(Im)possible opacity patterns in containment theory

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Opacity in Rule-based Phonology

V1 Deletion under Hiatus

	/tue/	/tio/	/tou/	/tei/
V1 Deletion: $V \rightarrow \emptyset / \_\_ V$	[t e]	[t o]	[t u]	[t i]

Palatalization before Front Vowels

	/tue/	/tio/	/tou/	/tei/
Palatalization: t → tʃ/__ [−bk]	–	tʃio	–	tʃei
	[tue]	[tʃio]	[tou]	[tʃei]

Feeding and Bleeding

		/tue/	/tio/	/tou/	/tei/
V1 Deletion:	$V \rightarrow \emptyset / \_\_ V$	t e	t o	t u	t i
Palatalization:	$t \rightarrow tʃ / \_\_ [-bk]$	tʃe			tʃi
		[tʃe]	[to]	[tu]	[tʃi]

Counter-Feeding and Counter-Bleeding

		/tue/	/tio/	/tou/	/tei/
Palatalization:	$t \rightarrow tʃ / \_\_ [-bk]$		tʃio		tʃei
V1 Deletion:	$V \rightarrow \emptyset / \_\_ V$	t e	tʃ o	t u	tʃ i
		[te]	[tʃo]	[tu]	[tʃi]

Opacity (Kiparsky 1973a: 79)

A phonological rule P of the form A $\rightarrow$B / C___ D is opaque if there are surface structures with either of the following characteristics:

a. instances of A in the environment C___ D. (Counterfeeding)

b. instances of B derived by P that occur in environments other than C___ D. (Counterbleeding)

Overview

Opacity in Optimality Theory

Palatalization in OT

Input: = /ti/	*TI	IDENT V	IDENT C
☞ a. [tʃi]			*
b. [tu]		*!	
c. [ti]	*!		

V1 Deletion in OT

Input: = /tou/	Onset	Dep	Max
☞ a. [tu]			*
b. [totu]		*!	
c. [tou]	*!		

Feeding in OT

Input: = /toi/	Onset	*TI	Max	Ident C
☞ a. [tʃi]			*	*
b. [ti]		*!	*	
c. [toi]	*!			

Bleeding in OT

Input: = /tio/	Onset	*TI	Max	Ident C
a. [tʃo]			*	*!
☞ b. [to]			*	
c. [tio]	*!	*!		

Harmonic Bounding of Counterbleeding

Input: = /tio/	*Tl	Ident C	Onset	Dep	Ident V	Max
☛ a. [to]						*
☞ b. [tʃo]		*!				*

Contradictory Requirements for Counterfeeding

Input: = /ti/	*TI	Ident C	Onset	Dep	Ident V	Max
a. [ti]		*				
b. [tʃi]	*					

Input: = /ti/	…	*TI	Ident C	…
a. [ti]		*!		
☞ b. [tʃi]			*	

Input: = /toi/	*TI	Ident C	Onset	Dep	Ident V	Max
a. [ti]		*				*
b. [tʃi]	*					*

Input: = /toi/	…	Ident C	*TI	…
☞ a. [ti]			*	
b. [tʃi]		*!		

Correspondence Theory vs. Containment

Input-Output Mapping in Correspondence Theory

Input: = $t_1o_2u_3$	Onset	Dep	Max
☞ a. t_1u_3			*
b. $t_1o_2tu_3$		*!	
c. $t_1o_2u_3$	*!		

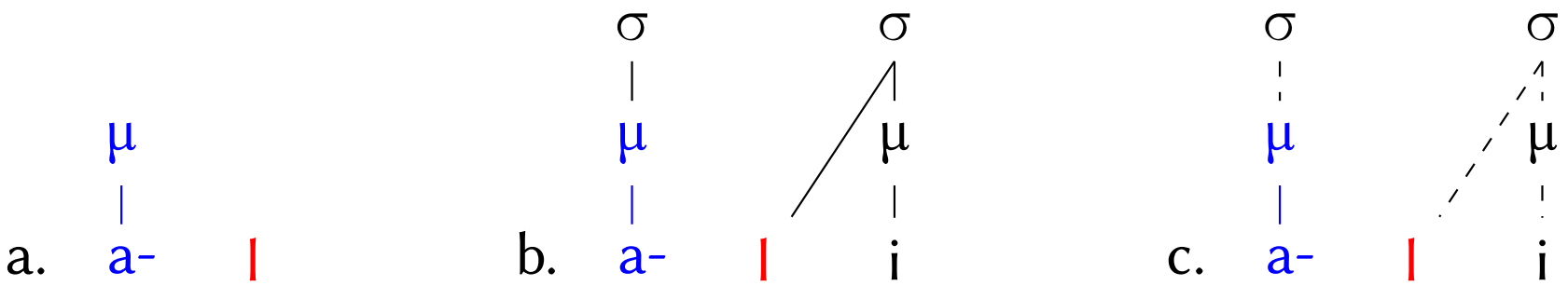
Input-Output Mapping in Containment Theory

Input: = tou	Onset	Dep	Max
☞ a. t o u			*
b. to t u		*!	
c. tou	*!		

