

Vowel Harmony: Prominence and Domains

Topic:

- Multiple vowel harmonies within one linguistic system.
- Case study of Servigliano.

1 Introduction

- (1) **Servigliano:** Three vowel harmony patterns
- Regressive vowel copy harmony among post-tonic Vs and proclitics.
 - Metaphony: High post-tonic Vs raise stressed e, o → [í ú] and ε, o → [é ó].
 - Regressive unstressed raising harmony within the word, excluding clitics.
- (2) *Issues*
- Domains sensitive to prosody and morphology.
 - Regressive directionality

(3) **Preview**

a **Domain**
 Copy harmony operates among the prosodically weakest vowels.
Prominence scale (Italian varieties):
 V/ó > V/Pretonic-Stem-ǒ > V/ǒ

b **Directionality**
 Regressive directionality arises from a type of anchoring constraint that enforces faithfulness at the left edge of a feature's span or association (see Cole & Kisseberth 1995ab, Walker 2001a, McCarthy 2004).

2. Servigliano – Vowel Copy Harmony

- Servigliano is a Romance language of Italy spoken in the extreme south of the Marches. (Data and description based on Camilli 1929, Maiden 1995, Nibert 1998; Other work on Servigliano includes Leonard 1978, Calabrese 1988, Kaze 1989, 1991, Flemming 1993, Dyck 1995.)

(4) **Vowel inventory:**

	Front	Back	
High	i	u	[+ATR]
Mid	e	o	[+ATR]
	ε	ɔ	[-ATR]
Low		a	[-ATR]

(5) **Unstressed mid vowel neutralization:**

/ε, ɔ/ raise to [e, o] when unstressed.

(6) **Stress:**

Main stress falls on one of the last three syllables of the word, excluding enclitics.

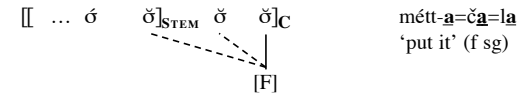
Copy harmony

- Full vowel copy harmony propagates regressively among sequences of unstressed vowels.
- Vowels that control harmony are (a) final in the clitic group constituent, i.e. a final stem vowel or enclitic vowel, and (b) the last proclitic vowel.

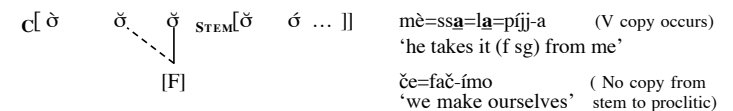
Schematically:

C notates clitic group (Nespor & Vogel 1986, Hayes 1989)

(7) a. **Vowel copy initiated by final vowel in C** *Exx.*



b. **Vowel copy initiated by last proclitic vowel**



Post-tonic data

- Trigger may be a stem vowel (8) or a clitic vowel (9).
- Copy occurs for all five unstressed vowel qualities.
- A stressed vowel blocks copy harmony.
 (Below “-” denotes affixes and “=” clitics.)

(8) *Vowel copy controlled by final stem vowel*

a. <u>Verb</u>			
préd[o]k-o	'I preach'		
préd[a]k-a	'he preaches'		
préd[i]k-i	'you preach'	[é] → [é] by metaphony	
b. <u>Noun</u>			
pérs[a]k-a	'peach tree'		
pérs[u]k-u	'peach'	[é] → [é] by metaphony	
pérs[i]k-i	'peaches'		
doménn[a]k-a	'Sunday'		
doménn[e]k-e	'Sundays'		

(9) *Vowel copy controlled by final clitic vowel*

a. <u>Verb</u>			
métt-[a]=č[a]=la	'put it (f sg)'		
métt-[e]=č[e]=le	'put it (f pl) there'		
mítt-[u]=č[u]=lu	'put it (m sg) there'	[é] → [i] by metaphony	
mítt-[i]=č[i]=li	'put it (m pl) there'		
cf. /mett-i/ → míti	'put; 'će	'there'	
b. <u>Noun</u>			
stómm[u]k-u	'stomach'		
stómm[i]k-i	'stomachs'		
párd-[u]=tu	'your father'		
cf. pátr-[e]	'father'		
mátr-[a]=ta	'your mother'		
cf. mátr-[e]	'mother'		

Proclitic data

- Unstressed proclitic vowels fully assimilate to final proclitic vowel (10a).
- A stressed vowel blocks copy harmony (10b).
- Copy does not affect pretonic stem vowels, nor do they initiate copy (10c).

