



Contrast, harmony, and feature emergence in a templatic approach to vowels

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Joaquim Brandão De Carvalho, Noam Faust. Contrast, harmony, and feature emergence in a templatic approach to vowels. 17ème colloque du Réseau Français de Phonologie, Université d'Orléans, 2019, Orléans, France. <hal-04396169>

HAL Id: hal-04396169

<https://hal.science/hal-04396169v1>

Submitted on 15 Jan 2024

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Appendix A: Tigre aperture harmony

	a. 'write', PERF		b. IMP
1 SG	kətəb-ko	2 MSG	ktəb
PL	katab-na	FSG	ktəb-i
2 MSG	katab-ka	MPL	ktəb-o
FSG	kətəb-ki	FPL	ktab-a
MPL	kətəb-kom		
FPL	kətəb-kin		
3 MSG	katba		
FSG	kətb-ət		
MPL	kətb-əw		
FPL	katb-aya		

Appendix B: Chichewa aperture harmony

		<i>Causative</i>	<i>Applicative</i>	
a.	pind-a	pind-its-a	pind-il-a	'bend'
	put-a	put-its-a	put-il-a	'provoke'
b.	lemb-a	lemb-ets-a	lemb-el-a	'write'
	konz-a	konz-ets-a	konz-el-a	'correct'
c.	bal-a	bal-its-a	bal-il-a	'give birth'
	kaṅgaz-a	kaṅgaz-its-a	kaṅgaz-il-a	'hurry up'

Appendix C: Pasiego Spanish raising harmony

a.	bebér	'drink'	koxér	'take'	INF
	bebémus		koxémus		1PL.PRES.INDIC
	beberé		koxeré		1SG.FUT
b.	bibí:s		kuxí:s		2PL.PRES.INDIC
	bibía		kuxía		1SG.IMPERF.INDIC
	bibiría		kuxiría		1SG.COND

Appendix D: Color harmony in Samhar Tigre

	a. 'write', PERF		b. IMP
1 SG	kətəb-ko ~ koṭəb-ko	2 MSG	ktəb
PL	katab-na	FSG	ktəb-i
2 MSG	katab-ka	MPL	ktəb- o ~ koṭəb-o
FSG	kətəb-ki	FPL	ktab-a
MPL	kətəb-kom ~ koṭəb-kom		
FPL	kətəb-kin		
3 MSG	katba		
FSG	kətb-ət		
MPL	kətb-əw ~ koṭb-ow		
FPL	katb-aya		

Appendix E: Epenthetic vowel and harmony in the imperative paradigm of [tərgim] 'translate'

a. MSG	tərgim
b. FSG	tərgim-i
c. MPL	tərgim-o ~ tərgum- o ~ tərgum-o
d. FPL	tərgim-a, * tərgim-a

Appendix F: Maasai ATR harmony

a. Non-ATR roots, non-ATR affixes

/ε-ɪ-ŋɔl/	[εɪŋɔl]	3SG.PRES	'stir'
/ɪ-ɪ-dɔr-ɔ/	[ɪdɔrɔ]	2SG.PRES.DIR	'move this way'
/kɪ-dɛtɪdɛt/	[kɪdɛtɪdɛt]	2PL.PRES	'dream'
/kɪ-rɪp-ɪʃɔ/	[kɪrɪpɪʃɔ]	1PL.PRES.INTR	'sew'
/nɛ-mɪ-rɪp/	[nɛmɪrɪp]	2SG.NEG.FUT	'sew'
/ε-nɔk-ɪʃɔ/	[ɛnɔkɪʃɔ]	3SG.PRES.INTR	'cover'

b. ATR roots

/ε-ɪ-bok/	[eibok]	3SG.PRES	'hinder'
/ɪ-ɪ-rik-ɔ/	[iriku]	2SG.PRES.DIR	'guide this way'
/kɪ-ken/	[kiken]	2PL.PRES	'shut'
/kɪ-pon-ɪʃɔ/	[kiponɪʃɔ]	2PL.PRES.INTR	'cut the ears of an animal'
/nɛ-mɪ-duŋ/	[nemiduŋ]	2SG.NEG.FUT	'cut'
/ε-irrug-ɪʃɔ/	[eirrugɪʃɔ]	3SG.PRES.INTRANS	'bend something down'

