

Rutgers University
29 October 2004

Assimilation and Reduction Phenomena as Licensing in Early Grammars

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1. Consonant Harmony (CH)

- (1) 1. Consonants which are not string adjacent assimilate to one another in place (e.g. Smith 1973, Ingram 1974, Vihman 1978, Stemberger & Stoel-Gammon 1991)

2. Triggers and Targets:

	Best ←————→ Worst		
Trigger	Dor	Lab	Cor
Target	Cor	Lab	Dor

3. Directionality: L-to-R implies R-to-L (e.g. Pater & Werle 2001, 2003)

- (2) **Amahl at Stage 1 (age 2.60)** (Smith 1973):

	CVC:	CVVC:	Bisyllabic:
a. Right-to-Left:	'sock' [gɔk]	'strike' [gaik]	'doctor' [gɔgə]
	'neck' [ɲɛk]	'snake' [ɲe'k]	'sticky' [gigi:]
b. Left-to-Right:	'good' [gug]	'coach' [gu:k]	'glasses' [ga:gi:]
	'cloth' [gɔk]	'clean' [gi:n]	

- (3) **Analysis:**

- Directionality is tied to different types of Licensing:
 - R-to-L = Dependent-to-Head applies in order to license place
 - L-to-R = Head-to-Dependent applies in order to license entire segments
- Domain is foot (see Rose 2000 on French CH)
- Segments that cannot be licensed through CH are subject to deletion or reduction to coronal, as appropriate

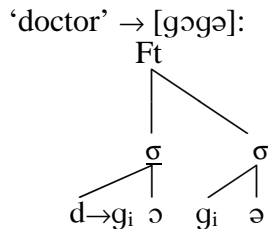
2. Recent Analyses of the Directionality Asymmetry

- (4) **Directionality as Constraint Argument** (Pater & Werle 2003, also 2001):
 AGREE-LEFT-(Dor): A consonant preceding a dorsal must be homorganic with it
 AGREE: Consonants agree in place of articulation

/dɔg/	AGREE-L-(Dor)	FAITH(Dor)	FAITH(Cor)	AGREE
☞ a. gɔg			*	
b. dɔd		*!		
b. dɔg	*!			*
/kot/	AGREE-L-(Dor)	FAITH(Dor)	FAITH(Cor)	AGREE
a. kɔk			*!	
☞ b. kot				*

- (5) **Directionality as tied to Licensing** (Goad 2001; cf. Rose 2000):
CH involves a relation between heads and dependents.

Enables marked features (Dor, also Lab) in prosodically-weak positions (e.g. foot-internal onset, coda) to surface through being associated to and therefore licensed by prosodically strong position (e.g. foot-edge onset).



Problem: CH incorrectly predicted to apply only dependent-to-head

- (6) **Current Approach: Analysis:**
- Dependent-to-Head (R-to-L in trochaic lgs) and Head-to-Dependent (L-to-R) CH warrant different analyses.
 - Both involve licensing, but they differ in what features need to be licensed:

Dependent-to-Head CH satisfies **PLACE LICENSING**; it applies to enable marked features to appear in prosodically-weak positions.

Head-to-Dependent CH satisfies **SEGMENT LICENSING**; it prevents segments in prosodically-weak positions from deleting.

- Head-to-Dep CH leaves the grammar earlier than Dep-to-Head CH as segments must be licensed before their features can be licensed.