Specific Assumptions

- **Hierarchical Nonlinear Representations:** combining Prosodic Phonology and Feature Geometry
- **Colors:** Each morpheme has a unique color characterizing all of its underlying nodes and association lines and distinguishing underlying from epenthetic ('colorless' material)
- **Radical Containment:** No erasure of association lines $\leftrightarrow$ marking association lines as invisible is the only counterpart to deletion operation in non-containment approaches

Colors and Epenthesis



Notation of Association (Zimmermann & Trommer 2011)

Morphological association relations		Epenthetic association relations
phonetically visible:	phonetically invisible:	phonetically visible:
X | Y	X ⫲ Y	X ⋮ Y

Axiom of Phonetic Visibility (Zimmermann & Trommer 2011)

A phonological node is visible to phonetics

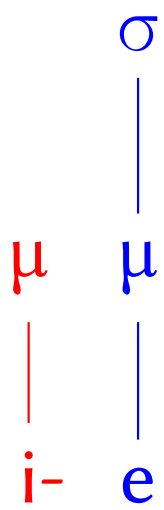
if and only if

it is dominated by the designated root node of the structure

through an uninterrupted path of phonetic association lines

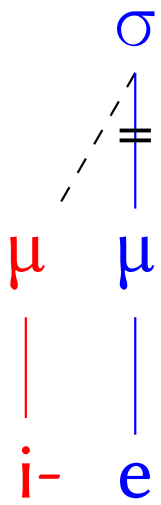
Deletion and Phonetically Invisible Association Lines

M



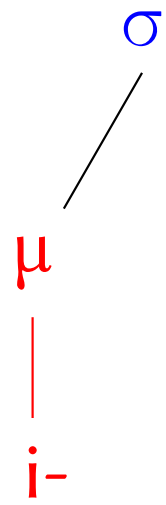
Morphological Structure (Input)

I



Integrated Structure (Candidate)

P



Phonetic Structure (Output)

The Cloning Hypothesis

Every markedness constraint exists in 2 incarnations:

The **general clone** refers to all structure in I

The **phonetic clone** refers only to structure in P

(cf. Cloning in Correspondence Theory, McCarthy & Prince 1995)

Cloning NoSkipping

(1) NoSkipping
Assign $*$ to every segmental root node, which is skipped by an association span connecting segments in **I**.

(2) NoSkipping
Assign $*$ to every segmental root node, which is skipped by an association span connecting segments in **P**.

Blocking of place assimilation in Hellendoorn Dutch (van Oostendorp 2004:2-3)

		Underlying	**Surface**
a.	'to work'	wɛrk-n	wɛrkŋ
b.	'we worked'	wɛrk-t-n	wɛrkn
c.	'to hope'	hop-n	hopm
d.	'we hoped'	hop-t-n	hopn

Blocking of place assimilation in Hellendoorn Dutch

Input: wɛrk-n, ‘to work’

	NoSkip	PlaceAssimilation
a. wɛrk-n		*!
☞ b. wɛr(k-ŋ)		

Input: wɛrk-t-n, ‘we worked’

	NoSkip	PlaceAssimilation
☞ a. wɛrk t -n		*
b. wɛr(k t -ŋ)	*!	

Opaque Patterns which Follow

Counterfeeding: Hellendorn Dutch

Counterbleeding: Tiberian Hebrew (McCarthy, 1999, 333)

			Counterbleeding
	/melk/	/qaraʔ/	/deʃʔ/
1. Epenthesis	melex	–	deʃeʔ
2. ʔ-Deletion	–	qara	deʃe
	‘king’	‘he called’	‘tender grass’

Tiberian Hebrew in Containment^{Cloning}: Constraints

(3) a. *CC]

Assign $*$ for every sequence of two adjacent consonants at the right word edge in **I**.

b. *ʔ]

Assign $*$ for every [ʔ] at the right word edge in **P**.