Appendix G: Opaque low vowel in Maasai

a. /a-ɪ-bok/	[aibok]	1SG.PRES	'hinder'
b. /a-rik-ɔ/	[ariku]	1SG.PRES.DIR	'guide this way'
c. /nɛ-ma-ɪ-puk/	[nɛmaipuk]	1SG.NEG.FUT	'flee'
d. /nɛ-ma-pon-ɪe/	[nɛmaɸonɪe]	1SG.NEG.FUT.CAUS	'cut the ears of an animal'
e. /kɪ-ta-ked-a/	[kitakedo]	2PL.PST	'climb'
f. /ɪ-ta-duŋ-a/	[ɪtaduŋo]	2SG.PST	'cut'

Contrast, harmony, and feature emergence in a templatic approach to vowels

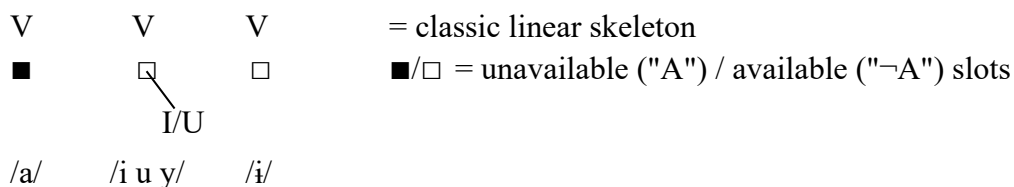
Joaquim Brandão de Carvalho & Noam Faust
Université Paris 8 / UMR 7023 SFL

- (1) Unarist theories of phonological primes face two difficulties:
 - a. many generalizations regarding high vowels require a missing non-A element;
 - b. why (A.I) and (A.U) (/e, o/) combinations are less marked than (I.U) (/y/)?
- (2) Our proposal solves these problems, and also:
 - a. provides a typology of contrast inventories and of aperture and ATR harmonies;
 - b. shows why and how certain features – in particular those that are sonority-related – should be changed into, and emerge from, structure (Pöchtrager 2006, Carvalho 2017).¹
- (3) a. Vocalic expressions are templates composed of two basic primes:
 - unavailable slots (■)
 - and available slots (□).
 - b. Only the latter may harbor the melodic privative "color" primes I/U.
 - c. The templatic ■/□ opposition expresses the "A/non-A" distinction; it does involve a binary contrast, but crucially it is not a melodic one.
 - d. The contrastive inventory of vowels, and height behaviour in a language follow from the setting of two parameters.
- (4) 1st parameter: What is the maximal size of vowel templates?

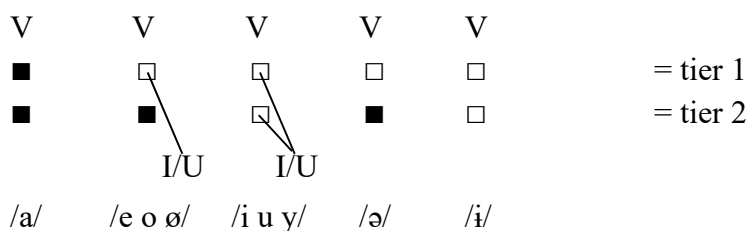
Languages with 3 vowels exhibit only one slot (a): ■ is realized [a] and □ [u] or [i], depending on the color associated with it.

Languages with 3 vowel heights exhibit two slots (b, c), etc. (cf. Schane 1984)

a. One-slot vocalic system:



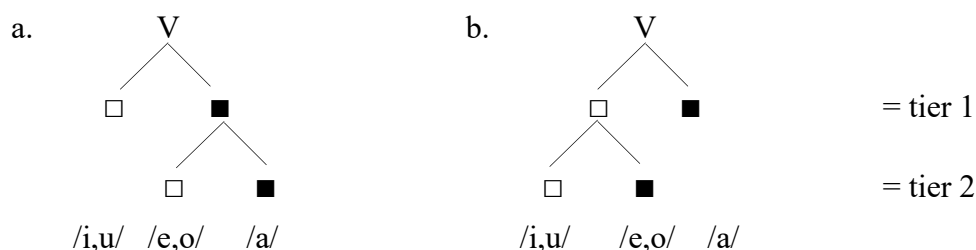
b. Two-slot vocalic system:



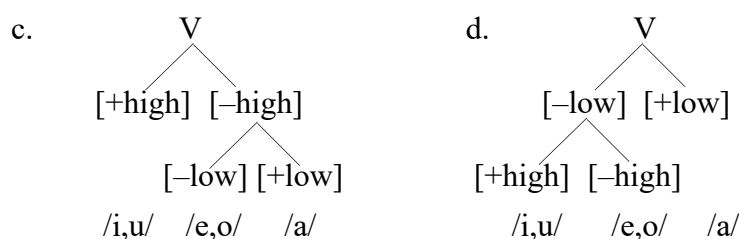
¹ Feature-based solutions to (1a,b) have been proposed through Kaye, Lowenstamm & Vergnaud's (1985) notion of "charm", and van der Hulst's (2005, 2012b) Radical CV Phonology.

