Outward-sensitive phrasal allomorphy in Kimatuumbi

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Cyclic Phonology

- According to the cyclic principle, a process P in a smaller domain applies before a process Q in a bigger domain.
- Q must counterbleed P: P applies, even if Q destroys P's environment.

(1) $[...Q\ [...P...]_{D}...]_{D+x}$

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Cyclic frameworks

a.o. SPE (Chomsky & Halle, 1968), LMP (Kiparsky, 1982), cophonologies (Orgun, 1997), Stratal OT (e.g. Bermúdez-Otero 2012), phasal phonology (e.g. Newell 2008)

Cyclic Allomorph Selection

- Morpheme insertion happens cyclically from the inside out.
- Phonologically conditioned allomorph selection cannot be outward sensitive (Bobaljik, 2000; Paster, 2006; Embick, 2010).

(2) ROOT-X-Y

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The Puzzle from Kimatuumbi

- Gliding is word-bound process.
- Initial Tone Insertion (ITI) is sensitive to phrasal information.

(3) [...ITI [...Gliding...]$_{\text{Word}}$...]$_{\text{Phrase}}$

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- ITI bleeds Gliding.

(3) [...ITI [...Gliding...]$_{\text{Word}}$

Odden's 1996 Account

ITI is a rule that applies countercyclically before Gliding.
ITI (and other phonological rules) access morphosyntactic features.

Proposal

- Cyclic reanalysis in Stratal OT requires two assumptions:
  - Prosodic Structure.
  - ITI is allomorph selection and not a phonological process.

Trade-off

ITI as allomorph selection is outward sensitive.
Countercyclic Morphology instead of countercyclic phonology?

Structure of this talk

Kimatuumbi

- Kimatuumbi is a Bantu language spoken in Tanzania.
- All Data is from Odden (1996).

High vowel gliding

- A high vowel glides before another vowel.
- The other vowel lengthens.

(4) lụ-até → lwaaté
CL-banana.hand
'banana hand' (DO96:113)

(5) a. ị-ụ́lá → jụụ́lá
CL-frog
'frogs' (DO96:113)

b. ḳi-ụ́lá → kjụụ́lá
CL-frog
'frog' (DO96:113)

Gliding is blocked I

- Long high vowels do not glide.

(6) mụ̱ụ̱-Ø-até → mụ̱ụ̱até
in-CL9-banana.hand
'in the banana hands' (DO96:278)

Gliding is blocked I

- Long high vowels do not glide.

(6) mụ̀ụ́-Ø-até → mụ̀ụ́até
in-CL9-banana.hand
'in the banana hands' (DO96:278)

- Gliding is blocked across word boundaries.

(7) ɨtabʉ́ asɨ́mɨlwá *ɨtabwáasɨ́mɨlwá
'borrowed books' (DO96:126)

Gliding is blocked II

- Gliding is blocked if
  - The high vowel has a high tone
  - and ($\wedge$) the following vowel is long.

(8)

a. pa-nį́-aándjįké $\rightarrow$ panį́aándjįké
COMP-1SG-write.PFV
'when I wrote' (DO96:123)

b. ca-tų́-oóndjté $\rightarrow$ catų́oóndjté
COMP-1PL-peel.PFV
'what we peeled' (DO96:118)

Both conditions must be met

- High tone alone does not suffice for blocking.

(9) a. pa-nį́-ụtį́té → panjụ́ụtį́té
COMP-1SG-pull.PFV
'when I pulled' (DO96:123)

b. ca-tụ́-asį́į́mé → catwáasį́į́mé
COMP-1PL-borrow.PFV
'what we borrowed' (DO96:123) pause

- Long second vowel alone does not suffice for blocking

(10) a. ụ-ụ́ụmį́te → wụ́ụmį́te
2SG-win.PFV
'you won' (DO96:116)

b. tụ-áandį́į́ke → twáandį́į́ke
1PL-write.PFV
'we wrote' (DO96:116)

Direction of Gliding I

- Between two ‘inner’ prefixes, Gliding applies left-to-right.