3. Consonant Harmony Data from Amahl

- (7) **Period 1** = Smith’s Stage 1 (age 2.60)
Period 2 = Smith’s Stages 2-5 (ages 2.115-2.144)
- (8) **Dep-to-Head CH:**
- | | |
|--|----------------------------------|
| a. Obstruent Targets:
Obligatory: | b. Nasal Targets:
Obligatory: |
| Period 1:
‘duck’ [gʌk]
‘tickle’ [gigu] | ‘snake’ [ɲeik] |
- (9) **Dep-to-Head CH:**
- | | |
|--|---|
| a. Obstruent Targets:
Obligatory : | b. Nasal Targets:
Obligatory: |
| Period 2:
‘take’ [geik]
‘doggie’ [gɔgi:] | ‘neck’ [ɲek]
‘nanga’ [ɲʌŋgə] (Hindi) |
- (10) **Head-to-Dep CH:**
- | | |
|---|----------------------------------|
| a. Obstruent Targets:
Obligatory: | b. Nasal Targets:
No CH: |
| Period 1:
‘good’ [gug]
‘glasses’ [ga:gi:] | ‘skin’ [gin]
‘corner’ [gɔ:mə] |
- (11) **Head-to-Dep CH:**
- | | |
|---|--------------------------------|
| a. Obstruent Targets:
No CH: | b. Nasal Targets:
No CH: |
| Period 2:
‘cat’ [gæt]
‘curtain’ [gədən] | ‘gone’ [gɔn]
‘green’ [gi:n] |

4. Dependent-to-Head (Right-to-Left) CH as Place Licensing

- (12) a. Word-final OEHS: /dʌk/ → [gɪʌkɪ]:
-
- b. Foot-internal Onset: /tiku/ → [gɪgɪu]:
-

- (13) **Head-Dependent Asymmetries** (Dresher & van der Hulst 1998, also Harris 1990):
Dependents cannot be more complex than their heads

- (14) a. **Complexity/Markedness Scale for Place:**¹
More complex ←————→ Less complex
Dor, Lab > Cor

- b. **Fixed Ranking of Constraints** (e.g. Kiparsky 1994):
FAITH(Dor), FAITH(Lab) >> FAITH(Cor)

- (15) a. No CH in Lab + Dor Contexts:
‘back’ [bɛk] *[gɛk]
‘finger’ [wiŋə] *[giŋə]
- b. No CH in Onsetless + Dor Contexts:
‘egg’ [ɛk] *[gɛk]
‘angry’ [ɛŋi:] *[gɛŋi:]

5. Questions

5.1. Why is the Domain of CH the Foot?

1. Analysis as involving head-dependent asymmetries requires reference to a domain where such asymmetries are independently motivated in adult grammars.
2. The foot has been proposed to be a possible domain for harmony in adult grammars (e.g. van der Hulst & van de Weijer 1995, Piggott 1996; see also Rose 2000 on child CH in Québec French).

- (16) **Umlaut in Korean** (data from Charette 1989 via Piggott 1996):

- a. /pam-i/ → [pæmi] ‘night’
/səm-i/ → [semi] ‘a measure’
- b. /pa:m-i/ → [pa:mi], *[pæ:mi] ‘chestnut’
/sə:m-i/ → [sə:mi], *[sɛ:mi] ‘island’

Piggott (1996):

Domain of harmony is foot; harmonic foot is right-headed:

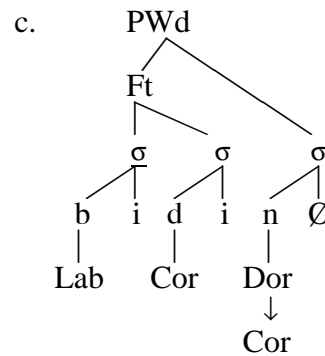
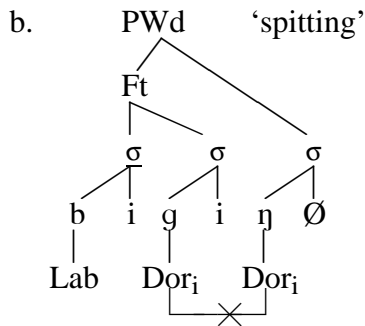
(pæmi)_{Ft} *(pæ:mi)_{Ft}

¹ There is some evidence that the complexity scale is instead Dor > Lab > Cor. For some children, labials are targets for CH from dorsals (e.g. Trevor’s ‘bug’ → [gʌg], ‘pickle’ → [gɪgʊ]; Pater & Werle 2003). As well, CH triggered by labials is less robust than CH triggered by dorsals (compare Amahl’s Lab CH ‘stop’ → [bɔp] ~ [dɔp] vs. Dor CH ‘stuck’ → [gʌk], *[dʌk] at Stage 1).

