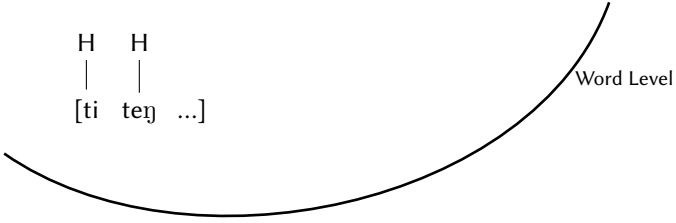
Getting stronger or weaker at every stratum: A new approach to tonal morphophonology

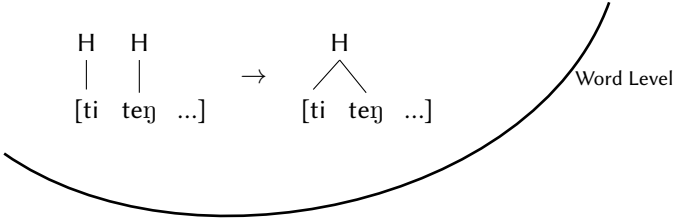
Jochen Trommer & Eva Zimmermann

mfm
May 26, 2021

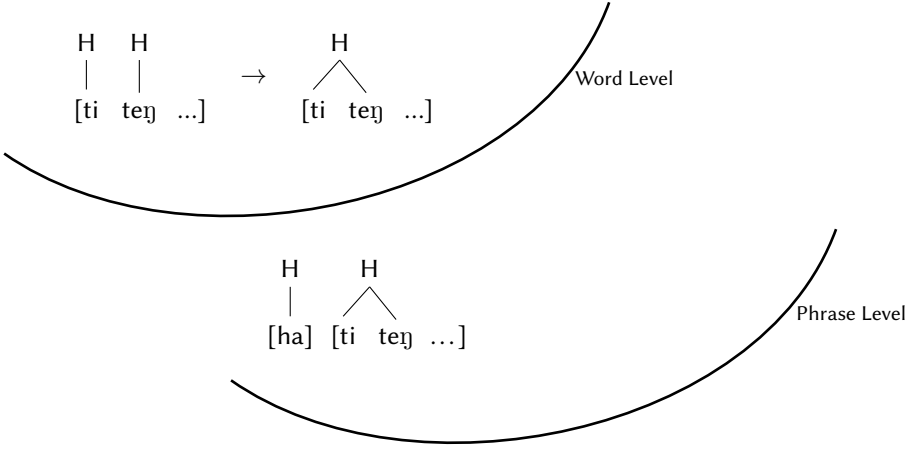
An example for inter-stratal conspiracies: OCP-resolutions in Shona (Myers, 1997)



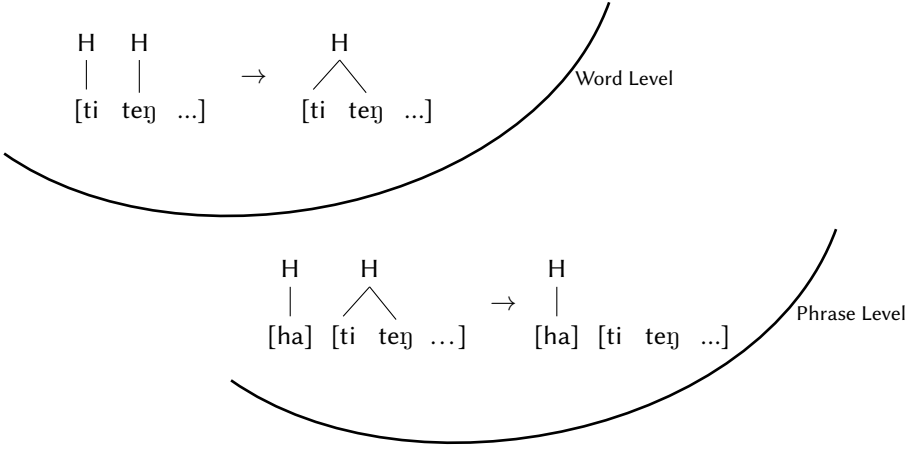
An example for inter-stratal conspiracies: OCP-resolutions in Shona (Myers, 1997)