(11) mu̱-i̱-u̱té → mwi̱i̱u̱té *mu̱ju̱u̱té
2PL-OBJ-pull
‘you should pull it’ (DO96:271)

Non-cyclic self-bleeding

- If every step of affixation was a cyclic domain in phonology, we would get *mu̱ju̱u̱té.
- Both prefixes belong to the same cyclic domain.
- Gliding applies iteratively left to right, or is shaped by a directionally evaluated constraint (Finley, 2009).

Direction of Gliding II

- Between an 'inner' and 'outer' prefix, gliding applies right-to-left/cyclically.

(12) mụ=ị-ụ́lá → mụjụ́ụ́lá *mwịịụ́lá
in=CL-frog
'in the frog' (DO96:271)

Cyclic self-bleeding

- If the 'outer' prefixes belonged to the same cyclic domain and gliding applies left-to-right, we would predict *mwịịụ́lá.
- Since we know that gliding is left-to-right, 'outer' prefixes must belong to an outer cyclic domain.
- Relevant outer prefixes are kụ= 'at', mụ='in', lị= 'CL5'.

Outer prefixes

➢ If not bled by pother processes, ‘outer’ prefixes do glide.

(13)

a. kụ=ị-sị́wá → kwịịsị́wá
to=CL-island
‘to the islands’ (DO96:113)

b. mụ=ị-kálaango → mwịịkálaango
in=CL-frying.pan
‘in the frying pans’ (DO96:113)

c. mụ=Ø-eéla → mweéla
in=CL-money
‘in money’ (DO96:114)

Interim Summary

Gliding

- Gliding turns a high vowel – vowel sequence into glide – long vowel.
- Gliding is applies first in an inner cyclic domain
  (root + 'inner' prefixes)
- Gliding applies then in an outer cyclic domain
  ((root + 'inner' prefixes)+'outer' prefixes)
- Gliding is bound to phonological words.
- Gliding is blocked if a. the high vowel has a high tone and b. the following vowel is long.

Initial Tone Insertion

- Some morphemes start with a high-toned vowel, (roughly) if the preceding word has no high tone.

(14) *Basic ITI pattern*

a. kị̀bao gánị̀
'which stool' (DO96:245)

b. kị̀tumbí̵ ganị̀
'which hill' (DO96:245)

ITI: Targets I

- ITI is restrcited to a set of morphemes:

(15) *ITI mophemes: prefixes*

a.	Prepositions: na- , kų-, mų-, pa-	(DO96:44-46)
b.	Subordinate verb prefix: ka-	(DO96:44-46)
c.	Numeral prefixes: jų-, ba-, gų-...	(DO96:34)
d.	Determiner prefixes: ju-, a-, gu-...	(DO96:34)

- c. and d. are irrelevant for the interaction, because they attach to a closed class of roots, none of which starts with a long vowel.

ITI: Targets II

(16) *ITI mophemes: arguably lexical words*

a. kị́ndaáị́ ‘today’, malaáu ‘tomorrow’, ncece ‘four’, Question words (DO96:44-46)

b. Some class 9 underived adjectives, e.g. kúlú ‘big’ (DO96:44-46)

ITI: Triggers

- If the preceding word is toneless, ITI morphemes have a high tone.

(17)

a. kị̀bao gánị̀
'which stool'

b. ị̀-jụ̀nị̀ ị̀-bilị̀ →ịjụ̀nị̀ ị́bilị̀
CL8-bird CL4/8.NUM-two
'two birds' (DO96:35)

c. mwaana kị̀tị̀wị̀ →mwaana kị́tị̀wị̀
child how
'how [did he kill] the child?' (DO96:245)

ITI: Non-Triggers

- ITI morphemes have a low tone if the preceding word has a high tone somewhere.

(18)

a. kị̀tumbí̩ ganị̀
'which hill' (DO96:245)

b. mị̀-kóŋgo ì̩-bilị̀ →mị̀kóŋgo ì̩bilị̀
CL8-tree CL4/8.NUM-two
'two trees' (DO96:35)

c. kị̀-túumbili kị̀tị̀wị̀ →kị̀túumbili kị̀tí̩wị̀
CL-monkey how
'how [did he kill] the monkey?' (DO96:245)

ITI: Non-Triggers

- ITI morphemes have a low tone if the preceding word has a high tone somewhere.