3. Empirical evidence for domain as foot is available from Dep-to-Head CH in Amahl's grammar.

(17) **Right-to-left CH in longer PWds: Final C can't trigger:**

- a. 'spitting' [bidin] *[big_iiŋ_i] (St 4)
 'running' [dΛnin] *[dΛŋ_iiŋ_i], *[g_iΛŋ_iiŋ_i] (St 1)
 'getting' [gɛdin] *[g_iɛg_iiŋ_i] (St 4)
 cf. 'ring' [g_iiŋ_i] (St 1)



4. Empirical evidence for domain as foot is available from Head-to-Dep CH in Amahl's grammar.

(18) **Left-to-right CH in longer PWds:**

- a. **Medial C can't be targeted:**
 'corridor' [gɔi:dɔi] *(g_iɔi:)g_iɔi (St 1)
 cf. 'glasses' [ga:gi:] (g_ia:g_ii:) (St 1)
- b. **Final C can't be targeted:**
 'biscuit' [bigi:] *(big_i)k_i (St 1)
 'curtain' [gə:gin] *(g_iə:g_ii)ŋ_i (St 1)

5.2. What Evidence is there that Foot-internal Onsets are Weak Licensers?

(19) **English Tapping** (Harris 1997):

pí[r]y vs. re[t]áin
 mé[r]re bou[t]íque

(20) **Danish Vocalization** (Harris 1997):

peber pé[w]er 'pepper' vs. bebude be[p]úde 'to foretell'
 modig mó[ð]ig 'brave' dedyre be[t]ýre 'to proclaim'
 koge kó[w]e or kóe 'to cook' igen i[k]én 'again'

5.3 What Evidence is there that Word-final Consonants are Onsets?

(21) **Selayarese** (Mithun and Basri 1986):

a. **Word-internal codas:**

ʔappa	‘find’	ʔandenka	‘throw’	laʔba	‘lack of salt’
allonni	‘this day’	timbo	‘grow’	seʔla	‘salt’

b. **Word-final consonants = codas (Piggott 1991, 1999)**

pekaŋ	‘hook’	sepeʔ	‘narrow passage’
potoŋ	‘style’	sassaʔ	‘lizard’

(22) **Diola-Fogny** (Sapir 1965):

a. **Word-internal codas:**

niŋaŋŋan	‘I cried’	takʊn-mbɪ	→ takʊmbɪ	‘must not...’
jensʊ	‘undershirt’	lɛt-ku-jaw	→ lɛkʊjaw	‘they won’t go’
salɛ	‘be dirty’	na-laŋ-laŋ	→ nalalaŋ	‘he returned’

b. **Word-final consonants = onsets (Piggott 1991, 1999):**

fumo:məf	‘the trunk’	ufe:ɡɪr	‘three’	famb	‘annoy’
wopus	‘green caterpillar’	irok	‘I am fat’	jawac	‘to swim’

(23) **Yapese** (Jensen 1977):

a. **Word-final consonants = onsets (Piggott 1991, 1999):**

laat	‘type of tree’	magad	‘lime container’	taaŋ	‘song’
garik	‘stinging jellyfish’	pilig	‘to take down’	lik	‘its root’
lukur	‘stick to pick up food’	danoop	‘the world’	faraf	‘floor’

b. *lukkʊr *piltig *dandoop *fardaf

(24) **Typology for Syllabification of Post-nuclear Consonants** (Goad & Brannen 2003):

Word-internal codas	Word-final consonants	Languages
Yes	Onset	Diola-Fogny, French
Yes	Coda	Selayarese, Japanese
No	Onset	Yapese, Kamaiurá
No	Coda	--

(25) **Phonetic Correlates of Final Onset Status** (Goad & Brannen 2003):

- Word-final consonants which are syllabified as onsets may be characterized by release properties similar to those observed for onsets which are followed by phonetically-realized nuclei.
- It would be highly unlikely for fortis release (e.g. aspiration) to be systematically present on a coda. Neutralization is typically observed in this position, and consonants which undergo laryngeal neutralization are often unreleased.