Tiberian Hebrew in Containment^{Cloning}:

Vowel Insertion

	*CC]	*ʔ]	Dep	Max
i. /melk/				
a. melk	*!			
b. mel<k>	*!			*
☞ c. melək			*	

ʔ-Deletion

	*CC]	*ʔ]	Dep	Max
ii. /qaraʔ/				
a. qaraʔ		*!		
☞ b. qara<ʔ>				*
c. qaraʔə			*!	

Tiberian Hebrew in Containment^{Cloning}: Counterbleeding

	*CC]	*ʔ]	Dep	Max
iii. /deʃʔ/				
a. deʃʔ	*!	*!		
b. deʃ<ʔ>	*!			*
c. deʃəʔ		*!	*	
☞ d. deʃə<ʔ>			*	*

Grandfather effects: Mekkan Arabic (McCarthy, 2002)

- A structure is avoided if it is newly created but preserved if it was present underlyingly
- in Mekkan Arabic (4), regressive voicing assimilation for obstruents (4-a) fails to produce new voiced obstruent (4-b)
- But underlying voiced obstruents are preserved (4-c)

(4) *Mekkan Arabic (McCarthy, 2002, 3)*

a.	ʔagsam	aksam	'he swore and oath'
	mazkuːr	maskuːr	'mentioned'
b.	ʔakbar	akbar, *ʔagbar	'older'
c.	ʔibnu	ʔibnu	'his son'

Mekkan Arabic and Rule Ordering

- No ordering of a general coda devoicing and a general assimilation rule would capture this pattern:

	/ʔagsam/	/ʔakbar/	/ʔibnu/
1. Assimilation	ʔaksam	ʔagbar	–
2. Devoicing	ʔaksam	*ʔakbar	*ipnu

	/ʔagsam/	/ʔakbar/	/ʔibnu/
1. Devoicing	ʔaksam	ʔakbar	*ipnu
2. Assimilation	ʔaksam	*ʔagbar	–

Mekkan Arabic and *Cloning* (cf. Trommer, 2014)

- the generalized version of *VcdObs predicts the grandfather effect
  - an underlyingly a voiced obstruent always violates the constraint; no (deletion) operation can help avoid this violation
  - an underlyingly voiceless obstruent, however, can avoid a violation of *VcdObs if no new feature [+vcd] associates

Grandfather Effects in Containment^{Cloning}

- the generalized version (5) is always violated by a sound that is underlyingly a voiced obstruent – no (deletion) operation can help avoid this violation

(5) *VcdObs
Assign $*$ for every obstruent that is associated to [+vcd] in I.

Grandfather Effects in Containment^{Cloning}

(6)

	*NoVcdObs	Share$^{VCD}_{-SON}$	Id-vc
i. /ʔagsam/			
a. ʔagsam		*!	
☞ b. ʔaksam			*
ii. /ʔakbar/			
☞ a. ʔakbar		*	
b. ʔagbar	*!		*
iii. /ʔibnu/			
☞ a. ʔibnu	*		
b. ʔipnu	*		*!

Problematic Patterns

Underlying Triggers only: Yawelmani (McCarthy, 1999)

a. Rounding Assimilation for Same-Height Vowels

/bok'-al/	→	[bok'ol]	'might find'
/dub-al/	→	[dubal]	'might lead by the hand'
/bok'-mi/	→	[bok'mi]	'having found'
/dub-mi/	→	[dubmu]	'having lead by hand'

b. Lowering of long Vowels

c'u:m-al	→	c'o:mal	'might destroy'

Underlying Triggers only: Yawelmani (McCarthy, 1999)

	Counterbleeding	**Counterfeeding**
1. Rounding Assimilation	c'uju:-hin	c'u:m-al
	c'uju:-hun	–
2. Lowering	c'ujo:-hun	c'o:mal
	'urinates'	'might destroy'

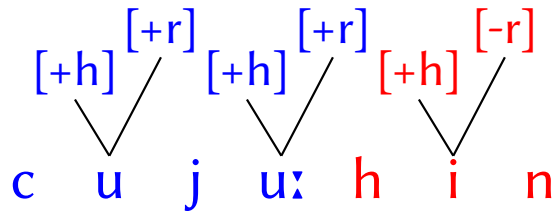
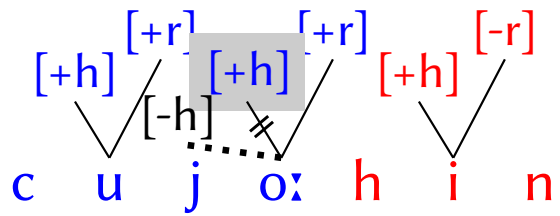
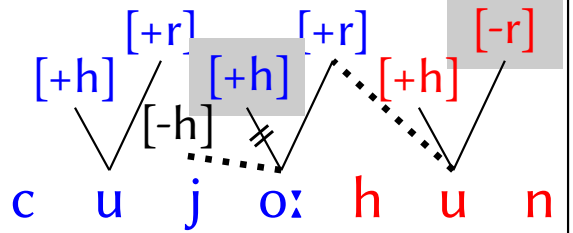
Yawelmani and Containment^{Cloning}: CB of rounding

