Roots and Patterns as Affixation+Phonology

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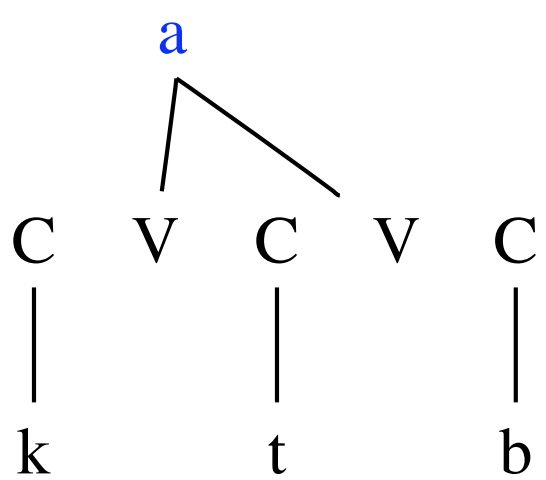
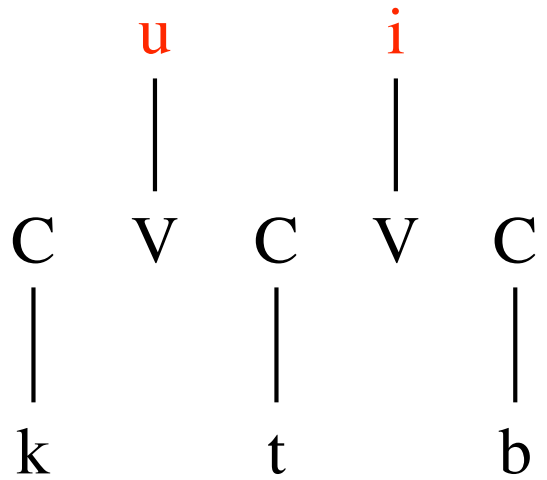
Concatenative Approaches to
Nonconcatenative Morphology
EGG 2008

Semitic Roots & Patterns (Arabic)

	Perfective		Impferfective	
	Active	**Passive**	**Active**	**Passive**
‘write’	k**a**t**a**b	k**u**t**i**b	aktub	uktab
‘cause to write’	k**a**tt**a**b	k**u**tt**i**b	ukattib	ukattab
‘correspond’	k**aa**t**a**b	k**uu**t**i**b	ukaatib	ukaatab

McCarthy (1981) on Semitic Roots & Patterns





Chomsky(1951) on Semitic Roots- & Patterns

(1) **Concatenation:**

a. ktb + **a** — **a** [+perfect +active +BinyanI]
b. ktb + **u** — **i** [+perfect +passive +BinyanI]

(2) **Phonological Rule:** $C_1C_2C_3 + V_1 — V_2 \rightarrow C_1\ V_1\ C_2\ V_2\ C_3$

(3) **Rule Application:**

a. ktb **a** — **a** → k**a**t**a**b
b. ktb **u** — **i** → k**u**t**i**b

(cf. also Bat-El, 1994; Ussishkin, 2000; Graf, 2003)

Amharic Roots and Patterns (Leslau,1995,2000)

Vowels in Tri-radicals (Affixes Removed)

	Type A	Type B	Type C
Perfect	səbbər	fəlləg	marrək
Imperfect	səbɨr	fəllɨg	marrɨk
Participle	səbar	fəllag	marak