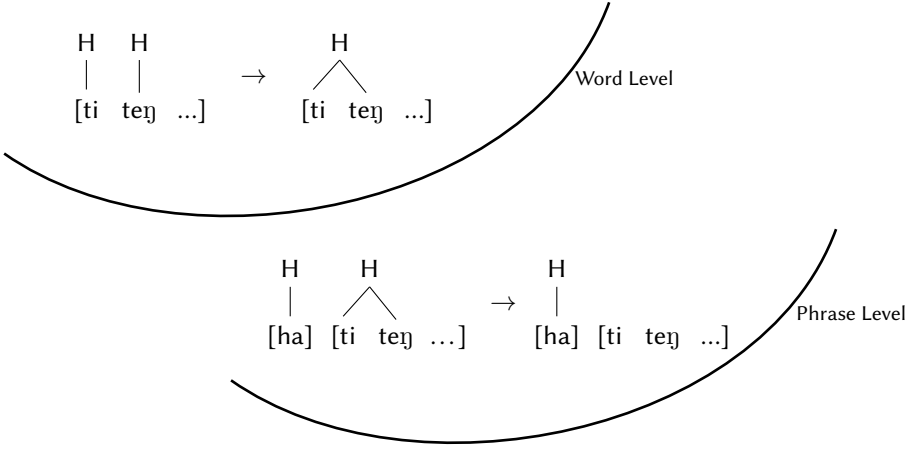
An example for inter-stratal conspiracies: OCP-resolutions in Shona (Myers, 1997)



An example for inter-stratal conspiracies: OCP-resolutions in Shona (Myers, 1997)



An example for inter-stratal conspiracies: OCP-resolutions in Shona (Myers, 1997)



→ same marked structure resolved differently in different morphological contexts

The novel theory of Harmonic Layer Theory (HLT)

- different phonological behaviour resulting from a **single phonological grammar**:

The novel theory of Harmonic Layer Theory (HLT)

→ different phonological behaviour resulting from a **single phonological grammar**:

- linguistics elements have **gradient activity** that results in gradient constraint violations
  (=Gradient Symbolic Representations; Smolensky and Goldrick, 2016; Rosen, 2016a; Zimmermann, 2019)

The novel theory of Harmonic Layer Theory (HLT)

→ different phonological behaviour resulting from a **single phonological grammar**:

- linguistics elements have **gradient activity** that results in gradient constraint violations
  (=Gradient Symbolic Representations; Smolensky and Goldrick, 2016; Rosen, 2016a; Zimmermann, 2019)

- a stratal model (Kiparsky, 2015; Bermúdez-Otero, 2018; Trommer, 2011)
  where tones can **get stronger or weaker in every stratum** and the 'same' tone can react differently to identical tonotactic problems in larger domains since it has different activity

Shona in HLT: Activity adjustment

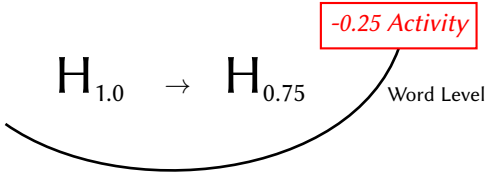
- constraint interaction ensures that all **H-tones decay** at every stratum

$$H_{1.0} \rightarrow H_{0.75}$$

$$H_{0.75} \rightarrow H_{0.5}$$

Shona in HLT: Activity adjustment

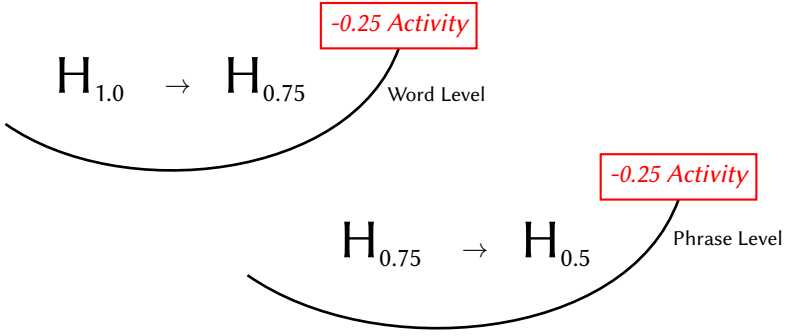
- constraint interaction ensures that all **H-tones decay** at every stratum