(7) *Yawelmani rule interaction: constraints*

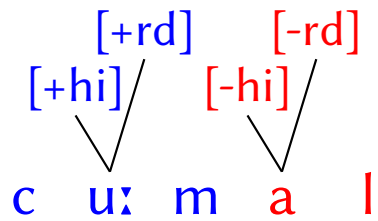
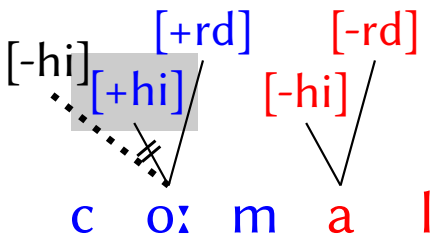
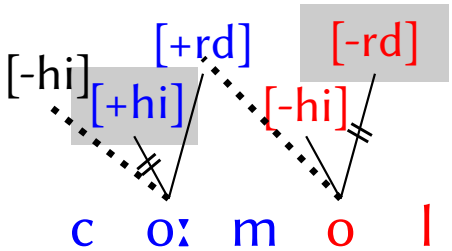
a. $\textsc{Shr}^{rd}_{hi}$
Assign a violation mark for every pair of adjacent vowels that have identical values for [±high] and are not associated to the same feature [±round] in **I**.

b. $\underline{*\text{I}\text{ː}}$
Assign a violation mark for every high long vowel in **P**.

Yawelmani and Containment^{Cloning}: Capturing Counterbleeding

/cuːjuː-hin/ (ul=a.)	*Iː	SHR$^{rd}_{hi}$	MAX [rd]	MAX [hi]
a. 	*!	*!		
b. 		*!		*
☞ c. 			*	*

Yawelmani: Overapplication for Counterfeeding

/cuːm-al/ (ul=a.)	*lː	$\text{Shr}^{\text{rd}}_{\text{hi}}$	Max [rd]	Max [hi]
a. 	*!		*	
☛ b. 		*!		*
☞ c. 			*	*

Output Triggers Only: Makassarese

- the only licit word-final codas in Makassarese are /ʔ/ and /ŋ/ (McCarthy and Prince, 1994)
- stems that are underlyingly C-final undergo copy-vowel epenthesis and ʔ-epenthesis (8-a)
- stems that are underlyingly V-final do not undergo /ʔ/-epenthesis (8-b)

(8) *Makassarese (McCarthy, 2002, 20)*

a.	rantas	rántasaʔ	'dirty'
	teʔter	tettereʔ	'quick'
b.	lompo	lompo	'big'
		*lompoʔ	

Makassarese and Rule Ordering

- the existence of the two rules of V-epenthesis and C-epenthesis necessarily results in C-epenthesis for an underlyingly V-final stem (9)

(9) *Insertion and deletion in Makassarese: overapplication of C-epenthesis*

	Feeding	
	/rantas/	/lompo/
1. V-epenthesis	rantasa	–
2. C-epenthesis	rantasaʔ	*lompoʔ

Makassarese and Containment[Cloning]

- Responsible constraints in McCarthy and Prince (1994); McCarthy (2002) are CodaCond (assuming that both /ʔ/ and /ŋ/ are place-less, McCarthy and Prince (1994)) and FinalC

(10) a. CodaCond
Assign ∗ for every consonant at the right word edge that has a place feature in **P**.

b. FinalC
Assign ∗ for every right word edge that is not right-aligned with a consonant in **P**.

Makassarese and Containment[Cloning]

(11) *Vowel- and Consonant epenthesis*

/rantas/	FinalC	CodaCond	Dep-C	Dep-V
a. rantas		*!		
b. rantasa	*!			*
☞ c. rantasaʔ			*	*

Makassarese and Containment[Cloning]

(11) *Vowel- and Consonant epenthesis*

/rantas/	FinalC	CodaCond	Dep-C	Dep-V
a. rantas		*!		
b. rantasa	*!			*
☞ c. rantasaʔ			*	*

(12) *Misprediction: Consonant epenthesis*

/lompo/	FinalC	CodaCond	Dep-C	Dep-V
☛ a. lompo	*!			
☞ b. lompoʔ			*	

Makassarese and Containment*Cloning*

- The cloning hypothesis is not helpful: the difference between an inserted and an underlying V is not detectable for FinalC or FinalC