(5) 2nd parameter: What is the structure of vowel templates?

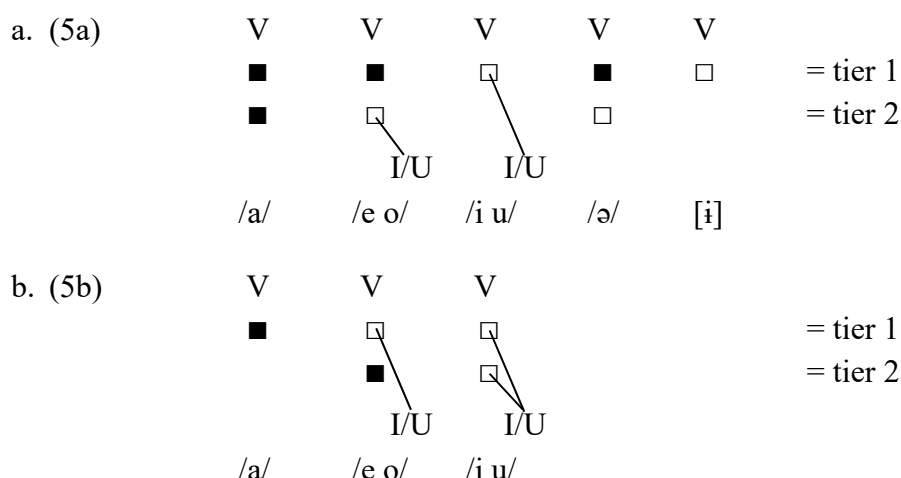
Vowel templates are based on binary hierarchies. Two possible height hierarchies according to whether the "branching" slot is ■ or □:²



This parameter is in line with Dresher's (2009) contrastive hierarchies manifesting different rankings of the [±high] and [±low] features within a binarist framework:



(6) The vocalic systems associated to (5a) and (5b) hierarchies:



(7) Let us illustrate this choice through different cases of Aperture Harmony (AH).³

a. AH is alignment of slot type on a given tier obeying two principles:

b. *Template preservation principle (TPP):*

All processes affecting vowel templates are size- and structure-preserving.

c. *Color preservation principle (CPP):*

All processes affecting vowel templates are color-preserving.

² Both slots can also branch, whence a symmetric system, but this case will be left aside here.

³ Evidence concerning vowel harmony comes mainly from Polgárdi (1998), van der Hulst (2012a), and, for ATR harmonies, from Casali (2003, 2008).

- (8) a. Tigre (Palmer 1956, Raz 1983, Lowenstamm & Prunet 1988, Faust 2017)

Inventory: /a i u o e ə/ plus an epenthetic vowel [ɨ]

AH: /ə/ → [a] / _a (See data in App. A.)

- b. Chichewa (Mtenje 1985)

Inventory: /a i u o e/

AH: /i, u/ → [e, o] / e, o_ (See data in App. B.)

- c. Pasiego Spanish (Penny 1969, McCarthy 1984, Vago 1988)

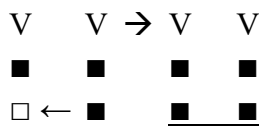
Inventory: /a i u o e/

AH: /e, o/ → [i, u] / í, ú_ (See data in App. C.)

- (9) Both Tigre and Chichewa favor ■-alignment on T₂, hence lowering.

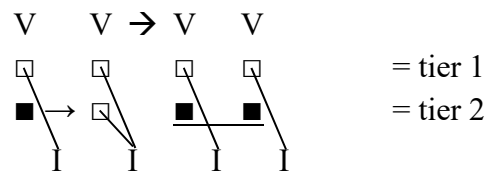
However, as Tigre exhibits the hierarchy in (5a), and Chichewa the one in (5b), lowering involves different targets and triggers.

