

## Main Claim

The existence of anticyclic mutation is unexpected given a standard paradigmatic account for non-concatenative morphology; a prediction explicitly formulated as the principle of 'Strict Base Mutation' (=SBM; Alderete, 2001a,b)

→ We show different types of anticyclic mutation and hence extend the typology of existing counterexamples to the SBM principle.

→ We argue that anticyclic mutation is expected under an analysis assuming that mutation is an epiphenomenon that follows from the **affixation of (non-segmental) phonological elements**.

## Mutation & Strict Base Mutation

### (1) Mutation: Non-concatenative morphology

- V Quality:** Bruder 'brother' ~ Brüder 'brothers' (German)
- C Quality:** dastah 'to dig' ~ nastah 'I dig' (Texistepec Popoluca)
- V Length:** gudù 'walk' ~ gudù: 'walking' (Hausa)
- C Length:** katai 'hard' ~ kat'ai 'hard!' (Shizuoka Japanese)
- Tone:** gwè 'swam' (Sg) ~ gwé 'swam' (Pl) (Ngbandi)

### (2) Mutation cum segmental affixation

- V Quality:** Buch 'book' ~ Büch-er 'books' (German)
- C Quality:** famar-ñe 'small' (C2) ~ pamar-o 'small' (C1) (Fula)
- V Length:** to 'take' ~ to:-ru 'take' (Pass.) (Tarahumara)
- C Length:** cam 'eat' (tr.) ~ cam:-o 'eat' (intr.) (Päri)
- Tone:** tādà 'boy' ~ tādà-wa 'boys' (Kanuri)

### (3) Theoretical accounts

	Cyclic	Non-cyclic
<b>Morphemic</b>	- Lexical Phonology (Kiparsky, 1982)	- Generalized Nonlinear Affixation (Wolf, 2007; Trommer and Zimmermann, 2014)
<b>Non-Morphemic</b>	- Word and Paradigm Morphology (Anderson, 1992) - Transderivational Antifaithfulness (Alderete, 2001b,a) - Realize Morpheme (Kurusu, 2001)	- Morphemes as constraints (Russel, 1995; Hammond, 2000)

Predicts only cyclic mutation:

[Prf<sub>2</sub>- [Prf<sub>1</sub>- [Stem] -Sfx<sub>1</sub>] -Sfx<sub>2</sub>]

Also predicts anticyclic mutation:

[Prf<sub>2</sub>- [Prf<sub>1</sub>- [Stem] -Sfx<sub>1</sub>] -Sfx<sub>2</sub>]

## Anticyclic Mutation

### Type I: Stem-Affix Mutation

Stem -Afx<sub>1</sub> -Afx<sub>2</sub>

#### ◆ Kpelle - Tone ◆

- 5 classes of nouns; class 2 and 5 have same surface tone pattern but affect following morpheme (affix/word) differently

#### (4) Plural formation in Kpelle (Konoshenko, 2008, 24)

CL.	BASE	PL	
1.	H.H	wúlú wúlú- <b>ɣàà</b>	'tree'
2.	L.L	yàlà yàlà- <b>ɣàà</b>	'lion'
3.	L.HL	ɣòwó ɣòwó- <b>ɣàà</b>	'axe'
4.	H.HL	yílè yílè- <b>ɣàà</b>	'dog'
5.	L.L	gbòndò gbòndò- <b>ɣàà</b>	'ring'

#### Analysis

- plural affix is underlyingly low: **gbòndò-ɣàà** (cl.5)
- final H of N spreads to this affix: wúlú-**ɣàà** (cl.1)
- final HL on N simplified via tone shift: yílè-**ɣàà** (cl.3+4)
- class 2 has a final floating H: **ɣyàlà-ɣàà**

#### ◆ Fula - Consonant Quality ◆

- consonants in 3 'grades'
- initial C of nouns determined by noun class and suffix-initial C determined by noun (5)

#### (5) Alternating noun class suffixes in Fula (Churma, 1988, 40)

	wor-	wa:-	hufine-	da:g
	'man'	'monkey'	'cap'	'sleeping mat'
	<b>stop</b>	<b>nasal</b>	<b>continuant</b>	<b>zero</b>
CLASS 3	gor-gel	ba:-ngel	kufine-jel	da:g-el
5	gor-gum	ba:-ngum	kufine-jum	da:g-um
7	ngor-ga	mba:-nga	kufine-wa	nda:g-a
8	ngor-go	mba:-ko	kufine-ho	nda:g-o