→ Solution must be orthogonal: reference to colors

Non-iterativity in Lardil

- words longer than two moras undergo deletion of a final short vowel (cf. below)
- syllables are CV(C) and only apicals are possible codas (with some additional complications)

(13) *Fed counterfeeding in Lardil (Bakovic, 2011, 3)*

			Counterfeeding
	/wangalk/	/jilijili/	/dibirdibi/
1. Final V-deletion	–	jilijil	dibirdib
2. Final [–apic]-C-deletion	wangal	–	dibirdi
	‘boomerang’	‘oyster species’	‘rock cod’

Lardil and Containment^{Cloning}

(14) a. CodaCond (after Staroverov, 2015)
Assign a violation mark for every coda consonant that is not [apical] and not assimilated to a following onset consonant in **P**.

b. FinalC
Assign a violation mark for every vowel that is final with the right edge of a PrWd in **P**.

Lardil and Containment[Cloning]

(15) *Lardil in Containment: C-deletion*

/wangalk/	FinalC	CodaCond	Max-V	Max-C
a. wangalk		*!		
☞ b. wangal<k>				*

Lardil and Containment[Cloning]

(15) *Lardil in Containment: C-deletion*

/wangalk/	FinalC	CodaCond	Max-V	Max-C
a. wangalk		*!		
☞ b. wangal<k>				*

(16) *Lardil in Containment: V-deletion*

/jilijili/	FinalC	CodaCond	Max-V	Max-C
a. jilijili	*!			
☞ b. jilijil<i>			*	

Lardil and Containment[Cloning]

(17) *Lardil in Containment: iterative deletion*

/dibirdibi/	FinalC	CodaCond	Max-V	Max-C
a. dibirdibi	*!			
b. dibirdib<i>		*!	*	
☛ c. dibirdi<bi>	*!		*	*
d. dibird<ibi>		*!	**	*
☞ e. dibir<dibi>			**	**

Opacity and Syllable Structure: Beduoin Arabic (McCarthy, 1999, 334)

(18)

		Counterbleeding
	/katab/	/badw/
1. Syllabification	ka.tab	badw
2. Raising in open σ	kitab	–
3. Vocalization	–	badu
	'he wrote'	'Bedouin'

Beduoin Arabic and Containment*Cloning*

(19) a. $\underline{{}^{*}CC_{+HI}}$

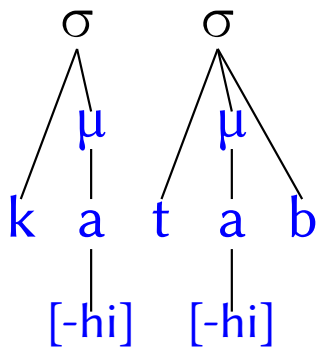
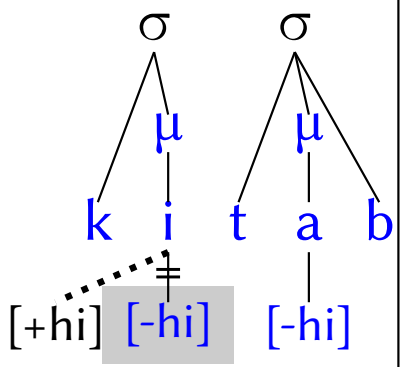
Assign $*$ for every [+high] segment that is not associated to a μ but preceded by a consonant in **P**.

b. $\underline{{}^{*}V_{-HI}]_{\sigma}}$

Assign $*$ for every [−high] vowel that is not followed by a consonant associated to the same syllable node in **P**.

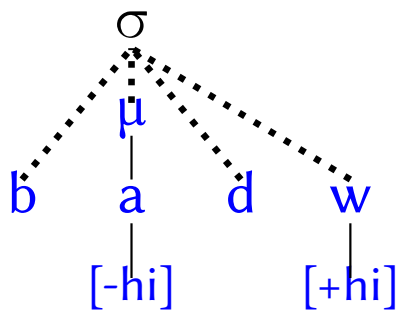
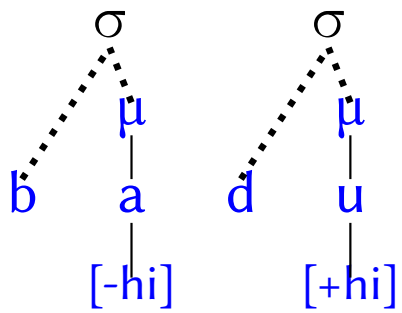
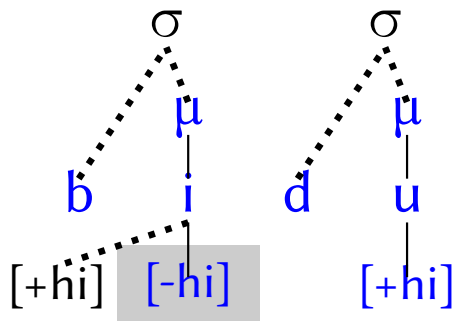
Beduoin Arabic and Containment*Cloning*