- a. Tigre



/ə ... a/ → [a ... a]

- b. Chichewa

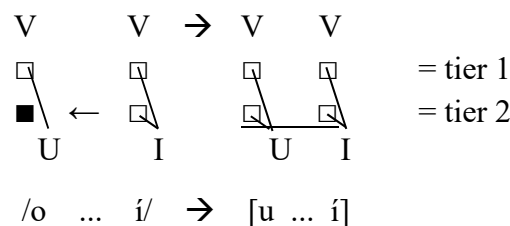


/e ... i/ → [e ... e]

- (10) Both Chichewa and Pasiego Spanish exhibit the hierarchy in (5b).

However, whereas Chichewa shows ■-alignment on T₂, hence lowering, Pasiego Spanish harmony involves □-alignment, hence raising.

Pasiego Spanish Raising harmony



/o ... í/ → [u ... í]

- (11) Due to the TPP,

- none of the /i u/ → [e o] and /e o/ → [i u] harmonies is possible in (5a) structures, since neither (□₁, ■₂) nor (□₁, □₂) are possible templates;
- a mid vowel cannot become low (as in Tigre) – nor can a low vowel change into a mid vowel – in (5b) structures, since neither (■₁, □₂) nor (■₁, ■₂) are possible templates.

(12) Due to the CPP,

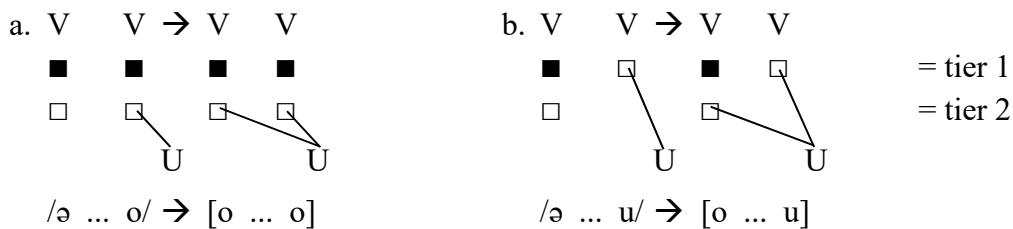
- a. □ is "copied" from the trigger without its color in Pasiego Spanish, and takes on the target's color (if there is any);
- b. no other mid vowel than /ə/ is affected by AH in Tigre, since ■-alignment would have eliminated color-bearing slots.

(13) Color Harmony (CH) is different from AH.

(Optional) CH in Tigre: /ə/ → [o] / _u, o (See data in App. D.)

CH cannot be alignment, as color is not situated on any specific tier.

CH is association of a color element to a previously unassociated, available slot as in (b).



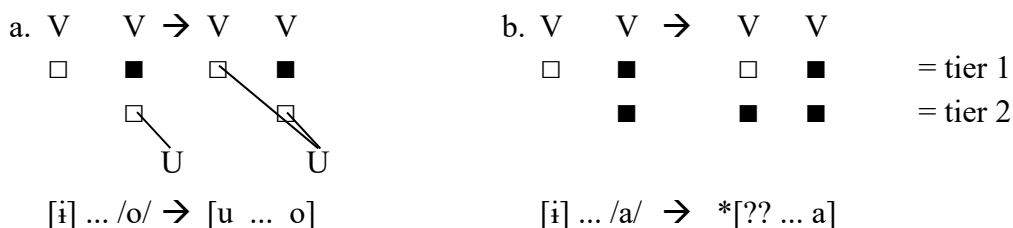
It is therefore predicted that CH, unlike AH, need not respect tier locality.

(14) This distinction is reflected in the different scopes of AH and CH in Tigre:

- the epenthetic vowel [i] is affected by CH, but not by AH: see (c,d) in App. E;
- AH never applies across epenthetic vowels: see (d) in App. E.

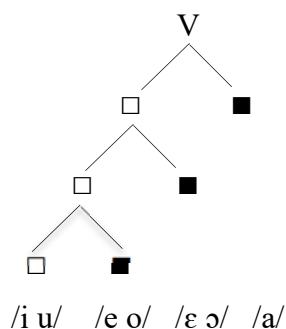
[i] has only one □-slot in Tigre: cf. (6a). If ■-alignment were to take place, the result would imply an impossible structure, violating TPP: *(□₁, ■₂).

Being neutral, [i] blocks AH.