Yapese (Jensen 1977:27), Sierra Popoluca (Elson 1947), and Nez Perce (Hoard 1978): voiceless stops which are followed by phonetically-empty nuclei are ‘aspirated’.
European French: All word-final consonants overtly released (Tranel 1987).

- (26) **Children's Grammars:**
- Distributional evidence:**
Word-final consonants emerge before word-internal codas.
 - Fortition:**
The final stop in CVC outputs may be aspirated, nasally released, or lengthened (fortis release)
 - Conclusion:**
Final consonants are syllabified as onsets.
- (27) **Fortis Release in English:**
- Hildegard (~1;10)** (Leopold 1970):
[wek(ə) ʔap^h] 'wake up'
[mit^h] 'meat'
[bok^h] 'broke'
 - Jacob (~1;8)** (Menn 1978):
[ap^h] 'up'
[sit^h] 'sit'
[ɔk^h] 'walk'
 - Lasan (21-25 mos)** (Fey & Gandour 1982):
[dap^h] 'drop' [dabm] 'stub'
[vit^h] 'feet' [bædn̩] 'bad'
[dɔk^h] 'talk' [bɪgn̩] 'big'
- (28) **Fortis Release in Québec French:**
- Clara (~2;06)** (Rose 2000):
Target: Output:
[pa'tât] [ba'tât^h] 'thing'
[kat] [kæt^h] 'four'
[a'sjet] [æ'sjɛ:t^h] 'plate'
 - Théo (~2;6)** (Rose 2000):
Target: Output:
[bi'bit] [pə'pit^h] 'bug'
[pɪk] [pɪc^h] '(it) pricks'
[br'sɪk] [br'sɪk^h] 'overalls'
- (29) **Fortis Release in German:**
- Annalena** (Elsen 1991):
Target: Asp output (~1;6): Non-asp output (~1;8):
[fɪlɪp] [fɪlɪ-p^h] [fɪlɪ→əp] 'Philip'
[gūt] [gʊt^h] [gūt] 'good'
[dʁɛk] [dɛk^h] [dʁɛk] 'dirt'
 - Hildegard (~1;10)** (Leopold 1970):
Target: Output:
[kapʊt] [bʊt^h] 'broken'
[lɔx] [lɔk^h] 'hole'
[bet] [bet^h] 'bed'
- (30) **Amahl's Grammar:**
Word-final consonants are 'voiceless fortis' (Smith 1973: 37)

6. Head-to-Dependent (Left-to-Right) CH as Segment Licensing

- (31) **Word-final Obstruent in Longer PWds: Period 1:**
- Obstruent → ∅:
'scissors' [didə] *[didət]
'carpet' [ga:bi:] *[ga:bit]
 - Final Obstruent Not Target for CH:
'biscuit' [bigi:] *[bigik]
'chocolate' [gɔgi:] *[gɔgik]
 - cf. 'good' [gug] *[gut] (10a)

(32) **Word-final Obstruent in Longer PWds: Period 2:**

- a. Obstruent → [t]:
 ‘garbage’ [gɑ:bit]
 ‘carpet’ [gɑ:bit]
- b. Final Obstruent Not Target for CH:
 ‘necklace’ [gɛgit]
 ‘pocket’ [bɔkit]
- c. cf. ‘cat’ [gæt] (11a)

(33) **Word-final Nasal in Longer PWds: Period 1:**

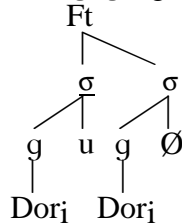
- a. Target [ŋ] Okay:
 ‘curtain’ [gə:gin]
 ‘kitchen’ [gigən]
- b. Target [ŋ] → [n]:
 ‘driving’ [waibin]
 *[waibiŋ]
 ‘shouting’ [daudin]
 *[daudiŋ]
- c. Dor Place Not Rescued by CH:
 ‘working’ [wə:gin]
 *[wə:giŋ]
 ‘taking’ [gekin]
 *[gekiŋ]
- d. cf. ‘skin’ [gin] (10b)