(20)

/katab/	*CC$_{+HI}$	*V$_{-HI}$]$_{\sigma}$	MAX[HIGH]	DEPμ
a. 		*!		
☞ b. 			*	

Beduoin Arabic and Containment*Cloning*

(21)

/badw/	*CC$_{+HI}$	*V$_{-HI}$]$_{\sigma}$	MAX[HIGH]	DEPμ
a. 	*!			
☛ b. 		*!		*
☞ c. 			*	*

Possible solutions

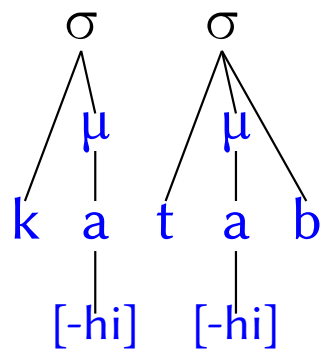
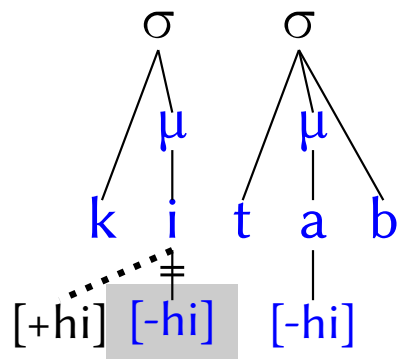
Beduoin Arabic: Reference to syllable structure

- follows if stem to which affix is added is already syllabified (=underlying or stratal optimization)

(22) $V_{+HI}]_{\sigma}$!
Assign $*$ for every vowel not associated to [+high] that is not followed by a consonant associated to the same syllable node in **I**.

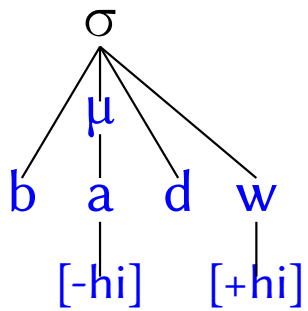
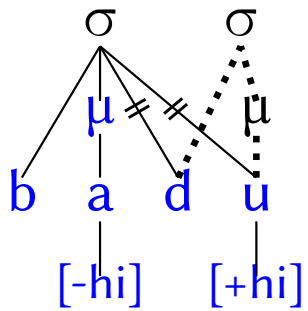
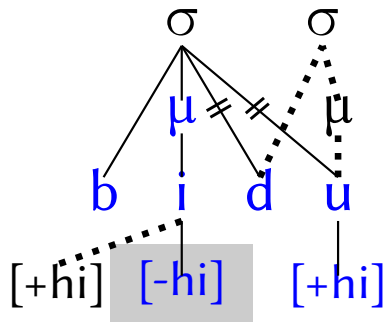
Beduoin Arabic: Reference to syllable structure

(23)

/katab/ (ul=a.)	*CC$_{+HI}$	V$_{+HI}$]$_\sigma$!	MAX[HIGH]	DEPμ
a. 		*!		
☞ b. 			*	

Beduoin Arabic: Reference to syllable structure

(24)

/badw/ (ul=a.)	*CC$_{+HI}$	V$_{+HI}$]$_\sigma$!	MAX[HIGH]	DEPμ
a. 	*!			
☞ b. 				*
c. 			*!	*

Full containment as a solution?

'Full' containment (McCarthy, 1996)

- all constraint parameters are specified for their level of application:
  - 'surface',
  - 'indifferent', or
  - 'underlying'

→ allows reference to *only the underlying* structure

(25) *Umlaut-trigger in the analysis for Icelandic McCarthy (1996)*

UMLAUT

*	Condition	Level
α	a	Surface
β	ü	Indifferent
Linear Order	α > β	Underlying
Adjacency	V-to-V	Indifferent