## Summary: anticyclic mutation patterns

	TYPE I	Type II
Tone	Kpelle Awa	Gã Gaahmg
C Quality	Fula Choguita Rarámuri	Chaha
V Quality	Chukchee Hungarian	
Length	Shoshone (&CQ)	Tamil
Stress	Modern Greek	

### Type II: Affix-Affix Mutation

Stem -Afx<sub>1</sub> -Afx<sub>2</sub>

#### ◆ Gã - Tone ◆

- Tense-Aspect is structurally inside of subject agreement (6)
- some TAM categories are only marked by tone (7), realized on the subject marker

#### (6) Inflection in Gã (Paster, 2000, 8)&(Paster, 2003, 32)

mí-n-cha 'I'm digging' e-baá-cha 'I will dig'  
1SG-**Prog**-dig 3SG-**Fut**-dig

#### (7) Tonal overwriting on AGR in Gã (Paster, 2003, 28-30)

	HABITUAL	PERFECTIVE	SIMPLE PAST
		<b>H-tone</b>	<b>L-tone</b>
1SG	mí-cha-a	mí-cha	mí-dú
2SG	o-cha-a	ó-cha	o-dú
	'dig'	'dig'	'cultivate'

#### ◆ Chaha - Consonant Quality ◆

- strong (~voiceless, hardened) and weak consonant series
- two forms for object markers: 'heavy' form after plural subject affixes, the 2.Sg.Fem, or the impersonal (9)

#### (8) Object marking in Chaha (Rose, 2007, 39)

	MALFACTIVE		BENEFACTIVE	
	LIGHT	HEAVY	LIGHT	HEAVY
1.SG	-β-i	-p-i	-n-i	-n-i
2.SG.F	-β-x <sup>j</sup>	-β-k <sup>j</sup>	-n-x <sup>j</sup>	-n-k <sup>j</sup>
3.SG.F	-β-a	-p-a	-r-a	-r-a
3.PL.F	-β-əma	-p-əma	-r-əma	-r-əma

#### (9) Object marking in Chaha: example (Rose, 2007, 40)

ji-rəxiβ-β-a ji-rəxiβ-o-p-a  
'he finds (sth) to her detriment' 'they find (sth) to her detriment'

## Alternation: type II & cyclic mutation

#### ◆ Tamil ◆

- intransitive formed by gemination the stem-final C (10-a) but if different allomorph for past tense marker -ndʒ surfaces, this is lengthened instead (10-b)

#### (10) Tamil (Sundaresan and McFadden, 2014, 2+3)

	TRANS.	INTR.
STEM PST		STEM PST
a.	a:gu a:(g-i)n- 'become'	a:k:u a:k:-in- 'make'
	u:du u:d-in- 'blow'	u:t:u u:t:-in- 'pour'
b.	oɖæ oɖæ-ndʒ- 'break'	oɖæ oɖæ-č:- 'break'
	vedʒi vedʒi-ndʒ- 'burst'	vedʒi vedʒi-č:- 'burst'

## Anticyclic mutation: affixation account

- all mutation and non-concatenative morphology is the **result of affixation** (Lieber, 1992; Bermúdez-Otero, 2012; Trommer and Zimmermann, 2014)
- a (nonlinear) morpheme may in principle affect the preceding or the following morpheme

#### (11) An affixation account for Gã

	H L H	*SPREAD RIGHT	τ ⇒ π	τ ⇒ π
	mi + + du			
a.	mi du		*	*!
b.	mi du		*	
c.	mi du	*!	*	