(18)
a. kɨtumbɨ́ ganɨ
'which hill' (DO96:245)

b. mɨ-kóŋgo ɨ-bilɨ →mɨkóŋgo ɨbilɨ
CL8-tree CL4/8.NUM-two
'two trees' (DO96:35)

c. kɨ-túumbili kɨtɨwɨ →kɨtúumbili kɨtɨ́wɨ
CL-monkey how
'how [did he kill] the monkey?' (DO96:245)

- The high tone that blocks ITI can be quite far away!

ITI-Triggers with high tone I

- ITI morphemes have a high tone, if the preceding word has a high tone only on a prefix.

(19) kḭ́-ŋoombe ganị → kḭ́ŋoombe gánị
PL-cow which
'What type of cows?' (DO96:247)

ITI-Triggers with high tone II

➢ If a verb has only a high tone on a first root mora, ITI morephemes are high toned.

(20)
a. nį-ka-téleka mų=kį-téleéko →nįkatéleka mų́kįtéleéko
1SG-FUT-cook in=CL7-cooking.pot
'I will go cook it in the cooking pot' (DO96:248)

b. naa-jí-į kų́=soóko →naajíį kų́soóko
1SG.PST-go-PFV to=market
'I went to the market' (DO96:248)

First and final tone blocks ITI

- High tone on only mora of verb blocks ITI.

(21) a. wáŋga-ljá na=mambóondo → wángaljá namambóondo
without-eat with-Mamboondo
'Without having eaten with Mamboondo' (DO96:248)

b. mbala ljá mų=kį-líndiilo → mbala ljá mųkįlíndiilo
1SG.want eat in=CL7-guard.shack
'I want to eat in the guard shack' (DO96:248)

No preceding context

- If nothing precedes the ITI morpheme, it surfaces with a low tone.

(22)
a. kụ=sụ́ụ́le → kụsụ́ụ́le
to=school
b. mụ=kị-kálaaŋgo → mụkị́kálaaŋgo
in=CL-frying.pan

Interim Summary

ITI

- Targets are from a list of prefixes/function words.
- They have a high-toned and a low-toned alternant.
- The high toned alternant appears after:
  - low toned stems (excluding prefixes).
  - verbs with a high tone on the first mora and no other tone.
- The low toned alternant appears elsewhere:
  - after stems with a high tone.
  - after the floating topic tone.
  - initially.

Cyclic expectation: Counterbleeding

- Gliding applies in a lexical domain, the word.
- ITI applies in a phrasal domain.
- If lexical processes apply before phrasal processes, Gliding must apply before ITI.

Cyclic expectation: Counterbleeding

- Gliding applies in a lexical domain, the word.
- ITI applies in a phrasal domain.
- If lexical processes apply before phrasal processes, Gliding must apply before ITI.
- Thus, ITI must counterbleed ITI.

(23)
a. Gliding
kụ-aanɟụ́ → kwaanɟụ́
b. ITI
ụtịlị kwaanɟụ́ → ụtịlị kwaanɟụ́

Bleeding

- However, factually ITI bleeds Gliding.

(24) a. ụtịlį́ kụ-aanɟụ́ → ụtịlị kwaanɟụ́
2SG-run.PFV.SBJV to-firewod
'You should run to the firewood' (DO96:275)

b. ụtịlị kụ-aanɟụ́ → ụtịlị kụ́aanɟụ́
2SG-run.PFV to-firewod
'You ran to the firewood' (DO96:275)

Crucial assumptions

- Phrasal phonological processes can be restricted to phonological words.
- ITI is allomorph selecetion.

Schematic derivation of countercyclic bleeding

(25)

Word level phonology	
aanɟú	Input
[aanɟú]$_\omega$	Prosodic structure is built
Morphosyntax	
[ụtịlị]$_\omega$ {kú,kụ} [aanɟú]$_\omega$	Concatenation
[ụtịlị]$_\omega$ kú [aanɟú]$_\omega$	Allomorph selection
Phrase level phonology	
[ụtịlị]$_\omega$ [kúaanɟú]$_\omega$	Prosodification
[ụtịlị]$_\omega$ [kúaanɟú]$_\omega$	Gliding is blocked

Phrasal Gliding

- Phrasal Gliding applies between 'outer' prefixes and stems.
- 'outer prefixes' integrate into a previously built prosodic word ω, either due to constraints (Selkirk, 1995), or due to a pre-phonological mechanism (Lee & Selkirk, 2022).