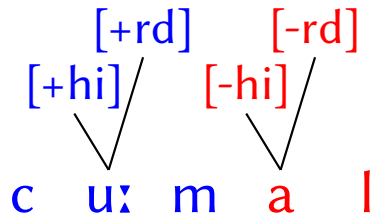
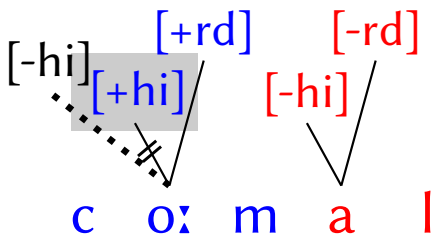
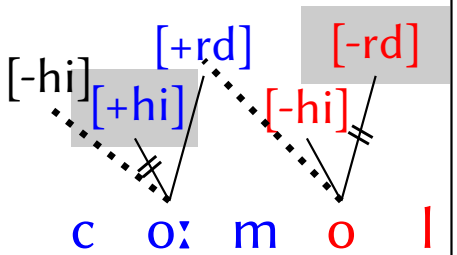
Yawelmani and full containment

(26) Sh_h^{rd}

Assign $*$ for every pair of vowels that are underlyingly specified for the same [±hi] value and are not specified for the same value of [±round].

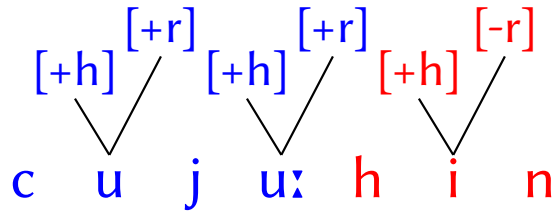
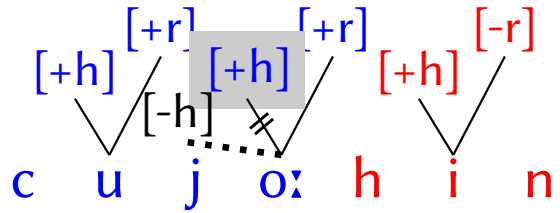
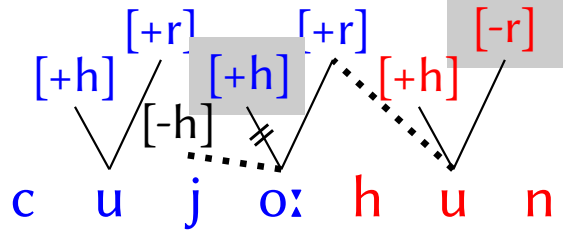
Yawelmani and full containment: CF

(27)

/cuːm-al/ (ul=a.)	$V\text{ː}_{-H}$!	Sh_h^{rd}	Max[rd]	Max[hi]
a. 	*!			
☞ b. 				*
c. 			*!	*

Yawelmani and full containment: CB

(28)

/cuːjuː-hin/ (ul=a.)	Vː$_{-H}$!	Sh^{rd}_{h}	M[RD]	M[H]
a. 	*!	*		
b. 		*!		*
☞ c. 			*	*

Makassarese and full containment

(29) *FinalC*
Assign ∗ for every phonetic final vowel that is not present underlyingly.

Makassarese and full containment

(30) *Vowel- and Consonant-epenthesis*

/rantas/	*FinalC*	CodaCond	Dep-C	Dep-V
a. rantas		*!		
b. rantasa	*!			*
☞ c. rantasaʔ			*	*

Makassarese and full containment

(30) *Vowel- and Consonant-epenthesis*

/rantas/	*FinalC*	CodaCond	Dep-C	Dep-V
a. rantas		*!		
b. rantasa	*!			*
☞ c. rantasaʔ			*	*

(31) *No Consonant-epenthesis*

/lompo/	*FinalC*	CodaCond	Dep-C	Dep-V
☞ a. lompo				
b. lompoʔ			*!	

Lardil and full containment

(32) *FinalC*
Assign ∗ for every phonetic vowel that is underlyingly final.

➙ different from above: reference to underlying *and* phonetic status

Lardil and full containment

(33)

	FinalC	CodaCond	Max-V	Max-C
i. /jilijili/				
a. jilijili	*!			
☞ b. jilijil<i>			*	
ii. /dibirdibi/				
a. dibirdibi	*!			
b. dibirdib<i>		*!	*	
☞ c. dibirdi<bi>			*	*
d. dibird<ibi>			**!	*

Problems for full containment

Imaginable rule ordering: Counterbleeding and Insertion

(34) *Assimilation and Insertion in Hellendorn'*

	Counterbleeding
	/werk-n/
1. Assimilation	werk-ŋ
2. Insertion	werk-əŋ

Hellendorn' and Full Containment

a. $^{*}C_{\alpha Pl}C_{\text{-}\alpha Pl}$

Assign ∗ for every pair of underlyingly adjacent consonants associated phonetically with different place features.

