotton 1981:166]
market-17 17-PRES-sell 2women
'Women are selling at the market.'

[3] The interested reader is refered to the LFG analysis of this construction in Chichewa given in Bresnan and Kanerva [1989].

(13) *Juma a-li-ondoka mnyonge* [Abdulaziz 1976:153]
1Juma 1-PST-leave 1humble person
'Juma left (as) a humble person.'

(14) *watu wa-me-ingia vumbi* [Whiteley 1972:22]
2people 2-STAT-enter 5dust
'The people are dusty.'

We begin the comparison with the bare instrumentals in (10) and (11). We noted earlier that a property of PR is that the host may not be associated with any morphological marking. However, as pointed out in Vitale [1981], the bare instrumentals *jiwe* and *kamba* above may be preceded by *kwa*, as shown below.

(15) a. *a-li-m-funga Juma kwa kamba*
1-PST-1-tie 1Juma with 9rope
'S/he tied Juma with a rope.'

b. *Juma a-li-u-ka-za mzigo kwa kamba*
1Juma 1-PST-3-tie-CAUS 3load with 9rope
'Juma tied the load with a rope.'

Furthermore, in the absence of the agent phrase, the instrumental can appear as the subject of the active verb (15c), whereas in PR the host may not occur as a subject (15d).

(15) c. *kamba i-li-m-funga Juma*
9rope 9-PST-1-tie 1Juma
'A/the rope tied Juma.'

d. **kichwa ki-li-m-piga Juma*
7head 7-PST-1-hit 1Juma
'Juma's head was hit.'

Unquestionably the predicate nominal in (12) and the locative inversion construction in (13) differ semantically. Nevertheless, we can illustrate that their syntactic behavior is similar in two respects and that it departs from that of PR. First, we showed earlier that under PR both the host and possessor may relativize. However, neither the predicate nominal nor the postverbal nominal in a Locative Inversion construction may relativize.

(16) **hawa ndiwo wanawake sokoni ku-na-wo-usa*
2these 2-be 2women market-17 17-PRES-2REL-sell
'These are the women who sold at the market.'

(17) **huyu ndiye mnyonge a-li-ye-ondoka mtu*
1this 1-be 1humble person 1-PST-1REL-leave 1person
'This is the humble person who left (as) a man.'

Secondly, recall that under PR the active verb obligatorily contains an object marker agreeing with the animate possessor; yet (18) and (19) show that in Locative Inversion and the Predicate Nominal, an object marker is obligatorily absent even though an animate NP follows the verb in both cases.

(18) **sokoni ku-na-wa-uza wanawake*
market-17 17-PRES-2-sell 2women
'Women sold at the market.'

(19) **Juma a-li-mw-ondoka mnyonge*
1Juma 1-PST-1-leave 1humble person
'Juma left (as) a humble person.'

Scotton [1981] cites (14) as an example of the Extensive Case (see section 4.2). Although only the possessor, not the host, may passivize under PR, two passive versions of (14) are possible, as shown in (20).

(20) a. *vumbi li-me-ingi-wa na watu*
5dust 5-STAT-enter-PASS by 2people
'The people are dusty.'

b. *watu wa-me-ingi-wa na vumbi*
2people 2-STAT-enter-PASS by 5dust
'Dust covers the people.'

This subsection has presented some of the syntactic contrasts available between PR and several of the cases traditionally subsumed with it under the rubric of the Nominal Construction. We believe we have demonstrated two things: first, that there is substantial evidence that the distributional properties of PR differ from those of the instrumental, locative inversion, the predicate nominal, and the construction in (14), and secondly that the properties of PR depart substantially enough from other Nominal Constructions to warrant PR as having its own

status. We conclude that the Nominal Construction can not be a natural syntactic class in Swahili grammar if it includes PR.[4]

4. Previous treatments

The next two subsections present the analyses in Hinnebusch and Kirsner [1980] and in Scotton [1981] of the inalienable interpretation often associated with PR. The third subsection contains our objections to their proposals.

4.1 The Inferential Account. Hinnebusch and Kirsner (hereafter H&K) assume that the lack of overt morphological cues in the Nominal Construction requires that the interpretation of the bare nominals be outside sentence grammar and, hence, inferred. Apparently, the syntax of PR is due to its being a member of the Nominal Construction since H&K do not discuss the syntax of PR. They provide a means of explaining the interpretations of (21) where PR is acceptable in inalienable contexts but unacceptable in alienable contexts.

(21) a. *ni-li-m-vunja Juma mguu*[5]
I-PST-1-break 1Juma 3leg
'I broke Juma's leg.'

b. **ni-li-m-vunja Juma kiti*
I-PST-1-break 1Juma 7chair
'I broke Juma's chair.'