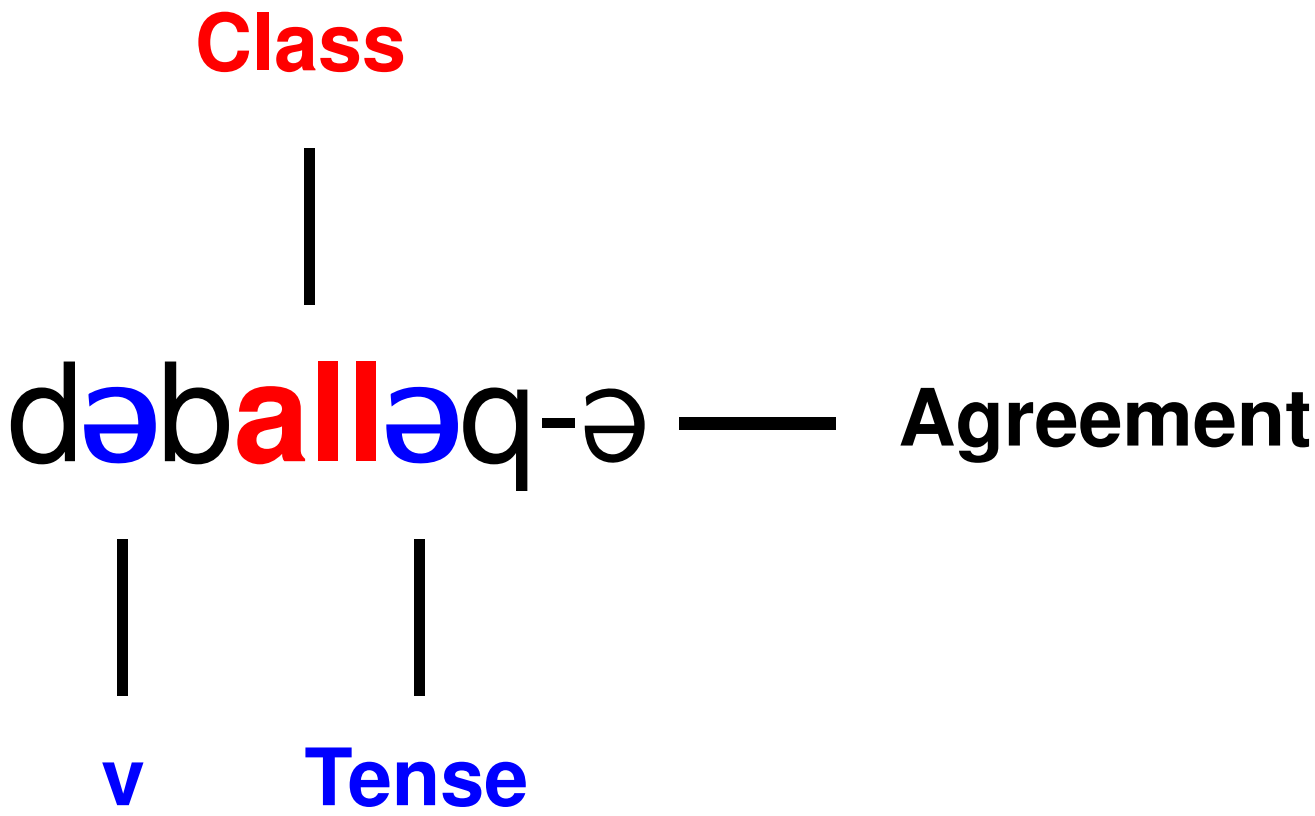
Gemination in Tri-radicals (Affixes Removed)

	Type A	Type B	Type C
Perfect	səbbər	fəlləg	marrək
Imperfect	səbɨr	fəllɨg	marrɨk
Participle	səbar	fəllag	marak