Hellendorn' and Full Containment

(35)

/werk-n/	*$C_{\alpha Pl}C_{\text{-}\alpha Pl}$	*CC]$_{\sigma}$	DepS	Max[Pl]
a. werkn	*!	*!		
b. werkŋ		*!		*
c. werkən	*!		*	
☞ d. werkəŋ			*	*

Hellendorn' and Containment^{Cloning}

- The inserted element intervenes in the phonetically visible and the 'all'-structure: there is no underlying adjacency that can be preserved

(36) *Hellendorn' in containment: constraints*

a. $\underline{{}^{*}C_{\alpha PL}C_{-\alpha PL}}$
Assign $*$ for every pair of consonants associated with different place feature in **P**.

b. $\underline{{}^{*}CC]_{\sigma}}$
Assign $*$ for every consonant at the right word egde that is directly adjacent to a preceding consonant in **P**.

Hellendorn' and Containment^{Cloning}

(37)

/werk-n/	*$C_{\alpha PL}C_{-\alpha PL}$	*$CC]_{\sigma}$	DEPS	MAX[PL]
a. werkn	*!	*!		
b. werkŋ		*!		*
☞ c. werkən			*	
☛ d. werkəŋ			*	*!

Attested?

- Glide deletion if SSP would be violated in coda and epenthesis to ensure SSP

(38) *Deletion and Insertion in Icelandic (Karvonen and Sherman, 1997, 7)*

	Counterbleeding
	/miðj-r/
1. j-Deletion	miðr
2. Insertion	miðʏr
	'middle' (nom.sg.fem)

- Riggs (2008) argues that this is in fact a transparent interaction: */ji/ is the responsible constraint

Overgeneration problem for full containment II

- a pattern as Finnish' (39) is predicted
  - palatalization (39-a) and vowel deletion (39-b) exist
  - vowel deletion bleeds palatalization (39-c)
  - but at the same time counterfeeds palatalization (39-d)

(39) *Palatalization in Finnish'*

	Underlying	Surface
a.	pat-i	patʃi
b.	ka-u	ku
c.	pat-i-o	pato
d.	kat-o-is	katis

Finnish': rule ordering

- under the assumption that the same vowel deletion process (=hiatus avoidance) applies in both contexts, this pattern can not be modeled in a rule-based theory

(40) *Impossible with rule ordering: Overapplication of palatalization*

	/pat-i-o/	/kat-o-is/
1. Deletion	pato	katis
2. Palatalization	–	*katʃis

(41) *Impossible with rule ordering: Overapplication of palatalization*

	/pat-i-o/	/kat-o-is/
1. Palatalization	patʃio	–
2. Deletion	*patʃo	katis

Finnish': full containment

(42) **ti*

Assign ∗ for every phonetically [-pal] stop that is underlyingly and phonetically followed by a high vowel.

Finnish': full containment

(43)

	*VV	*ti	Max[pal]	Max-V
i. /pat-i/				
a. pati		*!		
b. patʃi			*	
ii. /pat-i-o/				
a. patio	*!	*!		
☞ b. pat<i>o				*
c. patʃ<i>o			*!	*
iii. /kat-o-is/				
a. katois	*!			
☞ b. kat<o>is				*
c. katʃ<o>is			*!	*

Summary: Full containment

- can predict some of the patterns that are problematic for Containment^{Cloning}
- but overgenerates:
  - Hellendorn Dutch' and Finnish' are not attested
  - Lardil: the final vowel deletion is only found in the nominative and is hence not phonological at all (Hale, 1973; McCarthy and Prince, 1993; Horwood, 2001; Bye, 2006; Round, 2011); cf. Staroverov (2015) for counterarguments against this claim

Summary: problematic patterns

(44)

Pattern	RO	Predicted by: C^C	Predicted by: FC	Attested?
Syllable Structure: Beduoin Arabic	☺	☺*	☺*	Yes
Phonological DEE: Makassarese	☺	☹	☺	Yes
Non-iterativity: Lardil	☺	☹	☺	Not necessarily
Underlying Triggers: Yawelmani	☺	☹	☺	Yes
Underlying Adjacency: Hellendorn Dutch'	☺	☹	☺	No
Underlying Adjacency: Finnish'	☹	☹	☺	No

(*additional assumption of (underlying) syllable structure)

Conclusion

- Containment is able to solve opacity problems standard parallel OT faces
- Containment^{Cloning} undergenerates for phonologically DEE (=Makassarese) and Underlying Triggers (Yawelmani)
- Full Containment overgenerates (Finnish', Hellendorn', Lardil,)

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