They make the following assumptions: (1) morphology signals an invariant meaning, and with little morphological information, the hearer will infer an obvious message; (2) subject agreement signals primary focus of attention; and (3) object agreement signals secondary focus of attention.

(22)

ni-	*li-*	*m*	*vunja*	*Juma*	*mguu/kiti*
FOCUS		2ND FOCUS LESS ACTIVE			
breaker				breakee	

[4] Indeed this section has called into question the coherence of the Nominal Construction even if it does not include PR. And while it is far beyond the scope of this paper to discuss how GB might analyze these residual constructions, the interested reader may refer to Baker's [1988b] GB analysis of instrumentals and locatives for Chichewa and to the highly suggestive proposals in Freeze [1992] and Kayne [1993].

[5] Our informants insist, contra H&K, that PR sentences like (21) are not ambiguous between an alienable and an inalienable interpretation, but rather strictly encode an inalienable interpretation. See also Scotton's discussion in section 5.4 of her paper.

The verb "break" relates the bare lexical items to the event such that "Juma" can be the breakee if the "leg," an inalienable body part, is attached to him. However, the chair may not be related to the event in the same way.

4.2. The extensive case account. While the inferential account locates the interpretation of host-NP in PR entirely in the pragmatics, Scotton's [1981] proposal inserts a grammatical layer between the sentence types in the Nominal Construction and their (pragmatic) interpretations. Specifically, Scotton proposes that Swahili grammar has a syntactic position reserved for nominals which receive the Extensive Case (EC hereafter). EC's, like the host-NP in PR, occur in the following positions:

(23) i. NP1 (agent) + verb + NP2 (patient) + NP3 (extensive)
ii. NP1 (patient) + verb + NP2 (extensive)
iii. NP1 (locative) + verb + NP2 (extensive)

In the semantics, all EC nominals receive a uniform semantic characterization which " ... particularize the extent to which the action or state referred to by the main verb applies to the patient." (p.160) In other words, from the variety of interpretations available for EC nominals, the pragmatics will determine the specific interpretation accorded an EC nominal in the sentence token that contains it.

4.3. A critical discussion. We agree with a tacit assumption made in both studies. It is very unlikely that the Swahili verb has an inalienable possessor thematic-role to assign to the postverbal argument in PR. To illustrate this point consider (24) where the object of the verb can fulfill only the theme/patient role.

(24) a. **ni-li-m-kata Juma*
I-PST-1-cut 1Juma
'I cut Juma's.'

b. **ni-li-m-kat-i-a Juma Asha*
I-PST-1-cut-APPL-FV 1Juma 1Asha
'I cut Asha's for Juma.'

The possessional reading occurs only when the NP interpreted as the possessor cooccurs with the theme, as in (25).

(25) a. *ni-li-m-kata Juma kidole*
I-PST-1-cut 1Juma 7finger
'I cut Juma's finger.'

b. *ni-li-m-kat-i-a Juma Asha kidole*
I-PST-1-cut-APPL-FV 1Juma 1Asha 7finger
'I cut Asha's finger for Juma.'

However, neither study addresses this co-dependency in PR which we believe must be addressed in a successful treatment of the construction's interpretation.

Our first objection to the inferential and EC accounts concerns the characterization of PR sentences as members of the Nominal Construction. In the previous section we have demonstrated that PR's syntactic distribution departs substantially from that of the sentences from the Nominal Construction in (10) through (14).

Secondly, neither account provides an explanation for the syntactic properties of PR that we have isolated here. Specifically, the treatment of passive is unsatisfactory. The EC account stipulates that when an EC nominal becomes the subject, its EC case changes to the patient case, giving rise to the template in (23) ii. We wonder whether all semantic cases including "agent" may shift? If not, why not? If so, what overall function do semantic cases serve in the grammar that includes them? As for an account which infers the interpretation of the host-NP from PR surface strings, H&K seem forced to provide a treatment for the interpretation of passive PR sentences that infers the relation between the host and the possessor NP in subject position. This treatment must differ from their analysis of passive for non-PR sentences where the subject is not interpreted as the possessor. Furthermore, we saw in the previous section that PR is blocked in subject position. Neither the inferential nor the EC account provides an explanation for PR's failure in this purely grammatical context.

A third criticism concerns the nature of their semantics. As it turns out, "patient" refers simply to NP1 of a single argument verb and NP2 of a transitive verb, regardless of the semantic/thematic-role assigned. For instance, in (26a) 'leg' as the head of 'leg of Juma' is the patient. But, in (26b) 'leg' is in the extensive case and Juma is the "patient".

(26) a. *ni-li-u-vunga mguu wa Juma*
I-PST-3-break 3leg 3-of 1Juma
'I broke Juma's leg.'

b. *ni-li-m-vunja Juma mguu*
I-PST-1-break 1Juma 3leg
'I broke Juma's leg.'