## No anticyclic mutation: Antifaithfulness

#### (12) An antifaithfulness account for T. Popoluca

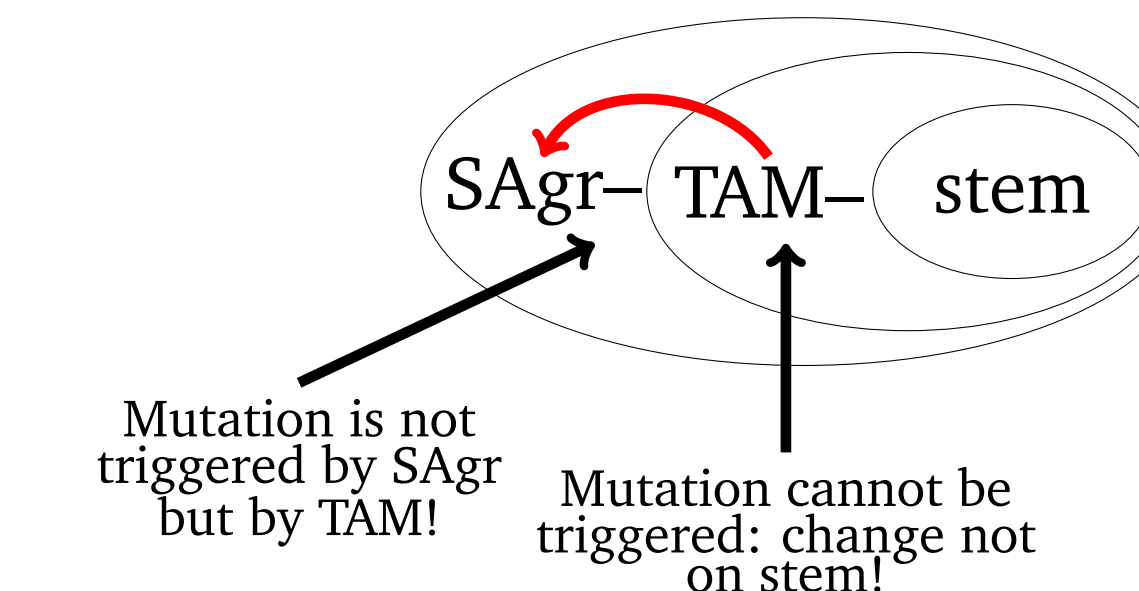
dastah + 1.SG	MAXS	-OO-IDENT	IDENT-NAS
		NAS[dastah]	
a. dastah		*!	
b. astah	*!	*!	
c. nastah			*

#### (13) Strict Base Mutation (Alderete, 2001b, 141)

Base	Derivative	-OO-FAITH	OO-FAITH
root	ROOT-af		*!
root	root-AF	*!	

(capitalization: change/mutation)

#### (14) Anticyclic mutation in Gã?



→ Only a mutation that **distinguishes a morphologically more complex word from a less complex base** can be demanded

## Appendix: Exocentric Mutation Data

### 1. Type I: Stem → Affix

#### 1.1. Chukchee: V Quality

→ Discussed in Wolf (2007) (citing Kenstowicz (1979)) as a counterexample to the SBM

- language employs [ATR] harmony with [-ATR] being the dominant feature
- some stems that are underlyingly vowel-less induce this dominant vowel feature on affix vowels (1-)
- (1-b) contrasts some vowel-less stems that do not induce the dominant [-ATR] on the affix-vowels

(1)	<i>Vowel-less stems and vowel harmony in Chukchee</i>				(Wolf, 2007, 51)
a.	təm-ək	'to kill'	ɣa-nm-ə-len	'he has killed'	
	təm-ək	'to say'	ɣa-tw-ə-len	'he has said'	
	rəw-ək	'to split'	ɣa-rw-ə-len	'he has split'	
b.	ɲət-ək	'to cut off'	ɣe-nt-ə-lin	'he has cut off'	
	rəɣ-ək	'to dig, scratch'	ɣe-rɣ-ə-lin	'he has dug, scratched'	

#### 1.2. Modern Greek: Stress

→ Discussed in Apoussidou (2003) as a counterexample to the SBM

- Modern Greek has not only pre-accenting suffixes but also post-accenting roots that generally assign stress to a following affix
- example (2-a) shows that default stress is on the antepenult if neither stem nor suffix are marked for any stress property
- in (2-b), the effect of a pre-accenting suffix (marked as -`X) can be seen, whereas (2-c) shows a post-accenting root (marked as X´-)
- example (2-d) only shows that if a pre-accenting suffix and a post-accenting root are combined, the stem-specification wins and the affix is stressed