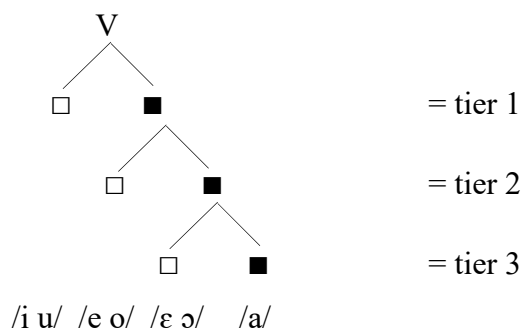


(15) More complex systems may involve an additional tier, like 4-height systems in (a,b):

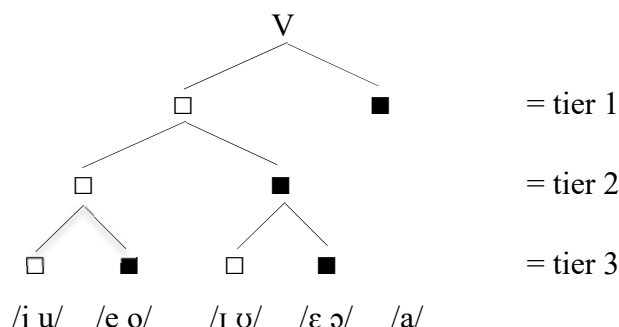
a. Italian



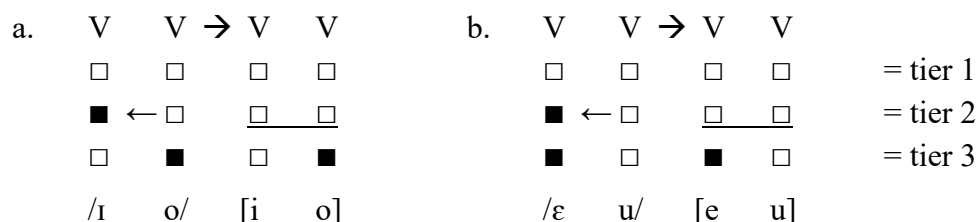
b. European Portuguese



- (16) They may also require symmetry, i.e. augmentation of both slot types, as in the 9-vowel system of Maasai:



- (17) Maasai ATR harmony (Quinn-Wriedt 2013; see App. F) involves the same operation as AH: □-alignment, as in Pasiego Spanish. It simply occurs on tier 2, not on the terminal tier:



Thus, in both AH and ATR harmonies, □ is "copied" from the trigger without its color, and takes on the target's color (if there is any).

- (18) a. In such a system, [+ATR] is the "dominant" feature, and /a/ is neutral: it is [−ATR] by default, and lacks a [+ATR] counterpart. It is the only exception to the generalization that there are no words with mixed ATR values in Maasai (see App. G).
- b. The identity of the neutral vowel, and of the dominant feature accordingly, is predicted by the hierarchy in (16). As /a/ lacks the tier where harmony takes place, if it received a □-slot on tier 2, the TPP would be violated: no $\ast(\blacksquare_1, \square_2)$ template is allowed! The reason for /a/ neutrality is thus the same as the one that explains [i] opacity *vis-à-vis* AH in Tigre (cf. §2.2).⁴
- (19) It can be shown that there exist languages exhibiting a mirror image of the hierarchy in (16), like Wolof (Pulleyblank 1996), with [−ATR] harmony, i.e. ■-alignment on tier 2, and neutral /i/. Thus, Wolof is to Maasai as Tigre is to Chichewa.

- (20) Conclusions:

- a. On markedness: markedness is built-in into our proposal.

A system is marked if it makes excessive use of branching, if templates remain uncolored (or if they use two color elements).

⁴ /a/ is also opaque: not only does it fail to participate in the harmony process, it also blocks ATR spreading (cf. App. G, Quinn-Wriedt 2013: 8). In fact, languages diverge as to whether the neutral vowel is opaque, as in Maasai, or transparent with respect to ATR harmony, as in Kinande (Bakley 1998). Both possibilities are allowed by our proposal according to whether or not locality outranks alignment in the harmonic constraint hierarchy.

- b. On "emergent features" (Mielke 2004): converting features into structure makes them emergent.

Height and ATR features are emergent insofar as they are just the labels associated to the different tiers of a given structure: □ in T₂ is "[–low]" in (5a), "[+high]" in (5b), and "[+ATR]" in (16).

This could be the case for all sonority-related putative features such as [consonantal], [sonorant] or [continuant].

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