Evidently, 'leg' is not the "patient" in both these examples, although it is broken in both cases. This might not appear so damaging in this case, but the difference is brought out more clearly in the following example.

(27) a. *mganga a-li-ondoa risasi ya Juma*
1doctor 1-PST-remove 9bullet 9-of 1Juma
'The doctor removed Juma's bullet.'

b. *mganga a-li-mw-ondoa Juma risasi*
1doctor 1-PST-1-remove 1Juma 9bullet
'The doctor removed Juma's bullet.'

Both accounts must claim that while 'bullet' is the patient/theme of the verb in (27a), it is 'him' that is the patient/theme in (b), and 'bullet' is in the extensive case (and/or whose meaning is inferred). However, if we adopt these proposals and assume that *kuondoa* assigns the patient thematic-role to NP2, then (27b) receives a non-sensical interpretation in which Juma is removed, rather than the bullet from him. Thus, it is clearly evident that the term "patient" is not consistent with nor equivalent to the thematic notion of patient/theme.

Finally, an account that relies as crucially on pragmatics and inference as these do just can not work for several reasons. First of all PR is not forced solely by the lexical content of the postverbal nominal such that only body parts cooccur with their hosts as bare nominals in this construction. Indeed, as noted in the introductory section of their paper, H&K demonstrate that NP's containing alienable possessions also provide lexical material that can undergo PR (our (29) below). However, it is not evident how their inferential account distinguishes (28) from (29) in which the possessed nominal is alienable.

(28) **ni-li-m-vunja Juma kiti*
I-PST-1-break 1Juma 7chair
'I broke Juma's chair.'

(29) a. *Rosa a-li-nyang'any-wa shuka*
1Rosa 1-PST-rip away-PASS 7shuka (article of clothing)
'Rosa had her shuka ripped off her.'

b. *mganga a-li-mw-ondoa risasi*
1doctor 1-PST-1-removed 9bullet
'The doctor removed his bullet.'

c. *meza i-me-pangu-s-wa vumbi*
9table 9-STAT-remove-CAUS-PASS 9dust
'The table was dusted.'

Moreover, in their discussion of (29c) H&K imply that if the ownership relationship obtains, PR should be possible. However, there are cases where

plausibility preserves the interpretation of ownership; yet, PR is impossible in such sentences. How does an inferential account permit an acceptable inference in (29c), but rule one out for (30)?

(30) a. **a-li-m-vunga mvuvi kisu*
1-PST-1-break 1fisherman 7knife
'S/he broke the fisherman's knife.'

b. **ni-li-haribu mwanafunzi vitabu vyote*
I-PST-ruin 1student 8books 8-all
'I ruined all of the student's books.'

Finally, Scotton contrasts the sentences in (31), saying of them that 'legs' is a member of a series which specifies extent as to the part of the patient to which the action applies and 'blanket' specifies the extent as to the manner in which the action gets accomplished.

(31) a. **a-li-m-funika miguu*
1-PST-1-cover 4legs
'S/he covered her/him with legs.'
[okay as: 'S/he covered her/his legs.']

b. **a-li-m-funika blanketi*
1-PST-1-cover 9blanket
'S/he covered her/his blanket'
[okay as: 'S/he covered him with a blanket.']

However, nothing in either Scotton's or H&K's system prevents the opposite interpretation in the unbracketed glosses above. Why MUST the sentences in (31) receive the inalienable and instrumental interpretations?

Similarly, neither account provides an explanation for why the other sentence types included in the Nominal Construction do not receive an inalienable reading. Scotton, for example, describes EC nominals as including IP (inalienable possession), locative, instrumental nominals, among others. However, there is no mechanism that we can determine that matches an EC to the appropriate interpretation, rather than to any of the other interpretations available for EC nominals. This comment extends to the inferential account as well. In short, these theories simply do not work sufficiently well to characterize the syntax, semantics or the pragmatics of PR.

5. A Government Binding Account of PR

Our goal differs from that of Scotton and H&K, who have sought to characterize the inalienable interpretation, virtually independently of the syntax of inalienable possession. We seek to determine how PR is syntactically licensed, by which we mean how a construction and the various distributional properties it manifests are properly characterized through the interaction of inde-pendently motivated principles of grammar. In this section, we present an explicit account within GB that accommodates our objections to the above studies and that addresses the central question of this study which we can now more cogently rephrase: how does GB explain the property of a construction containing an NP which does not receive a thematic-role from a verb but which nevertheless acts as an argument of the verb?