(2)	<i>Pre-accenting affixes and post-accenting stems in Modern Greek</i>				(Apoussidou, 2003, 19)
a.	anθrop-os	ánθropos	'man'-NOM-SG		
b.	anθrop-´u	anθrópu	'man'-GEN-SG		
c.	uran´-os	uranós	'sky'-NOM-SG		
d.	uran´-´u	uranú	'sky'-GEN-SG		

#### 1.3. Kpelle: Tone

- tones: H, M, L, HL; TBU= $\sigma$
- 5 classes of nouns; class 2 and 5 have same surface tone pattern but affect following morpheme (affix/word) differently

(3)	<i>Plural formation in Kpelle</i>				(Konoshenko, 2008, 24)
Cl.	BASE	PL			
1.	H.H	wúlú	wúlú-ɣáà	'tree'	
2.	L.L	yàlà	yàlà-ɣáà	'lion'	
3.	L.HL	yòwò	yòwò-ɣàà	'axe'	
4.	H.HL	yílê	yílê-ɣàà	'dog'	
5.	L.L	gbònò	gbònò-ɣàà	'ring'	

#### 1.4. Awa: Tone

- apparently different classes of noun suffixes that surface with different tone patterns (4), can be summarized as in (5)
- McPherson (2014) argues that this can be reanalysed without arbitrary classes assuming:
  - L-spreading rule across morpheme boundaries
  - floating L-tones for some H-final nouns
  - additional phonological constraints (e.g. no non-final rises)

(4)	<i>Noun suffix allomorphy in Awa</i>				(McPherson, 2014, 12)
a.	póétáhq-pò	pig-Q	'Is it a pig?'		
	náh-pò	taro-Q	'Is it a taro?'		
b.	póétáhq-mé	pig-ID	'the pig'		
	áyátá-mé	hair-ID	'the hair'		

#### 1.5. Fula: C Quality

- consonants in 3 'grades' (some (m, n, ɲ, ...) never alternate) (Churma, 1988; Paradis, 1992)
- initial C on nouns determined by noun class, i.e. by suffix which marks noun class
- suffix-initial C's show same alternation and in this case it idiosyncratically depends on noun (5)

(5)	<i>Alternating noun class suffixes in Fula</i>				(Churma, 1988, 40)
		wor-	wa:-	hufine-	da:g
		'man'	'monkey'	'cap'	'sleeping mat'
		<b>stop</b>	<b>nasal</b>	<b>continuant</b>	<b>zero</b>
CLASS	3	gor-gel	ba:-ngel	kufine-jel	da:g-el
	5	gor-gum	ba:-ngum	kufine-jum	da:g-um
	7	ngor-ga	mba:-nga	kufine-wa	nda:g-a
	8	ngor-go	mba:-ko	kufine-ho	nda:g-o

#### 1.6. Shoshoni: C Quality/Length

- Numic languages are well-known for their so-called final features that trigger a three/four-way gradation on a following consonant: nasalization, gemination, spirantization, and aspiration for some (Central Numic, e.g. Timbisha, Shoshoni, and Comanche; Miller et al., 2005)
- in Shoshoni, every stem ends in one of four segments: a vowel (=spirantization), 'n' (=nasalization), 'h' (=aspiration), or 'ʷ' (=gemination) (McLaughlin, 2012, 10)

(6)	<i>Final features in Shoshoni</i>				(McLaughlin, 2012, 10)
a.	<i>V-final stem</i>				
	kam:u-pa?a	kam:uβa?a	'on the jackrabbit'		
	kam:u-ma?ai	kam:uʷa?ai	'with the jackrabbit'		
b.	<i>n-final stem</i>				
	piyin-pa?an	piyimba?a	'on the duck'		
	piyin-ma?ai	piyim:a?ai	'with the duck'		
c.	<i>?-final stem</i>				
	haih-pa?an	hai?a?a	'on the crow'		
	haih-ma?ai	haihʷa?ai	'with the crow'		
d.	<i>Gemination</i>				
	tua"-pa?an	tuap:a?a	'on the son'		
	tua"-ma?ai	tuam:a?ai	'with the son'		