(26)

	$[\text{ja\'a}]_\omega$	*SHIFT	MAX-T	*.μ́μμ.	*i.V	*.μμμ.	MAX-μ
	a. $[\text{ja\'a}]_\omega$				*!		
☞	b. $[\text{ja\'a}]_\omega$						*
	c. $[\text{jaa\'a}]_\omega$					*!	

Phrase level Blocking: words

(27) *Derivation of blocking of gliding across word boundaries*

		...i̯]$_\omega$[a...]$_\omega$	*SHIFT	MAX-T	EXC-ω	*i̯.V	*.μμμ.	MAX-μ
☞	a.	...i̯]$_\omega$[a...]$_\omega$				*		
	b.	...]$_\omega$[ja...]$_\omega$			*!			

(28) EXC(ORPORATE)-ω
Count a violation for a final mora dominated by ω_i in the input that is not dominated by ω_i in the output.

➢ Without prosodic structure, Gliding could not be phrasal and restricted to words.

Phrase level Blocking: High tone – long vowel

(29) *Derivation of blocking of gliding with íVV*

		$\acute{ı}_i a_j a_k$	*Shift	Max-V:	Max-T	*σ́.σμμ	*ı́.V	*σ.μμμ.	Max-μ
☞	a.	$\acute{ı}_i a_j a_k$					*		
	b.	$já_i a_j a_k$				*!		*	
	c.	$ja_j a_k$			*!				*
	d.	$já_j a_k$	*!						*
	e.	$já_i a_k$		*!					*

Phrase level Blocking: High tone – long vowel

(29) *Derivation of blocking of gliding with íVV*

		íᵢaⱼaₖ	*Shift	Max-V:	Max-T	*μμμ.	*ᵢ.V	*.μμμ.	Max-μ
☞	a.	íᵢaⱼaₖ					*		
	b.	jáᵢaⱼaₖ				*!		*	
	c.	jaⱼaₖ			*!				*
	d.	jáⱼaₖ	*!						*
	e.	jáᵢaₖ		*!					*

(30) *Shift

Count a violation for a tone that is associated in the input to a mora μ_i but in the output associated to a mora μ_j and not associated to μ_i.

Phrase level Blocking: High tone – long vowel

(29) *Derivation of blocking of gliding with íVV*

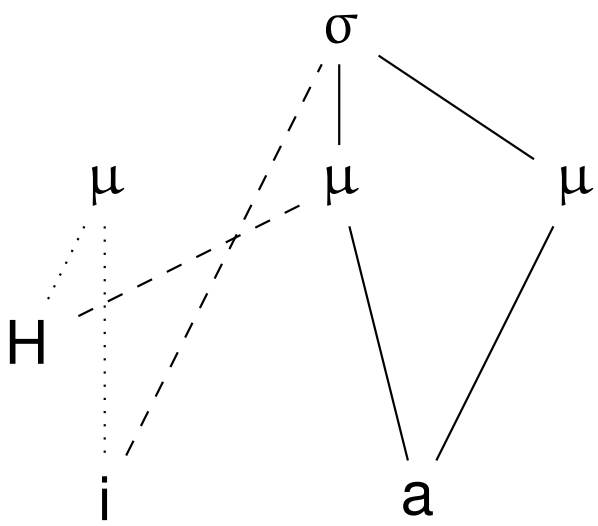
		íˌ$_i$a$_j$a$_k$	*SHIFT	MAX-V:	MAX-T	*.úμμ.	*i.V	*.μμμ.	MAX-μ
☞	a.	íˌ$_i$a$_j$a$_k$					*		
	b.	já$_i$a$_j$a$_k$				*!		*	
	c.	ja$_j$a$_k$			*!				*
	d.	já$_j$a$_k$	*!						*
	e.	já$_i$a$_k$		*!					*

(31) MAX-V:

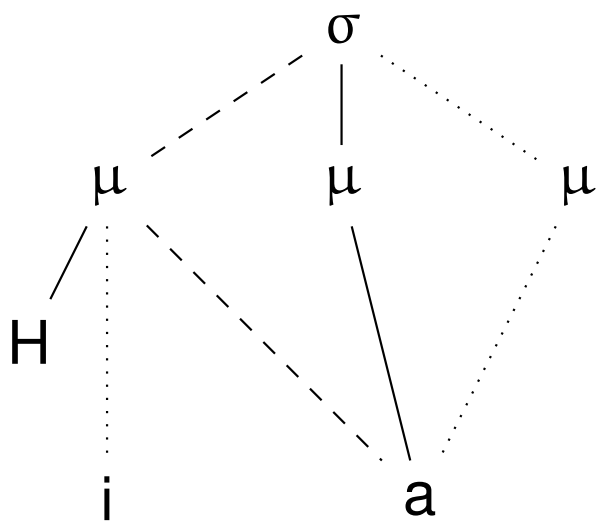
Count a violation for any mora that is associated with a vowel that is associated to another mora in the input and is not present in the output.

Representations

(32) Candidate (32-d)



(33) Candidate (33-e)



High tone is not enough

(34)

		ĺ$_i$a$_j$	*Shift	Max-V:	Max-T	*.úμμ.	*i.V	*.μμμ.	Max-μ
	a.	ĺ$_i$a$_j$					*!		
	b.	já$_i$							*!
	c.	ja$_i$á$_j$	*!						
☞	d.	já$_i$a$_j$							

Long vowel is not enough

(35)

		$j_i a_j a_k$	*SHIFT	MAX-V:	MAX-T	*μμμ	*i V	*μμμ	MAX-μ
	a.	$j_i a_j a_k$					*!		
	b.	$ja_i a_j a_k$						*!	
☞	c.	$ja_j a_k$							*
	d.	$ja_i a_k$		*!					*

Interim Summary

Analysis of Gliding

- Gliding between ‘outer’ prefixes and the stem is phrasal.
- Gliding across words is blocked by EXCORPORATE-ω with necessary reference to prosodic structure.
- A high toned vowel before a long vowel cannot glide, because, neither the high toned vowel nor the long vowel may lose a mora.

Countercyclicity avoided?

- If gliding with ‘outer prefixes’ is phrasal, and it is bled by phrasal phonological process (ITI), the bleeding interaction is no longer countercyclic. Problem solved?

Countercyclicity avoided?

- If gliding with ‘outer prefixes’ is phrasal, and it is bled by phrasal phonological process (ITI), the bleeding interaction is no longer countercyclic. Problem solved?

No

- ITI does not behave like a phonological process, it is rather like allomorphy.
- Even if it is analysed as a process, the bleeding interaction does not follow without an additional extrinsic ordering statement.

ITI is not a process

- ITI targets a closed class of elements.
- ITI does not look like a regular OCP process crosslinguistically.
- ITI does not look like OCP processes in Kimatuumbi.
- ITI is sensitive to morphosynactic features of the trigger (stem boundary, N/V distinction).

Closed class of elements

- Given that ITI does not apply to every word-initial syllable, it cannot be a general phonological process.
- If ITI is a process, ITI morphemes need some special representation.
- They could have a floating H tone.

(36) kʉ H

Problem I

Floating tones typically attach to an adjacent morpheme, not to the contributing morpheme. This is true crosslinguistically, but also in Kimatuumbi.

(37) maH-kooŋgoɲ́ → makóoŋgoɲ́
'hartebeests'

OCP long distance

➢ The floating tone must be deleted/ not associated if preceded by a high tone long distance.

Problem II

OCP is not evaluated long distance crosslinguistically (Meyers, 1997). OCP is also not evaluated long distance in Kimatuumbi.

(38) a. mi̱H-kaáte → mi̱kaáte
'loaves' (DO96:113)

b. makooŋgoní̱ → maH-kóoŋgoní̱
'hartebeests'

Initial ITI

- If High tone association of ITI morphemes is blocked by the OCP, we expect a high tone domain initially.

(39)
a. kụ=sụ́ụ́le → kụsụ́ụ́le
to=school
b. mụ=kị-kálaaŋgo → mụkị́kálaaŋgo
in=CL-frying.pan

Morphosyntactic reference

- ITI ignores prefixes and sees thus the prefix-root boundary.
- ITI ignores the first mora of verbs, and sees thus the category V (or v).