(10) *Vowel copy controlled by final proclitic vowel*

a. t[o]=lo=dík-o	'I tell it (neut) to you (sg)'	cf. te 'to you'
č[i]=li=métt-o	'I put it (m pl) there'	cf. će 'there'
tt[u]=lu=šígn-a	'he marks it (m pl) down for you (sg)'	cf. te 'for you'

b. mè=ss[a]=la=píjj-a	'he takes it (f sg) from me'	cf. se = reflexive pro.
tè=čč[o]=lo=dák-o	'I give it (neut) to you (sg)'	cf. će = reiterative pro.
me=ttè=ss[a]=la=píjj-a	'he takes it (f sg) from me'	
c. jje=ttunn-fmo	'we cut it/them'	
stommekós-a	'nauseating' (f sg)	
bokkal-ó	'foolish' (m sg)	
bbisuñ-ímo	'we need'	

(11) **Summary: Copy harmony**

- Full vowel assimilation across syllables.
- Strictly regressive.
- Operates among unstressed vowels in the clitic group constituent, excluding pretonic stem vowels.
- Stressed vowels block copy harmony.

(12) **Theoretical issues:** Some constraint types proposed to contribute to directionality and control in vowel harmony:

- Feature alignment (e.g. Kirchner 1993, Akinlabi 1994, Cole & Kisseberth 1995ab, Pulleyblank 1996, Archangeli & Pulleyblank 2002).
- Faithfulness to a word-edge syllable (especially root-initial) (Beckman 1997, 1998, see also Kaun 1995, Walker 2001b, Sasa 2001, among others).
- Faithfulness between stems and their affixed forms (achieving cyclicity) (Baković 2000).

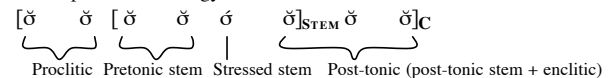
(13) **Problem:**

- Directionality and trigger control do not follow from approaches in (12). (To be revisited in §4). (For related discussion on difficulties in obtaining directionality effects and control in harmony, see Hyman 2002, Sasa 2003).

3 Analysis

3.1 Triggers and the harmony domain

(14) Descriptive terminology



- (15) **Proposal**
Vowel copy operates among prosodically weakest vowels in the language.
- Unstressed vowels are less prominent than stressed (e.g. shorter, lower amplitude).
 - Pretonic stem vowels show evidence of strength intermediate between stressed vowels and other unstressed vowels in other Romance languages.
 - *Brazilian Portuguese* – Less shortening in pretonic syllables than in post-tonic syllables (Major 1992, Crosswhite 1999, 2004).
 - *Italian (central dialects)* – Vocative forms delete all material to right of the stressed vowel. Pretonic content remains intact (Maiden 1995).
 - *Northern Salentino* – Neutralizing round and back harmony operates among post-tonic syllables but not pretonic ones (Sluyters 1988).
 - *Sant’ Oreste (Lazio)* – Historical neutralization of vowels generally occurs only in post-tonic syllables (Maiden 1995).
 - *Southern Lucanian* – [a, ə, u] occur in pretonic syllables but generally only schwa in post-tonic syllables (Maiden 1995, Crosswhite 2004).
 - *Romanian* – Immediate pretonic syllables are longer than other unstressed syllables occurring earlier in the word (Hualde & Chitoran 2003).
 - *Spanish* – A durational cline: Stressed > Pretonic > Prepretonic (Hualde & Chitoran 2003, Hualde 2004).
- Strength in pretonic syllables is also documented in Slavic. For example, Rhodope Bulgarian shows less vowel reduction in pretonic syllables than in post-tonic syllables (Crosswhite 1999) and Russian shows less vowel reduction in immediate-pretonic syllable than in other unstressed syllables (Crosswhite 1999, 2004; note also Bethin 2004 on pretonic length in other Slavic dialects).