1.7. **Choguita Rarámuri: C Quality**

- at least three suffixes alternate; an apparent idiosyncratic behaviour that depends on stem
- has been proposed that this is historically a remnant of a fortis/lenis system whose alternation can still be seen in Numic (Caballero, 2008, 45)
- initial C of future suffix is either voiced or voiceless, depending on the preceding stem and no phonological context (7)

(7) *Voicing alternation for plural suffixes* (Caballero, 2008, 46)

- a. wítjǒ-**bo** 'wash (clothes)'  
 newá-**bo** 'make'-Fut:Pl  
 wí-**bo** 'harvest'-Fut:Pl  
 b. pakó-**po** 'wash (dishes)'-Fut:Pl  
 nará-**po** 'cry'-Fut:Pl  
 tetfí-**po** 'comb'-Fut:Pl

- initial C of causative and potential suffix alternate as well: /t/ ~ /t/

(8) *Stop-flap alternation in potential and causative suffixes* (Caballero, 2008, 47)

- a. mahá-**ra** 'scare'-Pot  
 koʔá-**ri**-a 'eat'-Caus-Prog  
 b. tú-**ta** 'bring'-Pot  
 napá-**ti**-ma 'hug'-Caus-Fut

1.8. **Hungarian: V Quality**

- so-called [+shortening] stems show three idiosyncratic behaviours: 1) their final V is shortened preceding a class I suffix; 2) an otherwise mid suffix vowel is lowered; and 3) a phonotactically unmotivated V is introduced (9-a)
- lowering-stems also require a low vowel and introduce a phonotactically unmotivated vowel (9-b)
- examples (9-c) show corresponding non-shortening/-lowering stems where the expected surface form of the plural suffix can be seen

(9) *Stems triggering lowering in Hungarian* (Abrusan, 2005, 1+2)

		Acc. (-t)	Pl. (-Vk)
a.	<i>Shortening stem</i>		
	nyar	'summer' nyar- <b>a</b> -t	nyar- <b>ak</b>
	madar	'bird' madar- <b>a</b> -t	mnadar- <b>ak</b>
b.	<i>Lowering stem</i>		
	haz	'house' haz- <b>a</b> -t	haz- <b>ak</b>
	fog	'tooth' fog- <b>a</b> -t	fog- <b>ak</b>
c.	<i>Non-shortening/lowering stem</i>		
	pa:r	'pain' pa:r- <b>t</b>	pa:r- <b>ok</b>
	tana:r	'teacher' tana:r- <b>t</b>	tana:r- <b>ok</b>
	jog	'law' jog- <b>o</b> -t	jog- <b>ok</b>

2. **Type II: Affix<sub>1</sub> → Affix<sub>2</sub>**

2.1. **Gā: Tone**

- H and L, contours on long vowels
- downstep that is best analysed as floating L before an H
- multiple morphological tones (H and L, realized in different positions with respect to their base)
- Tense-Aspect is structurally inside of subject agreement, cf. (10)
- there are also TAM categories that are only marked by tone (11)– and those overwrite the tone on the subject marker, not the tone of the stem

(10) *TAM marking in Gā* (Paster, 2003, 32) and (Paster, 2000, 8)

mí-n-cha	'1m digging'	mí-cha-a	'1 dig habitually'
1SG-PROG-dig		1SG-dig-HAB	
e-baá-cha	'I will dig'	é-!lá	'he has sung'
3SG-FUT-dig		3SG-PERF-sing	

(11) *TAM marking in Gā* (Paster, 2003, 28-30)

	HABITUAL (Underlying H/L-Tone)	PERFECTIVE (Grammatical H)	SIMPLE PAST (Grammatical L)
1SG	mí-cha-a	mí-cha	mí-dú
2SG	o-cha-a	ó-cha	o-dú
	('dig')	('dig')	('cultivate')

2.2. **Gaahmg: Tone**

- aspectual affixes: /-sA/ for completive and /-An/ for continuative
- the latter has different forms in past and non-past that follow from assuming that the continuative has an underlying H-tone and the past affix consist of a floating M-tone that is realized on the /-An/ (12)
- only surface forms that remain mysterious given the regular phonological (tone) rules of the language are the tones following an L-toned stem