$$H_{0.75} \rightarrow H_{0.5}$$

Shona in HLT: Activity adjustment

- constraint interaction ensures that all **H-tones decay** at every stratum



Shona in HLT: Different activities = different OCP solutions

Input: = $H_{1.0}$ $H_{1.0}$	OCP w=100	Max w=11	Unif w=10	$\mathcal{H}$
a. $H_{0.75}$		-1.0		-11
☞ b. ($H_{0.75}$ $H_{0.75}$)			-1.0	-10
c. $H_{0.75}$ $H_{0.75}$	-1.0			-100.0

-0.25 Activity

Word Level

Shona in HLT: Different activities = different OCP solutions

Input: = $H_{1.0}$ $H_{1.0}$	OCP w=100	Max w=11	Unif w=10	$\mathcal{H}$
a. $H_{0.75}$		-1.0		-11
☞ b. ($H_{0.75}$ $H_{0.75}$)			-1.0	-10
c. $H_{0.75}$ $H_{0.75}$	-1.0			-100.0

-0.25 Activity

Word Level

Input: = $H_{0.75}$ $H_{0.75}$	OCP w=100	Max w=11	Unif w=10	$\mathcal{H}$
☞ a. $H_{0.5}$		-0.75		-8.25
b. ($H_{0.5}$ $H_{0.5}$)			-1.0	-10.0
c. $H_{0.5}$ $H_{0.5}$	-1.0			-100.0

-0.25 Activity

Phrase Level

Shona in HLT: Different activities = different OCP solutions

Input: = $H_{1.0}$ $H_{1.0}$	OCP w=100	Max w=11	Unif w=10	$\mathcal{H}$
a. $H_{0.75}$		-1.0		-11
☞ b. ($H_{0.75}$ $H_{0.75}$)			-1.0	-10
c. $H_{0.75}$ $H_{0.75}$	-1.0			-100.0

-0.25 Activity

Word Level

Input: = $H_{0.75}$ $H_{0.75}$	OCP w=100	Max w=11	Unif w=10	$\mathcal{H}$
☞ a. $H_{0.5}$		-0.75		-8.25
b. ($H_{0.5}$ $H_{0.5}$)			-1.0	-10.0
c. $H_{0.5}$ $H_{0.5}$	-1.0			-100.0

-0.25 Activity

Phrase Level

Summary

Harmonic Layer Theory where tones can get incrementally stronger/weaker at every optimization cycle

Summary

Harmonic Layer Theory where tones can get incrementally stronger/weaker at every optimization cycle

- can **solve persistent problems** for optimization and cyclicity within tonal morphophonology:
  - E1 global rules and strata straddling (Hyman, 1993)
  - E2 inter-stratal conspiracies (Myers, 1991, 1997)
  - E3 competition of overwriting patterns (Hyman, 2013)
  - E4 tonal attraction phenomena

Summary

Harmonic Layer Theory where tones can get incrementally stronger/weaker at every optimization cycle

- can **solve persistent problems** for optimization and cyclicity within tonal morphophonology:
  - E1 global rules and strata straddling (Hyman, 1993)
  - E2 inter-stratal conspiracies (Myers, 1991, 1997)
  - E3 competition of overwriting patterns (Hyman, 2013)
  - E4 tonal attraction phenomena

- makes testable empirical predictions:
  - P1 **Monotonicity** of phonological changes across strata
  - P2 **Consistency** of strength in a given stratum
  - P3 Pervasiveness (and cyclicity) of **Cooperation**

Appendix

mfm
May 26, 2021

P1: Monotonicity

Representations become monotonically stronger or weaker
+ single constant grammar
= monotonicity of phonological behaviour