Basic Claims

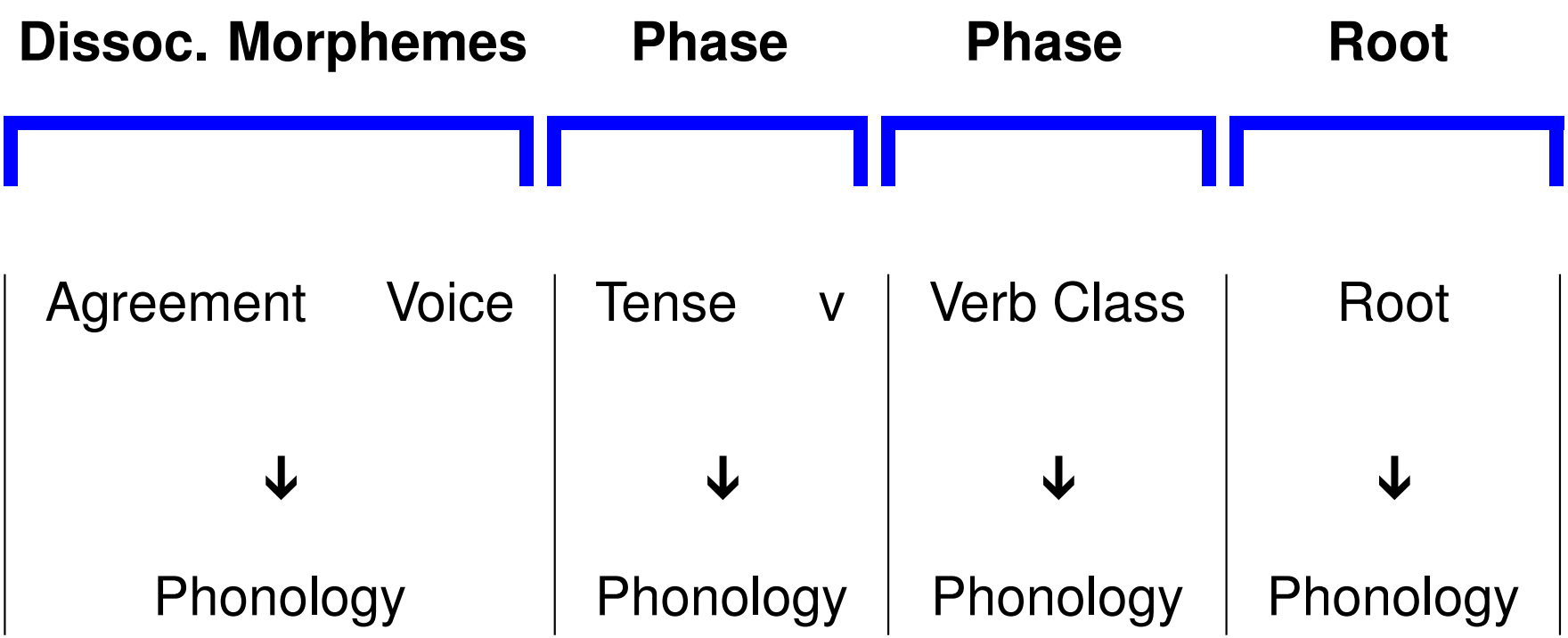
- Roots and Patterns = concatenative morpology + prosody
- Prosodic Domains $\subset$ Syntactic Domains
- Cyclic derivation of Morphosyntax and Phonology

Amharic Roots and Patterns



Outline

Spellout Levels



Verb Class: Gemination Classes

	Type A	Type B	Type 1	Type C	Type 2
Perfect	s **bb** r	f **ll** g	m s **kk** r	m **rr** k	d b **ll** q
Imperfect	s b r	f **ll** g	m s **kk** r	m **rr** k	d b **ll** q
Imperative	s b r	f **ll** g	m s k r	m r k	d b l q
Gerund	s b r	f **ll** g	m s k r	m r k	d b l q
Participle	s b r	f **ll** g	m s k r	m r k	d b l q
Verbal Noun	s b r	f **ll** g	m s k r	m r k	d b ll q
Gemination Class	1	all	2		

Verb Class: Vowel Classes

	Type A	**Type B/ Type 1**	**Type C/ Type 2**
Perfect	**ə** ə	ə **ə** ə	ə **a** ə
Imperfect	**ə** ɨ	ə **ə** ɨ	ə **a** ɨ
Imperative	**ɨ** ə	ə **ɨ** ɨ	ə **a** ɨ
Gerund	**ə** ɨ	ə **ɨ** ɨ	ə **a** ɨ
Participle	**ə** a	ə **ɨ** a	ə **a** a
Verbal Noun	**ɨ** ə	ə **ɨ** ə	ə **a** ə
Vowel Class	ə		a