- (16) **Prominence scale** (Italian varieties):
V/Strong (ó) > V/Weak (Pretonic stem) > V/Extra-Weak (Post-tonic, Unstressed clitic)

- (17) ***V-Feature/ σ_{XWEAK}**
Incurs a violation for each featural autosegment associated to an extra weak syllable.
(See Beckman 1997 on harmony triggered by minimizing autosegments.)
- For expositional convenience, *V-Feature/ σ_{XWEAK} is a cover constraint for *V-Feature constraints pertaining to individual features: [back], [rd], [high], [low].
 - Restriction to (extra) weak vowels informed by functional motivations below.

Functional motivations for vowel copy harmony

- (18) **Contrast minimization**
- Unstressed vowels are perceptually weak. Consonants have capacity to carry much/all contrastive information in clitics.
 - *Neutralization of contrast is accomplished by copy harmony across weak syllables.*
- (19) **Rhythmic**
- Italian is argued to disfavor successions of durational contrasts in its syllables, suggested to assist in perception of the language’s rhythm as syllable-timed (Farnetani & Kori 1990).
 - Among Farnetani & Kori’s findings:
 - Sequences of unstressed syllables in Italian are common (up to four syllables).
 - Within unstressed sequences, syllables do not vary much in length.
 - Absence of word-final lengthening and unsystematic occurrence of phrase-final lengthening contributes to uniformity of unstressed vowel duration.
 - Secondary stress in compounds is often not realized.
 - *Vowel copy harmony contributes to consistency of duration in sequences of unstressed syllables, which contributes to syllable-timed rhythm. Also diminishes prominence*
- (20) **Articulatory**
- Certain vowel harmonies are suggested to arise from maximizing V-to-V coarticulation and/or as a perceptual result of V-to-V coarticulation. (e.g. Ohala 1994, Steriade 1994, Majors 1998, Beddor et al. 2001, Kaun 2004.)
 - *Maximizing V-to-V coarticulation might play a motivating role here.*

3.2 Directionality

- (21) **Implementation as a type of Anchoring**
- Anchor constraints combine faithfulness and reference to edges (McCarthy & Prince 1995).
 - Example: LEFT-ANCHOR-IO: The left edge of the word in the input corresponds to the left edge of the word in the output.
 - Versions of ‘Anchor’ constraints which enforce faithfulness at the edge of a feature or tone’s span/associations have been suggested (though not all are labeled anchoring) (Cole & Kisseberth 1995ab, Myers 1997, Walker 2001a; see McCarthy 2004 for implementation in terms of faithfulness to heads of feature spans and constraints on span head location).

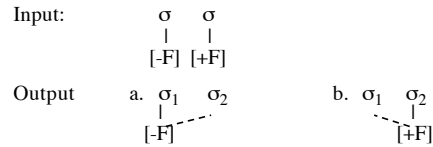
Edge-faithfulness for feature associations

(22) **IDENT-IO(F)-Right**

“The rightmost association of a feature is faithful.”

Let α be a segment in the input and β its correspondent in the output. If β is the rightmost segment to which an occurrence of feature [F] is associated, then α and β must have identical specifications for [F].

(23) Output (a) below violates IDENT-IO(F)-Right but (b) obeys it:



Result

Regressive directionality results from requirement that right edge of a feature’s associations be faithful.¹

3.3 Constraint ranking

- For each feature showing regressive harmony, there is an active IDENT-Right constraint. IDENT-IO(V-Feature)-Right is used as a cover constraint.

(24) **IDENT-IO(V-F)-Right >> *V-Feature/ σ_{XWEAK} >> IDENT-IO(V-F)-Left**

- Retains features on rightmost vowel in a copied sequence and prevents harmony from a preceding stressed syllable. For simplicity, one * is marked for each cluster of vowel features.