(1) Monotonicity of thresholds for phonological behavior in HLT

T_x ➞ Phonological behavior 1

Weaker: Threshold 1

$T_{x\text{-}y}$ ➞ Phonological behavior 2

Weaker: Threshold 2

$T_{x\text{-}y\text{-}z}$ ➞ Phonological behavior 3

(2) vs. stratum-specific rankings

Stem Level:	MaxH	≫	OCP
Word Level:	OCP	≫	MaxH
Phrase Level:	MaxH	≫	OCP

P2: Consistency of strength

Different repairs for elements must be contingent with their input strength since constraint weighting remains constant

(3) Consistency-obeying: Giphende Nominal Morphology

Citation Form:	a. L-LL	b. L-LH	c. L-HL	d. L-HH
Focus:	H-HL	L-LH	L-HL	L-HH
Genitive:	H-HL	H-LH	L-HL	L-HH
Predicative:	H-HL	H-LH	H-HL	H-HH

(4) Consistency-violating: Construction-specific rankings

		H]$_{\text{PrWd}}$	**H**H
Construction 1	$M_1 \gg F \gg M_2$	Deletion	No deletion
Construction 2	$M_2 \gg F \gg M_1$	No Deletion	Deletion

P3: Pervasiveness of Cooperation

Multilateral conditioning of morphophonological processes: Fused phonological material of different strength may contribute cumulatively to phonological behavior

(5) e.g. Cooperation in Limbum (Gjersœ et al., 2016) and Gjersœ et al. (2019)

- phrase-final low boundary tones further lower final syllables which are already Low and extend High- and Mid-tone syllables to falling (High-Low and Mid-Low)
- lexical conditioning: many High- and Mid-tone morphemes resist this process

E1: global rules and strata straddling

Representations made opaque by processes of earlier cycles or predicted to be inaccessible by Bracket Erasure still play a role at later strata

(6) Kuria inceptive formation (Marlo et al., 2015; Sande and Jenks, 2018; Trommer, 2020)

a. to-ra-[hootoótér-a] ‘we are about to reassure’
1PL-TNS-[reassure-FV]

b. to-ra-[rom-a] eɣétɔ́ ‘we are about to bite a banana’
1PL-TNS-[bite-FV] banana

E3: competition of overwriting patterns

More than one affix or word triggers tonal patterns within the same domain: complex resolution strategies emerge

(7) e.g. Leggbó (Hyman, 2013):

IRR	≫	NEG	≫	HAB	≫	OTHER
L-L/M-L		H-M/M-M		L-L/M-L		

(8) Theoretical accounts

a. Construction Morphology: Morphological structure
[[M1] M2] M2's phonology superimposed: overwriting
[[M2] M3] M3's phonology superimposed: overwriting + spreading

b. HLT: Underlying representations
M1 ↔ /H_x/ H-tone with strength $\boxed{x}$
M2 ↔ /H_{x+y}/ H-tone with strength $\boxed{x+y}$ → stronger than M1's H-tone
M3 ↔ /H_{x+y+z}/ H-tone with strength $\boxed{x+y+z}$ → stronger than M1's and M2's H-tone

E4: tonal attraction phenomena

A tone sponsored by a morpheme M_1 is 'attracted' to (realized on) a designated position P under influence of a second morpheme M_2

(9) e.g. Japanese /-nori/ 'thing'

nori	'to ride'	nori-mono	'thing to ride'
jómi	'to read'	jomí-mono	'thing to read'

(10)

	Input stratum 1	Output stratum 1
a.	$H^b_{0.6}$ no ri – mo no	$H^b_{0.6}$ no ri mo no
b.	H^a_1 $H^b_{0.6}$ jo mi – mo no	$H^{a,b}_{1.6}$ jo mi – mo no

Shona HLT account: Constraints

(11) MAX H: Assign -x violation for every H_x in the input without an output correspondent.

(12) $^*\Sigma_H$: Assign -x violation for every H_x.

(13) OCP: Assign -1 violation for every pair of adjacent H-tones.