Representative Paradigms

	Type A	**Type B**	**Type 1**	**Type C**	**Type 2**
Perfect	səbbər	fəlləg	məsəkkər	marrək	dəballəq
Imperfect	səb ɨr	fəllɨg	məsəkkɨr	marrɨk	dəballɨq
Imperative	sɨb ər	fəllɨg	məs k ɨr	mar k	dəbal q
Gerund	səb ɨr	fəllɨg	məs k ɨr	mar k	dəbal q
Participle	səb ar	fəllag	məs k ar	mar ak	dəbal aq
Verbal Noun	sɨb ər	fəlləg	məs k ər	mar ək	dəbal əq

Roots

	Type A	Type B	Type 1	Type C	Type 2
Perfect	s b r	f l g	m s k r	m r k	d b l q
Imperfect	s b r	f l g	m s k r	m r k	d b l q
Imperative	s b r	f l g	m s k r	m r k	d b l q
Gerund	s b r	f l g	m s k r	m r k	d b l q
Participle	s b r	f l g	m s k r	m r k	d b l q
Verbal Noun	s b r	f l g	m s k r	m r k	d b l q

Gemination Class

	Don’t geminate class 1 Imperfect forms
Otherwise	Geminate all class 2 forms
Otherwise	Geminate all and only (Im)perfect forms

Gemination

	Type A	Type B	Type 1	Type C	Type 2
Perfect	s **bb** r	f **ll** g	m s **kk** r	m **rr** k	d b **ll** q
Imperfect	s b r	f **ll** g	m s **kk** r	m **rr** k	d b **ll** q
Imperative	s b r	f **ll** g	m s k r	m r k	d b l q
Gerund	s b r	f **ll** g	m s k r	m r k	d b l q
Participle	s b r	f **ll** g	m s k r	m r k	d b l q
Verbal Noun	s b r	f **ll** g	m s k r	m r k	d b ll q
Gemination Class	1	all	2		

Vowel Class

Insert a vowel before the penultimate root consonant

a	a-class		
ɨ	ə-class	/ __	Imperative/Verbal Noun class 1
ə	ə-class	/ __	CC

Vowel Class

	Type A	Type B	Type 1	Type C	Type 2
Perfect	səbb r	fəll g	m səkk r	marr k	d ball q
Imperfect	s b r	fəll g	m səkk r	marr k	d ball q
Imperative	sɨb r	fəll g	m s k r	mar k	d bal q
Gerund	s b r	fəll g	m s k r	mar k	d bal q
Participle	s b r	fəll g	m s k r	mar k	d bal q
Verbal Noun	sɨb r	fəll g	m s k r	mar k	d bal q

Little v

Insert ə after the first root consonant

(if not filled)

Little v

	Type A	Type B	Type 1	Type C	Type 2
Perfect	səbb r	fəll g	məsəkk r	marr k	dəball q
Imperfect	səb r	fəll g	məsəkk r	marr k	dəball q
Imperative	sɨb r	fəll g	məs k r	mar k	dəbal q
Gerund	səb r	fəll g	məs k r	mar k	dəbal q
Participle	səb r	fəll g	məs k r	mar k	dəbal q
Verbal Noun	sɨb r	fəll g	məs k r	mar k	dəbal q

Tense

Insert a vowel before the last root consonant:

Participle		a
Imperative	/ __ class 1	
Perfect		
Verbal Noun		ə

Tense

	Type A	Type B	Type 1	Type C	Type 2
Perfect	səbbər	fəllag	məsək ər	marrək	d ballaq
Imperfect	səb r	fəll g	məsəkk r	marr k	d ball q
Imperative	sɨb ər	fəll g	məs k r	ma r k	d bal q
Gerund	səb r	fəll g	məs k r	m r k	d bal q
Participle	səb ar	fəllag	məs k ar	m r ak	d bal aq
Verbal Noun	sɨb ər	fəllag	məs k ər	m r ək	d bal əq