5.1 A morpholexical account. We begin by showing that a purely morpholexical account is inadequate to the task of licensing PR. The argument proceeds as follows. We assume causative and benefactive verbs are derived by morpholexical rules which add an argument to the base verb. Although these operations can convert a transitive into a ditransitive through the addition of verbal extensions, these operations may not convert a ditransitive into a tri-transitive. In fact there is no overt morpholexical operation in Swahili that can give rise to three bare postverbal nominals. Only in PR do we find what appears to be tri-transitives. We conclude that PR can not be derived by morpholexical operations.

First, although the causative morpheme may convert a transitive verb like (32a) into the ditransitive in (32b), two causative morphemes may not derive the tritransitive causative in (32c).

(32) a. *Asha a-li-pika chakula*
1Asha 1-PST-cook 7food
'Asha cooked food.'

b. *watoto wa-li-m-pik-isha Asha chakula*
2children 2-PST-1-cook-CAUS 1Asha 7food
'The children made Asha cook food.'

c. **Juma a-li-wa-pik-ish-isha watoto Asha chakula*
1Juma 1-PST-2-cook-CAUS-CAUS 2children 1Asha 7food
'Juma made the children make Asha cook food.'

Yet double causatives are possible in Swahili as shown by the completely acceptable case below taken from Vitale [1981].

(33) *Yusuf a-li-m-saf-ish-isha Jahi chumba*
Yusuf 3S-PST-him-clean-CAUS-CAUS Jahi 7room
'Yusuf made Jahi clean the room.'

Vitale further observes that "... the double lexical causatives which do occur are derived, for the most part, from underlying intransitive constructions since anything above a three-place predicate is marginally or totally unacceptable because of the number of adjacent NP's." [p.175-176].

Likewise, the applicative, which may derive a ditransitive benefactive, may not produce a tritransitive causative-applied verb in Swahili.

(34) **Juma a-li-wa-andik-ish-i-a watoto mwalimu barua*
Juma 1-PST-2-write-CAUS-APPL 2children 1teacher 9letter
'Juma made the children write a letter to/for teacher.'

In fact, neither the causative nor the benefactive morpholexical operations may apply to an underived ditransitive, thereby producing a tritransitive.

(35) a. *Asha a-li-m-pa Juma kitabu*
Asha 1-PST-1-give 1Juma 7book
'Asha gave Juma a book.'

b. **Ali a-li-m-p-esh-a Asha Juma kitabu*
Ali 1-PST-1-give-CAUS 1Asha 1Juma 7book
'Ali made Asha give Juma a book.'

c. **Ali a-li-m-p-e-a Asha Juma kitabu*
Ali 1-PST-1-give-APPL 1Asha 1Juma 7book
'Ali gave Juma a book for Asha.'

In summary, the morpholexical causative and benefactive operations can convert intransitive verbs into transitives, and transitives into ditransitives, but not ditransitives into tritransitives. Only in PR do we find tri-transitives like (36).

(36) a. *ni-li-m-chan-i-a Juma watoto nywele*
I-PST-1-comb-APPL 1Juma 2children 9hair
'I combed the children's hair for Juma.'

b. *ni-li-m-gus-i-a Asha Juma mkono*
I-PST-1-touch-APPL 1Asha 1Juma 3arm
'I touched Juma's arm for Asha.'

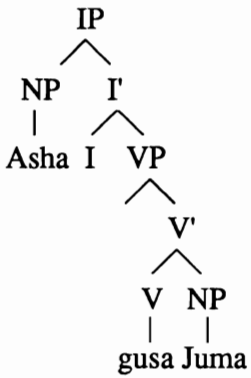
Moreover, as pointed out by an anonymous SAL reviewer, another reason for concluding that PR is not a morpholexical operation is that no overt morphology signals PR.

5.2 A syntactic analysis of PR. Drawing on proposals in Koopman [1987], Koopman and Sportiche [1988], and Carstens and Kinyalolo [1990], works which develop proposals in Chomsky [1981, 1986], we propose that the analysis of PR lies in the interaction of Case theory, Theta theory and the theory of phrase structure.

To begin let us see how assumptions from these works provide a derivation for a simple sentence in Swahili. A sentence like (37a) would begin its derivation as (37b).[6]

(37) a. *Asha a-li-m-gusa Juma*
1Asha 1-PST-1-touch 1Juma
'Asha touched Juma.'

b.

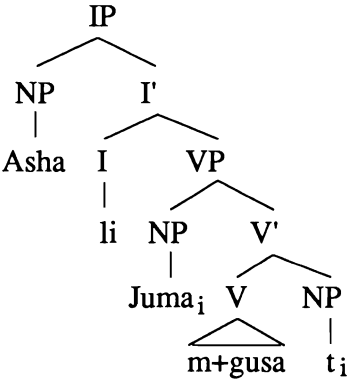


Each of the lexical elements in the d-structure (37b), in particular V and I (inflection), projects a structure that accords with the principles of X' theory. The subject is base generated in the specifier of IP position, the canonical subject position. The object of the verb is generated in immediate postverbal position. It is at this d-structure level that the semantic role of the verb's arguments must be assigned. In GB theory this is expressed through the Theta Criterion which requires that each of the verb's semantic (thematic) roles be assigned to an appropriate phrase and that each argument in the structure be assigned a thematic role. In (37b), "Asha" receives the agent role in virtue of occupying the subject

6 For ease of presentation in this paper, we are simplifying the analysis presented in Keach and Rochemont [1991b], Rochemont and Keach [1991] and modifying to some extent the theoretical assumptions drawn from the works cited. For more detail the reader is referred to these references.