(25)

/mett-i=če=la/	IDENT-IO(V-F)-R	*V-Feature/ σ_{XWEAK}
☞ a. métt- a =č a =la Regressive copy		*(a)
b. métt- i =č i =li Progressive copy	*!	*(i)
c. métt- e =č e =le Bidirectional copy	*!	*(e)
d. métt- i =č e =la No copy		*(i) *!(e) *(a)

¹ A possible alternative means of obtaining directionality is to make use of a targeted version of the harmony-driving constraint (Wilson 2003, Hansson 2006). On consonant harmony at a distance, see Hansson (2001) for a proposal to capture leftward consonant harmony via targeted constraints and Rose & Walker (2004) on precedence sensitive faithfulness constraints.

(26) **Summary: Analysis of copy harmony**

Vowels that participate in copy harmony

- Weakest vowels in terms of prominence.
- Contrast minimization:** Harmony neutralizes contrast in perceptually difficult positions.
- Rhythmic Uniformity:** Copy harmony improves uniformity of syllable timing in sequences of unstressed vowels.
- Coarticulation:** Copy harmony maximizes V-to-V coarticulation across unstressed syllables. Minimizes number of gestures.

Directionality of copy harmony

- Obtained by edge-anchored version of IDENT-IO(F).
- *V-Feature constraint, which drives harmony, is nondirectional.

4. Alternatives: Some previous approaches to directionality

Leftward feature alignment or spreading

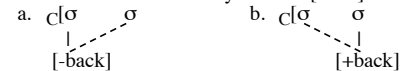
(27) ALIGN-[back]-L

Align the left edge of every [back] feature with the left edge of the clitic group constituent.

Problem

- Will not accomplish leftward directionality here. Alignment constraints are evaluated over outputs only.

(28) Structures below both satisfy ALIGN-[back]-Left:



Word-final faithfulness

- Word-final faith is argued to play a role in certain vowel harmony processes. (Hyman 1998, Krämer 2001, Sasa 2003, Walker 2005; other applications discussed by Curtin 2002, Petrova et al. 2006. Note also Steriade 1994, Barnes 2002.)

(29) WF-IDENT-IO(F)

An output segment in the word final syllable and its input correspondent must have identical specifications for feature [F].

Problem

- Not clear that clitics should hold the status of “word.”
- Even if clitics are words, word-final faith does not determine which word-final syllable will control harmony.

(30) Structures below both each contain two syllables that violate WF-IDENT-IO(F):
(Prosodic phrasing after Nibert 1998.)

/mett-i=čce=la/ 'put it (f sg) there'

a. [[métt]ₐ [čca]ₐ [la]ₐ]C b. [[métti]ₐ [čci]ₐ [li]ₐ]C c. [[métte]ₐ [čče]ₐ [le]ₐ]C

(31) Further points

- Forms in (30a-c) will tie even if word-final faithfulness is used together with leftward feature alignment.
- Faithfulness to a clitic group final syllable would not resolve the problem because regressive harmony likewise holds in unstressed proclitic sequences.

Stem - affixed stem faithfulness

- Obtains certain directionality effects via "cyclicality" (Baković 2000).

(32) SA-IDENT[F]

A segment in an affixed form [*Stem + affix*] must have the same value for the feature [F] as its correspondent in the stem of affixation [*Stem*].

- Not applicable here. Vowel that controls harmony is rightmost in unstressed sequences – in many cases not contained within an embedded stem constituent.

5. Raising harmonies

Metaphony

- Post-tonic [i, u] raise stressed e, o → [i u] (33a), and ε, o → [e, o] (33b).
- Trigger vowel may be a stem vowel or an enclitic vowel.²

(33) a. kr[é]d-o kr[f]d-i 'I/you believe'
 m[é]tt-o m[f]tt-i 'I/you put'
 kw[é]st-o kw[f]st-u 'this' (neut/m sg.)
 p[é]s-a p[f]s-u 'heavy' (f sg/m sg.)
 métt-[e]=č[e]=le mít-[u]=č[u]=lu 'put it (f pl/m sg) there'
 fj[ó]r-e fj[ú]r-i 'flower' (m sg/m pl.)
 p[ó]č-e p[ú]č-i 'flea' (m sg/m pl.)
 r[ó]šš-a r[ú]šš-u 'red' (f sg/m sg.)
 skjif[ó]s-a skjif[ú]s-u 'fussy' (f sg/m sg.)