ITI as Allomorphy

- Allomorphy targets definitionally restricted sets.
- Phonologically conditioned allomorph selection is not necessarily phonologically reasonable (Paster, 2006).
- Phonologically conditioned allomorphy has access to both phonological and morphological features.

Assumptions

Allomorphy happens before regular phonology (Paster, 2006; Kalin, 2020) at multiple cycles (Kalin, 2020).

Overview of the Analysis

(40)

Word level phonology	
aanɟú	Input
$[aanɟú]_{\omega}$	Prosodic structure is built
Morphosyntax	
$[u̯tiji̯]_{\omega}$ {kú,ku} $[aanɟú]_{\omega}$	Concatenation
$[u̯tiji̯]_{\omega}$ kú $[aanɟú]_{\omega}$	Allomorph selection
Phrase level phonology	
$[u̯tiji̯]_{\omega}$ $[kúaanɟú]_{\omega}$	Prosodification
$[u̯tiji̯]_{\omega}$ $[kúaanɟú]_{\omega}$	Gliding is blocked

Subcategorisation frame

(41) Subcategorisation frames for TODAY

a. ... μ́] malaáu ↔ TODAY
Directly after a high tone, the alternating morpheme is always toneless.

b. [μ́...]$_{\Sigma:V}$ málaáu Today
Verb stems with only an initial H lead to the selection of the high-toned variant.

c. [...]$_{\Sigma}$ málaáu ↔ TODAY
Stems without any high tone lead to the selection of the high toned variant.

d. malaáu ↔ TODAY
The default case has the toneless syllable.

ITI Allomorphy is outward sensitive

(42) [[ụtịlị]$_V$ [{kṷ,kụ} [aanɟṷ]$_{NP}$]$_{PP}$]$_{VP}$

Outward-sensitive Morphology

- Outward sensitive allomorphy is only necessary countercyclic if every merge operation is a cycle.
- If the cycle is equivalent to a phase, some outward sensitive allomorphy can be expected (Deal & Wolf, 2017; Rolle & Bickmore, 2022).
- Can phases make Kimatuumbi allomorph selection cyclic?

Domain of ITI

- If there is no CP boundary between trigger and target, ITI applies regardless of syntactic relation.
- If there is a CP boundary, ITI applies only if the trigger is in the embedding CP, and the target in the embedded CP.

(43) a. ɲaamịnị cáaŋgú caaóbịte
[ɲaamịnị [{cá,ca}-aŋgú caaóbịte]$_{CP}$]$_{CP}$
expect.1SG POSS.CL-1SG lost
'I expect that mine is lost'

b. ... jwaátwetʃ́ị ɲama namboópo
[...[jwaátwetʃ́ị ɲama]$_{CP}$ {na,ná}=mboópo]$_{CP}$
took.REL meat with=machete
'[I killed the man] who took the meat with a machete'

- If the CP is a phase, ITI is still countercyclic.

Extrinsic ordering and non-modular ITI

- With non-modular phonology and extrinsic ordering, the assumption of prosodic structure suffices to derive the interaction.

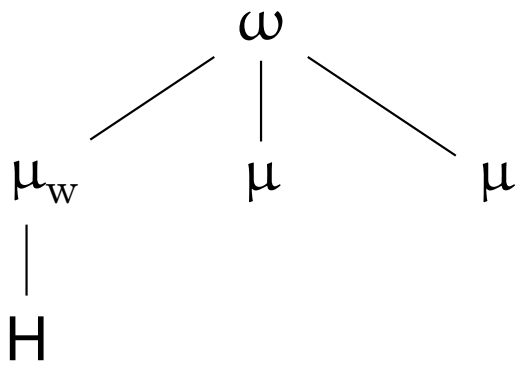
(44)

Word level phonology	
aanɟú	Input
$[aanɟú]_{\omega}$	Prosodic structure is built
Morphosyntax	
$[ụtịlị]_{\omega}$ kụ $[aanɟú]_{\omega}$	Concatenation
Phrase level phonology	
$[ụtịlị]_{\omega}$ $[kụaanɟú]_{\omega}$	Prosodification
$[ụtịlị]_{\omega}$ $[kúaanɟú]_{\omega}$	ITI Rule
—	Gliding

Without anti-modular rules

- Given the data in Odden (1996), stems can be replaced with a prosodic domain that excludes prefixes.
- Reference to verbs can be avoided if we assume that verb-inital morae are defective (45).