ɨ-epenthesis

	Type A	Type B	Type 1	Type C	Type 2
Perfect	səbbər	fəlləg	məsəkkər	marrək	dəballəq
Imperfect	səb r	fəllɨg	məsəkkɨr	marrɨk	dəballɨq
Imperative	sɨb ər	fəllɨg	məs k ɨr	mar k	dəbal q
Gerund	səb r	fəllɨg	məs k ɨr	mar k	dəbal q
Participle	səb ar	fəllag	məs k ar	mar ak	dəbal aq
Verbal Noun	sɨb ər	fəlləg	məs k ər	mar ək	dəbal əq

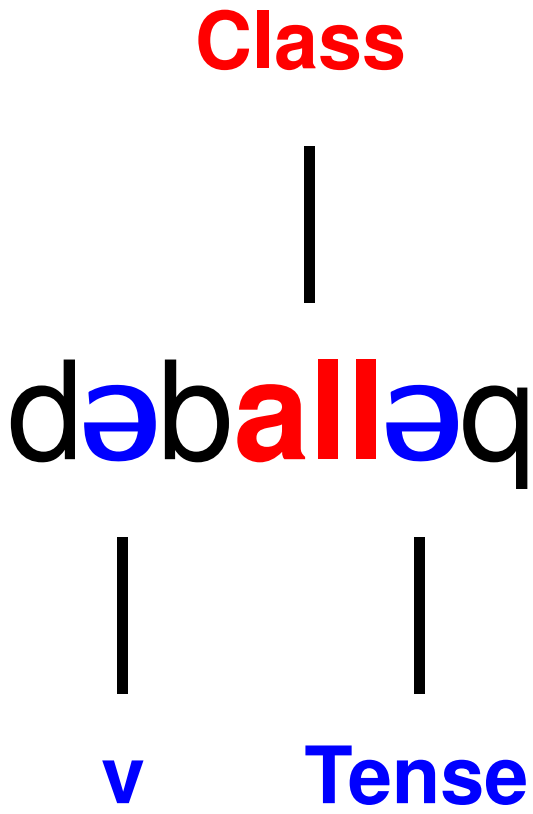
Example I

Root	Verb Class	v	Tense
↓	↓	↓	↓
d b l q	d b **all** q	d **ə** b all q	d ə b all **ə** q

Example II

Root	Verb Class	v	Tense
↓	↓	↓	↓
m r k	m **arr** k	m arr k	m arr **ə** k

Amharic Roots and Patterns



General Condition on Stem Vowels

No front or back vowels (cf. Buckley, 2003)

	*[+/-back]	FAITH
☞ a. səbɨr		*
b. səbir	*!	
c. səbur	*!	

ə= [-high -low] ɨ= [+high -low] a = [-high +low]

i = [+high -low-back] u = [+high -low+back]

General Conditions on Prosodic Stem Shape

Stems are prosodic words

Highranked STEM=PRWD (Kager, 1999)

Prosodic Words have a single final trochaic foot:

$$\ldots \sigma\ \sigma\ \sigma\ (\acute{\sigma}\ \sigma)_{F}$$

High-ranked ALIGN(FT,R,PWD,R) (Kager, 1999)

General Conditions on Prosodic Stem Shape

Onsets

- All sylllables have onsets
- No complex onsets

Codas

- Final sylllables **must** have codas
- Penultimate syllables **may** have codas
- Other syllables **mustn't** have codas

General Conditions on Prosodic Stem Shape

	ONS	*COMPLEX$^{\text{ONS}}$	FINAL-C
☞ a. mɨsɨkɨr			
b. mɨsɨkɨrɨ			*!
c. msɨkɨr		*!	
d. ɨmɨsɨkɨr	*!		