(14) UNIF: Assign -1 violation for every pair of input tones corresponding to the same output tone.

(15) $|\Delta\mathcal{S}| \leq 0.25$: Assign -x violation for every input tone H_a corresponding to output tone H_b where a-b and x is ≤ 0.25.

(16) $|\Delta\mathcal{S}| \leq 0$: Assign -x violation for every input tone H_a corresponding to output tone H_b where a-b.

Shona HLT account: Decrease of H-tone activation

(17) Word Level: $H_{1.0} \rightarrow H_{0.75}$

Input: = $H_{1.0}$	$\lvert\Delta\mathcal{S}\rvert \leq 0.25$ w=∞	Max H w=11	$^{*}\Sigma_{H}$ w=10	$\lvert\Delta\mathcal{S}\rvert \leq 0$ w=1	$\mathcal{H}$
☞ a. $H_{0.75}$			-0.75	-0.25	-7.75
b. $H_{0.5}$	-0.25		-0.5	-0.5	∞
c. Ø		-1.0			-11
d. $H_{1.0}$			-1.0		-10

(18) Phrase Level: $H_{0.75} \rightarrow H_{0.5}$

Input: = $H_{0.75}$	$\lvert\Delta\mathcal{S}\rvert \leq 0.25$ w=∞	Max H w=11	$^{*}\Sigma_{H}$ w=10	$\lvert\Delta\mathcal{S}\rvert \leq 0$ w=1	$\mathcal{H}$
☞ a. $H_{0.5}$			-0.5	-0.25	-5.75
b. $H_{0.25}$	-0.25		-0.25	-0.5	∞
c. Ø		-0.75			-8.25
d. $H_{0.75}$			-0.75		-7.5

Shona HLT account: Different OCP resolutions

(19) Word Level: Fusion (marked with brackets)

Input: = $H_{1.0}$ $H_{1.0}$	$\lvert\Delta\mathcal{S}\rvert \leq 0.25$ w=∞	OCP w=100	Max w=11	$^*\Sigma_H$ w=10	Unif w=10	$\mathcal{H}$
a. $H_{0.75}$			-1.0	-0.75		-18.5
☞ b. ($H_{0.75}$ $H_{0.75}$)				-0.75	-1.0	-17.5
c. $H_{0.75}$ $H_{0.75}$		-1.0		-1.5		-115.0
d. $H_{1.0}$ $H_{1.0}$		-1.0		-2.0		-120.0

(20) Phrase Level: Deletion

Input: = $H_{0.75}$ $H_{0.75}$	$\lvert\Delta\mathcal{S}\rvert \leq 0.25$ w=∞	OCP w=100	Max w=11	$^*H$ w=10	Unif w=10	$\mathcal{H}$
☞ a. $H_{0.5}$			-0.75	-0.5		-13.25
b. ($H_{0.5}$ $H_{0.5}$)				-0.5	-1.0	-15.0
c. $H_{0.5}$ $H_{0.5}$		-1.0		-1.0		-110.0
d. $H_{0.75}$ $H_{0.75}$		-1.0		-1.5		-115.0

GSR in phonology: Case studies

- liaison consonants in French (Smolensky and Goldrick, 2016)
- semi-regularity of voicing in Japanese Rendaku (Rosen, 2016b)
- allomorphy in Modern Hebrew (Faust and Smolensky, 2017)
- tone sandhi in Oku (Nformi and Worbs, 2017)
- lexical accent in Lithuanian (Kushnir, 2018)
- tone allomorphy in San Miguel el Grande Mixtec (Zimmermann, 2018a)
- exceptional tone (non)spreading in San Molinos Mixtec (Zimmermann, 2018b)
- lexical stress in Moses Columbian Salishan (Zimmermann, 2018c)
- compound stress in Sino-Japanese (Rosen, 2018)
- stress-syncope interaction in Levantine Arabic (Trommer, 2018)
- (interacting) ghost segments in Welsh (Zimmermann, 2019)
- interaction of phonological/lexical gemination/lenition in Italian (Amato, 2019)
- special behaviour of coronals (Walker, 2019a)
- distribution of nasal vowels in French (Hsu, 2019)
- nasal-stop voicing assimilation in Greek (Revithiadou and Markopoulos, 2019)
- asymmetries in Korean place-assimilation (Walker, 2019b)
- the typology of exceptional (non)undergoers and (non)triggers (Zimmermann, 2020a)
- templates in Ibibio (Zimmermann, 2020b)
- …

References

Amato, I. (2019). Gorgia and Raddoppiamento Fonosintattico: when strength matters. talk at OCP 16, January 17, 2019.