(45) *structure of téleka*



(46) structure of ITI morpheme

kʉ

H

(47) ITI-Rule

$VH \rightarrow \acute{V}$ /[($\acute{\mu}_w$)μμ$_0$]$_\pi$ –

Without extrinsic ordering

- Can the rule in (47) become a constraint?
- Yes! But it still derives counterbleeding.

(48) ITI Constraint
Count a violation for a phonological word without a high tone on the first mora that is preceded by a toneless word.

(49)

	[...] H $j_i a_j a_k$	DEP-H	MAX-V;	ITI	ASSOC-T	*.úμμμ.	*i.V	*.μμμμ.	MAX-μ
☞	a. $\acute{ı}_i a_j a_k$						* !		
✂	b. $já_j a_k$								*

Interim Assessment

Trade offs

- An analysis without extrinsically ordered rules requires outward sensitive allomorph selection, and prosodic structure.
- An analysis without outward sensitive allomorph selection either requires countercyclic phonology (Odden, 1996) or questionable extrinsically ordered rules (+ prosody).

Diverging predictions (Gleim, 2024)

- The combination of prosody and and Stratal OT can derive some apparent countercyclic interactions, such as (most instances of) countercyclic bleeding and feeding, if the cyclic domain aligns with a prosodic domain.
- It cannot derive transparent missaligned countercyclicity, where no adequate prosodic domain exists.
- It cannot derive (most) opaque countercyclic interactions.
- Serially ordered rules with prosody can derive all of these patterns.

Countercyclic Counterfeeding (CCCF)

P: iterative VH

(50) pʊtʊ-ku → putuku

Q: Non-itearive phrasal VH

(51) lʊtʊ mutʊ → lʊtu mutʊ

P counterfeeds Q

(52) lʊtʊ pʊtʊ-ku → lʊtʊ putuku

Extrinsically ordered rules can derive CCCF

(53) *Derivation of counteryclic counterfeeding*

Cycle φ_1	
pʊtʊku	Input
$[$pʊtʊku$]_{\pi}$	PROSODIFICATION
Cycle φ_2	
$[$lʊtʊ$]_{\pi}$ $[$pʊtʊku$]_{\pi}$	Input
$[[$lʊtʊ$]_{\pi}$ $[$pʊtʊku$]_{\pi}]_{\phi}$	PROSODIFICATION
—	VOWEL-HARMONY-ϕ
$[[$lʊtʊ$]_{\pi}$ $[$putuku$]_{\pi}]_{\phi}$	VOWEL-HARMONY-π
$[[$lʊtʊ$]_{\pi}$ $[$putuku$]_{\pi}]_{\phi}$	Output

Stratal OT + prosody cannot derive CCCF

(54) *Derivation of countercyclic counterfeeding fails*

		$[lʊtʊ]_ω[pʊtʊ\text{-}ku]_ω$	VH-ω	VH-φ	CRISP	EDGE	FAITH
	a.	$[lʊtʊ]_ω[pʊtʊku]_ω$	∗!				
	b.	$[lʊtʊ]_ω[putuku]_ω$		∗!			
☞	c.	$[lutu]_ω[putuku]_ω$				∗	∗∗∗∗
	d.	$[lʊtu]_ω[putuku]_ω$		∗!		∗	∗∗ ∗

Crosslinguistic pattern

(55) Countercyclic Interaction patterns

	PaC-OT	PaC-RB	Attested
Transparent interactions			
aligned	✓	✓	✓
misaligned	✗	✓	✗
Opaque interactions not derivable in OT			
aligned	✗	✓	✗
misaligned	✗	✓	✗
3-Level-opacity	✓	✓	✓

Conclusion

- The interaction of Gliding and ITI in Kimatuumbi is a problem for cyclic phonology.
- The assumption of prosodic structure is necessary to derive it cyclically.
- in addition, we need either:
  - The assumption thet ITI is outwardlooking phrasal allomorphy.
  - Powerful representation with extrinsically ordered rules.
- The data suggest that ITI is not a phonological process.
- If we adopt extrinsic rule ordering and prosody, virtually all countercyclic interaction patterns can be derived, whereas prosody and OT derives only an attested subset.

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