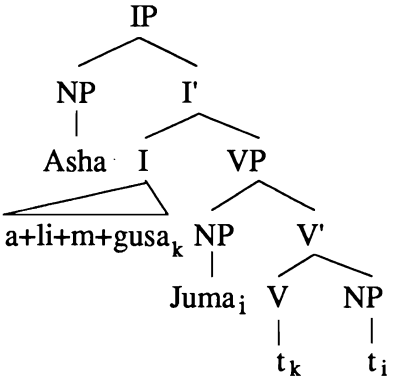
position and "Juma" receives the patient/theme role since it occupies the canonical object position.

(37) c.



In the intermediate structure (37c), the object has raised to the specifier position of VP (leaving a trace at the extraction site), the position in which it receives Abstract Case and triggers agreement on the verb following the references cited above. This is also the position that phrases that undergo passive must occupy in order to be passivizable.

(37) d.

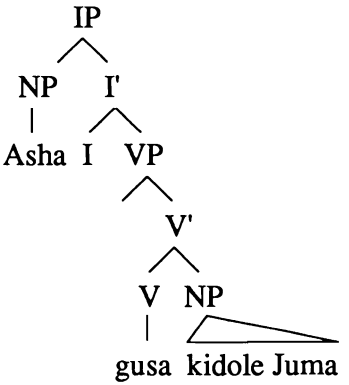


In the s-structure (37d), the verb has raised from its position in VP to I where it acquires the inflectional morphology associated with I. Once again, the subject and the verb, now in I, are in an agreement relation. Abstract Case for the subject is satisfied due to this relation. GB theory has an s-structure principle which mandates that all arguments in the structure must receive Abstract Case from an Abstract Case marking head. As we have just seen, this requirement is satisfied for the two arguments in (37), and in both cases, due to the specifier-head relation.

Consider now how these theoretical assumptions apply in the analysis of PR. We have argued that the possessor in these cases is not thematically related to the verb. In this we follow the analytical approach to PR advanced in Massam [1985] and Baker [1988]. The simplest assumption for PR cases is that the possessor's theta-role is due to its relation to the host. Since the Theta Criterion is satisfied at d-structure, GB theory suggests a d-structure of the sort in (38b) for the sentence (38a).[7]

(38) a. *Asha a-li-m-gusa Juma kidole*
1Asha 1-PST-1-touch 1Juma 7finger
'Asha touched Juma's finger.'

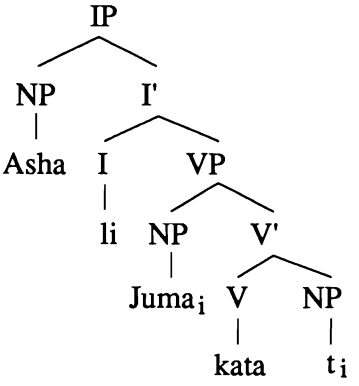
b.



To characterize the object-like behavior of the possessor, we will assume that in PR constructions the possessor raises from its d-structure NP internal position to the structural object position in the specifier of VP, as illustrated below.

[7] The structure of the NP in Swahili is a subject of some investigation, c.f. Carstens [1991]; Reynolds [1989]; Hawkinson [1979]. As it is not our purpose here to analyze NP structure, we do not intend to make any explicit proposal regarding the internal structure of NP's and accordingly remain uncommitted in the d-structure (38).

c.



After V raising as in the earlier example, the intermediate structure above will give rise to a structure underlying the sentence in (38a).