Bermúdez-Otero, R. (2018). Stratal phonology. In Hannahs, I. S. and Bosch, A. R. K., editors, *The Routledge handbook of phonological theory*, pages 100–134. Routledge, Abingdon.

Faust, N. and Smolensky, P. (2017). Activity as an alternative to autosegmental association. talk given at mfm 25, 27th May, 2017.

Gjersœ, S., Nformi, J., and Paschen, L. (2019). Hybrid falling tones in Limbum. In Clem, E., Jenks, P., and Sande, H., editors, *Theory and description in African Linguistics: Selected papers from ACAL 47*, pages 95–118. Language Science Press, Berlin.

Gjersœ, S., Nformi, J. A., and Paschen, L. (2016). The interaction of lexical tone and phrase-level intonation in Limbum. In *Proceedings of Speech Prosody 2016*. doi: 10.21437/SpeechProsody.2016.

Hsu, B. (2019). Exceptional prosodification effects revisited in Gradient Harmonic Grammar. *Phonology*, 36:225–263.

Hyman, L. (1993). Problems in rule ordering in phonology: Two Bantu test cases. In Goldsmith, J., editor, *The Last Phonological Rule*, pages 195–222. University of Chicago Press, Chicago.

Hyman, L. (2013). Morphological tonal assignments in conflict: Who wins? In *UC Berkeley Phonology Lab Annual Report (2013)*, pages 327–343.

Kiparsky, P. (2015). Stratal OT: A synopsis and FAQs. In Hsiao, Y. E. and Wee, L.-H., editors, *Capturing Phonological Shades*, pages 2–44. Cambridge Scholars Publishing, Cambridge.

Kushnir, Y. (2018). *Prosodic Patterns in Lithuanian Morphology*. PhD thesis, Universität Leipzig.

Marlo, M. R., Mwita, L. C., and Paster, M. (2015). Problems in Kuria H tone assignment. *NLLT*, 33:251–265.

Myers, S. (1991). Structure preservation and the Strong Domain Hypothesis. *LI*, 22(2):379–385.

Myers, S. (1997). OCP effects in Optimality Theory. *NLLT*, 15(4):847–892.

Nformi, J. and Worbs, S. (2017). Gradient tones obviate floating features in Oku tone sandhi. talk at the Workshop on Strength in Grammar, Leipzig, November 10, 2017.

Revithiadou, A. and Markopoulos, G. (2019). Misbehaved PWs: A Harmonic Grammar account of gradient sandhi in Greek. talk, given at the workshop 'Segmental Processes in Interaction with Prosodic Structure', Tromsø, September 19-20, 2019.

Rosen, E. (2016a). Predicting the unpredictable: Capturing the apparent semi-regularity of rendaku voicing in Japanese through Harmonic Grammar. In Clem, E., Dawson, V., Shen, A., Skilton, A. H., Bacon, G., Cheng, A., and Maier, E. H., editors, *Proceedings of BLS 42*, pages 235–249. Berkeley Linguistic Society, Berkeley.

Rosen, E. (2016b). Predicting the unpredictable: Capturing the apparent semi-regularity of Rendaku voicing in Japanese through Harmonic Grammar. In *Proceedings of BLS 42*, pages 235–249. Berkeley Linguistic Society.

Rosen, E. (2018). Evidence for gradient input features from Sino-Japanese compound accent. poster, presented at AMP 2018, San Diego, October 06, 2018.

Sande, H. and Jenks, P. (2018). Cophonologies by Phase. In *Proceedings of NELS 48*, volume 3, pages 39–53.