- we expect /L.LH/ in the past (L+M → L.L) instead of L.H
- we expect /L.M/ in the non-past (L+H → L.M) instead of L.LM

(12) *Past and non-past continuative forms* (Stirtz, 2011, 51)

Root tone	CONT.PST		CONT.NPST		
H	kómá 'n	H.MH	kómán	H.H	'cut, chop'
L	gáfán	L.H	gáfá 'n	L.LM	'give'
MH	kē 'dē 'n	MH.MH	kē 'dén	MH.H	'strike'

2.3. **Chaha: C Quality**

- an instance of root and pattern morphology: stem shape/vowels correspond to aspectual/tense meaning
- important part of stem 'shape' is the presence/position of mutated consonants: there are two series of consonants, a 'weak' and a 'strong' (~voiceless, hardened)
- order of affixes on verbs as in (13)

- object markers in (13) can be subsegmented into a consonantal part marking the case and a remainder marking the person/number
- the object suffixes surface in one of two versions, the choice being dependent on the preceding subject marking: 'heavy' form used following verbs with plural subject affixes, the 2.Sg.Fem, or the impersonal (Rose, 2007, 38)

(13) *Object marking in Chaha (Rose, 2007, 39)*

	MALFACTIVE		BENEFACTIVE	
	LIGHT	HEAVY	LIGHT	HEAVY
1.Sg	-β-i	-p-i	-n-i	-n-i
1.Pl	-β-ndə	-p-ndə	-n-ndə	-n-ndə
2.Sg.F	-β-xʰ	-β-kʰ	-n-xʰ	-n-kʰ
2.Pl.F	-β-xma	-β-kma	-n-xma	-n-kma
3.Sg.F	-β-a	-p-a	-r-a	-r-a
3.Pl.F	-β-əma	-p-əma	-r-əma	-r-əma

(14) *Object marking in Chaha: example* (Rose, 2007, 40)

ji-rəxiβ-β-a	ji-rəxiβ-o-p-a
S3-'find'-MAL-O3SgF-TnsS	S3-'find'-MAL-S3Pl-O3SgF-Tns
'he finds (sth) to her detriment'	'they find (sth) to her detriment'

(Wolf (2007) cites Chaha as another counterexample to the SBM but refers to another morphological context (labialisation of the root final consonant in 3.Ps.Sg and impersonal contexts) and we are not sure how the data he refers to very briefly is a problem for the SBM)

2.4. Tamil: C Length

- distinction between transitive and intransitive verbs in Tamil involves gemination (Schiffmann, 1999; Sundaresan and McFadden, 2014)
- intransitivization in (15-a) involves gemination of the stem-final consonant and the allomorph /in/ as past tense marker
- intransitivization in (15-b) involves a different allomorph for the past tense /ndʒ/ and gemination of this past tense suffix and not a stem consonant (gemination always affects the first suffix directly adjacent to the stem (aspect or tense), not only the past tense suffix)
- the orthographic /u/ that is final in the bare stems in (15) is taken to be epenthetic
- there are no voiced geminates and no geminated /r/ in Tamil, gemination hence involves devoicing for some sounds and change of /r/ to /dd/ (↔ one of the arguments that the intransitive is formed via gemination and not the transitive via degemination)

(15) *Gemination in Tamil* (Sundaresan and McFadden, 2014, 2+3)

	TRANS.			INTR.		
	stem	Pst		stem	Pst	
a.	aagu	aa(g-i)n-	'become'	aakku	aakk-in-	'make'
	uudu	uud-in-	'blow'	uuttu	uutt-in-	'pour'
	tirumbu	tirumb-in-	'return'	tiruppu	tirupp-in-	'return'
	suruŋgu	suruŋg-in-	'shrink'	surukku	surukk-in-	'shrink'
	uuru	uur-in-	'ooze'	uuttu	utt-in-	'pour'
b.	oɖæ	oɖæ-ndʒ-	'break'	oɖæ	oɖæ-čč-	'break'
	veɖi	veɖi-ndʒ-	'burst'	veɖi	veɖi-čč-	'burst'
	va ar	va ar-nd-	'grow'	va ar	va ar-tt-	'grow'

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