FINAL-C: Prosodic words end in a consonant
(McCarthy & Prince, 1994; Graf, 2003)

Root

Input: dblq (◯= [-cons])

	*[+/-voc]	ONS	*COMPL^{ONS}	FINAL-C
☞ a. d◯b◯l◯q				
b. d◯b◯l◯q◯				*!
c. db◯l◯q			*!	
d. ◯d◯b◯l◯q		*!		
e. d~~i~~b~~i~~l~~i~~q	*!*			

➔ only empty vowels in the output

➔ no distinctive root vowels

Verb Class

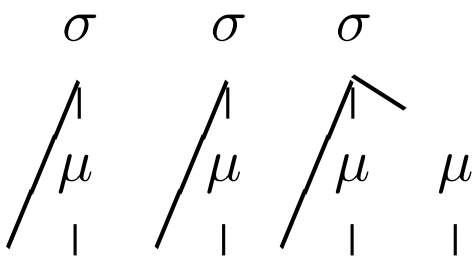
Basic Question: Why are class features in the penultimate syllable?

Answer: Attraction to strong position

Prosodic Word: $\ldots \sigma\ \sigma\ \sigma\ (\acute{\sigma}\ \sigma)_{\mathrm{F}}$

Gemination as Mora Affixation

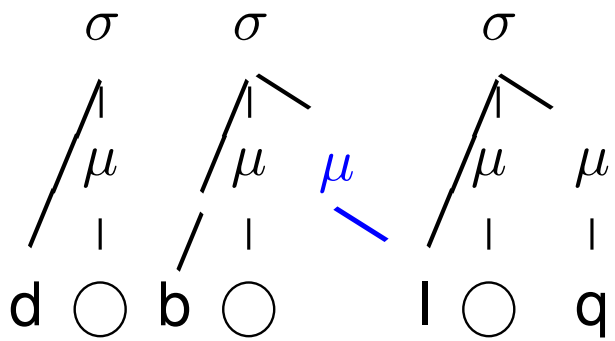
(Lombardi & McCarthy,1990;Samek-Lodovici,1992;Davis & Ueda, 2003)



Input:

Affix:

Output:



Options for mora realization

Long Vowel	d **VV** b l q	*$V_{\mu\mu}$
Stem-initial Geminate	**dd** b l q	*ONS-μ
Stem-final Geminate	d b l **qq**	*GEM $]_{\omega}$
Left-aligned Geminate	d **bb** l q	
Right-aligned Geminate	d b **ll** q	

Mora Alignment

Input: d◯$_\mu$b◯$_\mu$l◯$_\mu$q + μ

	MAX μ	STRESSTOWEIGHT
☞ a. d◯$_\mu$(b◯$_\mu$-μ.l◯$_\mu$q)		
b. d◯$_\mu$-μ.(b◯$_\mu$.l◯$_\mu$q)		*!
c. d◯$_\mu$(b◯$_\mu$l◯$_\mu$q)	*!	*

STRESSTOWEIGHT: Stressed syllables are heavy

Positional Licensing and Vowel Class Position

LIC(F, S-Pos): Feature specification [F] is licensed by (dominated by) strong position S. (Zoll, 1998; Walker, 2001)

Prosodic Word in Semitic: $\ldots \sigma\ \sigma\ \sigma\ (\acute{\sigma}\ \sigma)_{\mathrm{F}}$

LIC(**F**, $\acute{\sigma}$)

$\ldots \sigma\ \sigma\ \sigma\ (\ \mathbf{F}\ \sigma)_{\mathrm{F}}$

Vowel Class

Input: d◯$_1$b◯$_2$ll◯$_3$q-**a$_4$**

	TEMPL	LIC ([-low],$\acute{\sigma}$ $\mu\mu$)	MAX V	LIC ([+low],$\acute{\sigma}$)
☞ a. d◯$_1$(b**a$_{2,4}$**l◯$_3$q)				
b. d◯$_1$(b◯$_2$ l**a$_{3,4}$**q)				*!
c. d◯$_1$(b◯$_2$l◯$_3$q)			*!	
d. d◯$_1$b◯$_2$l◯$_3$q-**a$_4$**	*!			
e. **a$_4$**-d◯$_1$b◯$_2$l◯$_3$q	*!			