Recall that it is the phrase that occupies the VP specifier position that may trigger agreement on the verb and that may passivize. Given that the VP has a unique specifier position, we properly characterize the object marking and passivization properties of PR. In particular, only the possessor may passivize or object mark in such cases. Notice that the Theta Criterion is satisfied for the possessor due to its d-structure relation to the host, and for the host, by virtue of its d-structure object relation to the verb. The case requirement is satisfied for the possessor because of its specifier-head relation to V (as for the object in (37)), and for the host by virtue of inherent case assignable only to phrases already in a thematic relation to the verb. The further property of PR that either the host or the possessor may relativize follows from the assumption that relativization in Swahili does not require movement through the specifier of VP.[8]

What stops the host nominal from raising to the Spec of VP and stranding the Possessor giving rise to the illformed sentence below in (39a)?[9]

(39) a. **Asha alikata kidole Juma*
b. **kidole kilikatwa Juma (na Asha)*

Following Chomsky [1986] we assume that only heads and maximal projections may undergo movement. Since in our analysis the Possessor NP (a maximal projection) moves into the government domain of the verb, the host (also a

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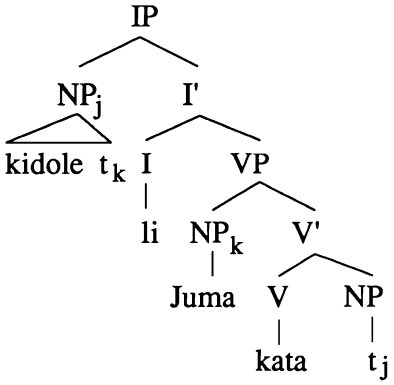
[8] We note that on the account given here relativization of the host leads to a violation of the proper binding condition which may be avoided in various ways: by adopting an analysis of inalienable possession of the type proposed in Yoon [1990] (see note 12); by assuming that in Swahili the host in N' may relativize; or by assuming reconstruction at LF for A' level movement operations.

[9] Baker [1988] pursues an analysis of PR in which the host-head incorporates into the verb. Keach and Rochemont and Rochemont and Keach's discussion of Bantu object symmetry and asymmetry reveal difficulties that an incorporation analysis would impose on Bantu grammar overall.

maximal projection) may not move without also taking along the syntactically dependent possessor. Moreover, movement of the host into subject position of the passive verb as in (39b) would constitute a proper binding condition violation whereby the subject NP contains a trace that c-commands its antecedent, as shown in (40).

(40)



Finally notice that an NP internal possessor may not relativize without passing through specifier-VP because that would lead to a violation of subjacency.[10] This analysis provides a syntactic characterization of Possessor Raising.

6. The Inalienable Interpretation

We begin this section with two observations concerning the semantics of PR. First, the NP to be explained in our account differs from the problematic NP in the inferential and EC treatments. Because those proposals analyze the possessor NP as directly theta-related to the verb as secondary Focus or as the theme/ patient, the interpretation of the host requires an explanation in the EC and Inferential accounts. In our account it is the interpretation of the possessive nominal in PR that requires an explanation, not its host, since the host satisfies the selectional restrictions associated with the verb's theme/patient thematic-role. Second and more importantly, if we assume that verbs do not directly assign a possessional theta-role at all,[11] as the evidence suggests, then this study resurrects the question probed in the inferential and EC accounts: how does an explicit grammar account for the interpretation associated with PR?

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[10] The analysis just outlined for the core cases of possessor raising can be extended to accommodate the morpholexical examples in the first part of this section under specific assumptions concerning the nature and distribution of structural and inherent case. For a specific proposals see Keach and Rochemont [1991a] and Keach (in preparation).

[11] We might suppose that the possessor gets its thematic-role inside NP. See Williams [1981], Di Sciullo and Williams [1987], and Grimshaw [1990] for discussion.

We confess our inability to address this issue satisfactorily here. And as we have argued here the previous accounts provide no successful account either. However, our research has uncovered a cluster of generalizations, some heretofore unobserved in the literature, that might guide further research toward an insightful analysis.

First, we repeat the observation made in section 4.3. that there is a codependency between the possessional reading and the presence of a lexically overt theme. How is the required presence of the theme associated with the interpretation of PR? [12]

Secondly, PR appears to signal not simply inalienable possession, but more broadly a part-whole relationship, as often noted. Consider the following PR sentences from Swahili.

(41) a. *ni-li-(i)-vunja meza miguu miwili*
I-PST-(9)-break 9table 4leg 4two
'I broke two of the table's legs.'

b. *wa-li-(li)-saf-isha gari magurudumo*
2-PST-(5)-clean-CAUS 5car 6wheels
'They cleaned the car's wheels.'

c. *ni-me-(li)-vunja birika mkono*
I-STAT-(5)-break 5vessel 3handle
'I have broken the vessel's handle.'

d. *ni-me-(ki)-fanya kiti miguu*
I-STAT-(7)-make 7chair 4legs
'I have made the chair's legs.'

The sentences in (41) display the familiar distributional pattern we have seen in cases of PR involving inalienable possession: the possessor controls the object marker, optional here since the possessor is inanimate, but the host does not; the possessor may be the subject of the passive verb while the host may not. Voeltz

[12] Yoon [1990] addresses this issue and the question of the semantic class of verbs that allow PR in his GB analysis of the interpretation of inalienable possession constructions in Mandarin, French and Korean. He proposes that the body part and inalienable possessor NP's share a single theta-role via Theta Identification, a modification relation. While his account can be adopted for the canonical cases of Swahili inalienable possession involving body parts, it is not readily apparent what further assumptions might be necessary to distinguish between sets of data like those in (28) and (29) where the possessions are all alienable, but where PR is possible only in (28). Even if a single modification could account for such data, it is unlikely that it could subsume the issues raised in this remainder of this section.