(34) **Word-final Nasal in Longer PWds: Period 2:**

- a. Target [ŋ] Okay:
 ‘curtain’ [gə:dən]
 ‘medicine’ [mɛdin]
- b. Target [ŋ] → [n]:
 ‘sitting’ [didin]
 *[didiŋ]
 ‘squatting’ [gɔpin]
 *[gɔpiŋ]
- c. Dor Place Not Rescued by CH:
 ‘breaking’ [be:gin]
 *[be:giŋ]
 ‘taking’ [gekin]
 *[gekiŋ]
- d. cf. ‘gone’ [gɔn] (11b)

(35) **Final Coronal Obstruent Targeted in Head-to-Dep CH (Period 1):**

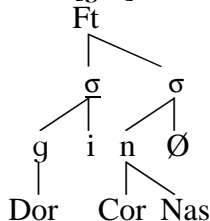
/gud/ → [gug] ‘good’:

(36) **Final Coronal Obstruent Deleted (Period 1):**

- a. *[bigit] ‘biscuit’
- b. *[bigikɪ]
- c. [bigi:]
-

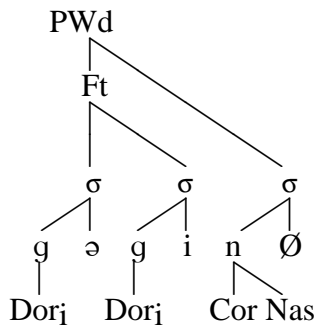
(37) **Final Coronal Nasal Not Targeted in Head-to-Dep CH (Period 1):**

/skin/ → [gin] ‘skin’:

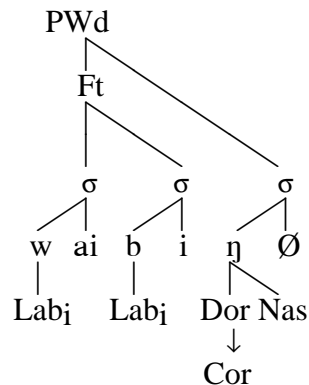


(38) **Final Nasal Preserved as Coronal (Period 1):**

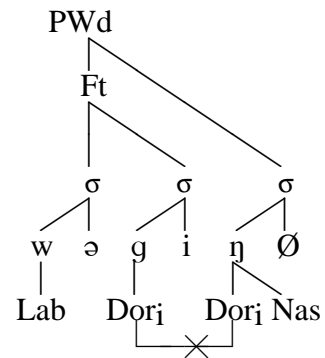
a. 'curtain' → [gə:gin]



b. 'driving' → [waibin]



c. 'working' → [wə:gin]

7. **Conclusion**

- Dep-to-Head (R-to-L) and Head-to-Dep (L-to-R) CH are both motivated by licensing: marked segmental content must be licensed by association to a prosodically-strong position.
- Dep-to-Head CH satisfies place licensing: CH permits prosodically-weak positions to bear Dor. Head-to-Dep CH satisfies segment licensing: CH rescues Dor segments in weak positions from deletion/reduction.
- The source of Head-to-Dep CH as segment licensing was determined through parallels between this type of CH and the patterns observed for word-final consonants in longer PWds: coronal obstruents are targets for CH in short words at the same time as they are deleted in word-final position in longer PWds.
- Consonants in final position in longer PWds cannot be rescued by CH, as they are outside the foot, the domain of harmony. The idea that final consonants are outside the foot required that they be syllabified as onsets of empty-headed syllables. Evidence for this analysis of final consonants in both adult and early grammars was provided.
- Concerning obstruents, both Head-to-Dep CH which targets obstruents and final obstruent deletion in longer words are overcome at the same time.
- Concerning nasals, they are not targets for Head-to-Dep CH and, not surprisingly, they are also licit in word-final position in longer PWds. Dorsal nasals are replaced by coronal in this position; as they are outside the foot, their dorsality cannot be preserved through harmony.

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