Vowel Class II

Input: m◯$_1$s◯$_2$kk◯$_3$r-ə$_4$

	TEMPL	LIC ([-low],σ μμ)	MAX V	LIC ([+low],σ)
☞ a. m◯$_1$(sə$_{2,4}$kk◯$_3$r)				
b. m◯$_1$(s◯$_2$kk◯$_3$r)			*!	
c. m◯$_1$(s◯$_2$ kkə$_{3,4}$r)		*!		
d. m◯$_1$s◯$_2$kk◯$_3$r-ə$_4$	*!			
e. ə$_4$-m◯$_1$s◯$_2$kk◯$_3$r	*!			

Vowel Class III

Input: m◯$_1$s◯$_2$k◯$_3$r-ə$_4$

		TEMPL	LIC ([-low],$\acute{\sigma}$ $\mu\mu$)	MAX V	LIC ([+low],$\acute{\sigma}$)
	a. m◯$_1$(sə$_{2,4}$k◯$_3$r)		*!		
☞	b. m◯$_1$(s◯$_2$k◯$_3$r)			*	
	c. m◯$_1$(s◯$_2$ kə$_{3,4}$r)		*!		
	d. m◯$_1$s◯$_2$k◯$_3$r-ə$_4$	*!			
	e. ə$_4$-m◯$_1$s◯$_2$k◯$_3$r	*!			

V

Input: ə$_1$-d◯$_2$ba$_3$ll◯$_4$q

	MAX V	ONS	FIN-C	LINEARITY
☞ a. də$_{1,2}$ba$_3$ll◯$_4$q				*
b. d◯$_2$bə$_{1,3}$ll◯$_4$q				**!*
c. d◯$_2$ba$_3$llə$_{1,4}$q-				**!***
d. d◯$_2$ba$_3$ll◯$_4$q-ə$_1$			*!	*******
e. ə$_1$-d◯$_2$ba$_3$ll◯$_4$q		*!		
f. d◯$_2$ba$_3$ll◯$_4$q	*!			

v (II)

Input: ə$_1$-ma$_2$r◯$_3$k

	IDENT(low)^{Stem}	MAX V	IDENT(low)^{Affix}
☞ a. m**a**$_{1,2}$r◯$_3$k			*
a. m**a**$_2$r◯$_3$k		*!	
b. mə$_{1,2}$r◯$_3$k	*!		

Tense

Input: də$_1$ba$_2$ll◯$_3$q-ə$_4$

	MAX V	ONS	FIN-C	LINEARITY
☞ a. də$_1$ba$_2$llə$_{3,4}$q				*
b. də$_{1,4}$ba$_2$ll◯$_3$q				**!**
c. də$_1$ba$_2$ll◯$_3$q-ə$_4$			*!	
d. ə$_4$-də$_1$ba$_2$ll◯$_3$q		*!		*******
e. də$_1$ba$_2$ll◯$_3$q	*!			

Agreement

Input: də$_1$ba$_2$llə$_3$q-**ə$_4$**

	LINEARITY	MAX V	ONS	FIN-C
☞ a. də$_1$ba$_2$llə$_3$q-**ə$_4$**				*
b. də$_1$ba$_2$llə$_3$q		*!		
c. də$_1$ba$_2$ll**ə**$_{3,4}$q	*!			
d. d**ə**$_{1,4}$ba$_2$llə$_3$q	*!*			

Arguments for Cyclicity

- Stem Template is opaque at the word level
- Vowel Licensing is opaque at other levels
- empty root vowels are opaque at other levels

Summary

Amharic Roots and Patterns are . . .

- concatenative
- cyclic