[1976] provides a number of similar examples from Sotho like the ones below in (42) where a part/whole relationship obtains between the post-verbal nominals.

(42) a. *Palesa okhaola sefate makala/*selepe*
P. cuts tree branches/axe

b. *P. obetia pene motsu/*lebare*
P. sharpens pen tip/razor blade

We conclude with Voeltz [1976], Hyman [1977], and Scotton and Whiteley [1968, 1972] that the part/whole relation may be a more precise characterization of the relation that obtains between the bare nominals in the PR construction than inalienable possession. Third, an account of the interpretation of PR will address the fact that only a specific class of verbs can give rise to PR even when the part/whole relation is satisfied (43a), and in some cases where it appears not to be, as in (43b) through (43d).

(43) a. [Swahili]
**Juma a-li-mw-ona Asha miguu*
1Juma 1-PST-1-see 1Asha 4legs
'Juma saw Asha's legs.'

b. [Swahili: H&K p.3]
Rosa a-li-nyang'any-wa shuka
1Rosa 1-PST-rip-PASS 9shuka
'Rosa had her shuka ripped off her.'

c. [Haya: Hyman [1977]]
n-ka-teemul'ómwáán' éshaati
SM-P3-tear child shirt
'I tore the child's shirt.'

d. [Kinyarwanda:Kimenyi [1978]]
umujura y-aa-ny-ib-ye igitabo
thief SM-PST-1/SO-steal-asp book
'The/a thief stole my book.'

Massam [1985:342] notes that Korean verbs such as *ppaas* 'deprive', *karochae* 'usurp', *thol* 'rob', and *ttut* 'rip off' allow a genitive possessor to passivize to subject. Moreover, in a survey of the Possessor Stranding in Iroquoian languages, Baker suggests that Possessor Stranding must be governed in one of two ways: the verb must be a transfer of possession verb (e.g. 'steal', 'buy', 'find' ...), or the noun must take an inalienable rather than an alienable possessor. A satisfying

analysis of the interpretation of PR would address the fact that for some semantic class of verbs, PR is possible whether or not the NP's are in a part-whole/inalienable relation.

And finally, any account of PR's interpretation will come to grips with a glaring but unrecognized generalization revealed in our research. There appear to be no instances of PR with ONLY an inalienable or part/whole reading that cooccur with overt verbal morphology. What we do find are possessor raising cases where the verb is overtly morphologically marked and where there is no restriction to a part-whole/inalienable relation between the bare nominals.

(44) a. [Kinyarwanda: Kimenyi p. 98]
umhuungu a-ra-som-er-a umukoobwa igitabo
boy he-PRES-read-APPL-ASP girl book
'The boy is reading the girl's book.'

b. [Chichewa: Baker p. 271]
fisi a-na-dy-er-a kalulu nsomba
hyena SP-PAST-eat-APPL-asp hare fish
'The hyena ate the hare's fish.'

c. [Chamorro: Baker p. 272]
ha f'gasi-yi yu'si Flory ni magagu-hu
3S-wash-APPL me PN Flory obl clothes-my
'Flory washed my clothes.'

d. [Choctaw: Baker p. 272]
naahollo-ya tobi i-m-apa-li-tok
whiteman-acc bean 3S-APPL-eat-I-PST
'I ate the white man's beans.' OR 'I ate green beans.'

In sum, we hope that a treatment of PR's interpretation would not only explain such cross-linguistic observations, but would also wed that explanation to an explicit syntactic treatment, such as the one proposed.[13]

[13] A highly suggestive possibility is that particular extractions from NP might be made sensitive to a part/whole requirement. For exammple, Cattell [1979] observes that wh- extraction of adjuncts from NP in English does display this restriction.

(i) which car do you like the brakes in?
(ii) *which car do you like the girl in?

7. Conclusion

To summarize, we have argued that PR displays a coherent set of syntactic properties which distinguish it from the Nominal Construction. We have shown further how an analysis guided by GB assumptions might account for those properties. In this account, the constrained mechanisms in the GB framework, specifically X-bar, theta-, case and movement theories, interact in such a way as to provide an explanation for the syntactic properties associated with PR.

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Derek F. Gowlett (ed.). *African Linguistic Contributions.* Pretoria: Via Afrika Limited. 1992. Pp.388. R70,00.

This collection of 17 papers is presented in honor of Ernst. O. J. Westphal, formerly Head of the Department of African Languages at the University of Cape Town. The papers reflect the wide-ranging research interests of professor Westphal. The book incudes the following papers: "The Tsonga Rule" by E. J. M. Baumbach, "Computing African linguistic prehistory" by C. H. Borland, "Fundamental principles of Venda phonology" by Farida Cassimjee, "The tense system of Southern Sotho" by S. Chapole, "*Isihlonipho sabafazi* and the Xhosa-speaking speech community" by Tessa Dowling, "The selection of moods in *ukuba-* sentences by matrix verbs in Xhosa" by J. A. du Plessis, "From past to present dynamics in Xhosa" by Rosalie Finlayson, "Yeyi reflexes of proto-Bantu" by D. F. Gowlett, "Compound noun phrases in Nama" by W. Haacke, "A continuum interpretation of the Bantu noun class system" by A. P. Hendrikse and G. Poulos, "The morphology of the direct relative in Zulu" by J. S. M. Khumalo, "Metrical structure in Zigula tonology" by Charles W. Kisseberth, "The transcription of Afrikaans: towards an improved "standard" notation" by Roger Lass, "Restraints on the formation of nasal compounds in Tsonga" by J. A. Louw and C. T. D. Marivate, "Beyond morphological concatnations: Issues in the syntax and semantics of mulitply-extended verbs in Xhosa" by Sizwe Satyo, "A confusion of sounds: the phonetic description of !Xũ clicks" by A. Traill, and "*q* in Khoe: borrowing, substrate or innovation?" by Rainer Vossen. While the book contains an obituary of Professor Westphal, written by David Rycroft, it does not contain a bibliography of his contributions to African linguistics.

Joan Maw. *Narrative in Swahili: Sentence Structure, Intonation, and the Story Teller.* London: School of Oriental and African Studies. 1992. Pp. 107. £8.00.

[From the Introduction]: "This study considers two interlocking aspects of oral narrative in Swahili: the use of the structure of sentences in terms of clause relationships and classes, with a look at related lexis; and the use of intonation in terms of class and extent of tone-groups. The 'interventions' of the narrator are also considered. ... In choosing to look at sentence structure and tone-groups in Swahili in an extended story-telling performance I am considering the macro-elements of its structure. The study provides some information about the use of sentence structures which may seem rather surprising; and throws new light on the function of certain tone-groups... Taken together, these two parameters, plus the interventions of the narrator, throw considerable light on the style and technique of successful story-telling in Swahili."

The monograph is divided into two parts: Part I, Sentence Structure, and Part 2, Tone-groups and syntax. The full narrated text is included with intonation and clause analysis.

Gillette Staudacher-Valliamee. *Phonologie du Créole Réunionnais: Unité et diversité*. Louvain and Paris: Peeters Press (SELAF N° 335). 1992. Pp. 190. BF 963.

Touted as a "geo-phonological study" describing the unity and diversity of the oral tradition of the island of Reunion, this book examines phonological diversity in the French creole of Reunion. The data for the study were collected from 18 informants speaking different idiolects, including 10 men ranging in age from 15 to 90 and 8 women ranging in age from 13 to 80. Following a general introduction to Reunion and its history, the book is divided into three parts. The first part presents a phonological description of the various idiolects. The second part is an analysis of distinctive phonological features, six consonantal and three vocalic. The third and final section, "Unité et diversité", examines what is common to all the idiolects and what social and/or geographic factors contribute to diversity. The texte includes 13 maps.

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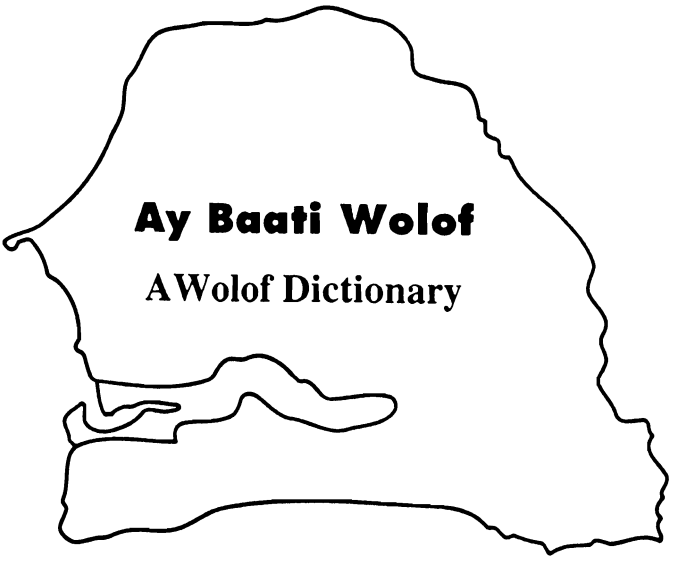

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