² Whether an enclitic vowel that is immediately adjacent to a stressed vowel triggers metaphony remains to be determined. The analysis here assumes that it does, consistent with the description of Camilli (1929).

b. mod[é]st-a mod[é]st-u 'modest' (f sg/m sg.)
 p[é]tten-e p[é]tten-i 'comb' (m sg/m pl.)
 sgw[é]z-a sgw[é]z-u 'sinister' (f sg/m sg.)
 ššw[é]rt-a ššw[é]rt-u 'eccentric' (f sg/m sg.)
 pr[é]dok-o pr[é]dik-i 'I/you preach'
 spr[ó]t-a spr[ó]t-u 'pedantic' (f sg/m sg.)
 birik[ó]kan-a birik[ó]kun-u 'apricot tree' (f sg/m sg.)
 m[ó]r-e m[ó]r-i 'he dies/ you die'
 m[ó]rt-a m[ó]rt-u 'dead' (f sg/m sg.)
 m[ó]š-a m[ó]š-u 'depressed' (f sg/m sg.)

- Stressed /i, u, a/ are not affected by metaphony:

(34) am[f]k-a am[f]k-u 'friend' (f sg/m sg.)
 d[f]č-e d[f]č-i 'he says/you say'
 m[ú]t-o m[ú]t-i 'mute' (neut/m pl.)
 p[á]tr-e p[á]tr-i 'father' (m sg/m pl.)

Unstressed raising harmony

- High vowels [i u] raise preceding unstressed e, o → [i u].
- Trigger vowel may be stressed (35a) or unstressed (35b). (The latter from description and data in Camilli 1929 and comparison with Vulgar Latin by Maiden 1995; cf. Kaze 1989, Nibert 1998).
- Stressed vowels that are high as a result of metaphony also trigger raising.
- Low [a] is transparent (35c).
- Raising does not persist to proclitics (35d).

(35) a. l[e]g-éte l[i]g-ímo 'you (pl.)/we tie'
 v[e]rd-ó v[i]rd-ú 'very green' (m sg/m pl.)
 nf[o]rk-éte nf[u]rk-ímo 'you pl/we mount'
 b[e]s[o]n-á b[i]s[u]n-ímo 'to need/we need'
 st[o]mm[e]kós-a st[u]mm[i]kús-u 'nauseating' (f sg/ m sg.)
 k[o]mm[u]n[e]k-á k[u]mm[u]n[i]k-ímo 'to communicate/
 we communicate'

(Also: p[u]tímo < *p[o]tímo 'we can,' fj[u]r[i]llítta < *fj[o]r[e]llítta 'little flowers.')

b. k[u]ntsumá < *k[o]nsumáre 'to consume'
 f[u]rmikétta < *f[o]rmikétta 'ant'
 bb[i]ššiká < *v[e]ššikáre 'to remove the bladder'

d[i]libberá < *d[e]liberáre 'to set free'
 s[u]spirá < *s[o]spiráre 'to sigh'

- c. b[o]kalétt-a b[u]kalítt-u No gloss (f sg/m sg)
 b[o]kkaal-ó b[u]kkaal-ú 'foolish' (m sg/m pl)
- d. lo=dičía 'I said it'
 se=putiría 'one could'

(36) Evidence suggesting metaphony and unstressed raising harmonies are distinct

- Blocking/transparency

[a] is transparent to unstressed raising but harmony triggered by post-tonic Vs does not persist beyond [a] (cf. Kaze 1989).

- Domain

Metaphony may involve feature linkage across a stem-clitic boundary but unstressed raising does not.

- Crosslinguistic evidence

Many of the minor Romance languages show metaphony only, i.e. raising that propagates only as far as the stressed vowel. Metaphony patterns in a number of other languages also show the stepwise raising seen in Servigliano (e.g. Maiden 1991; note also Nibert 1998).

(37) **Summary: Metaphony and unstressed raising harmony**

- Metaphony raises stressed e, o → [í ú] and ε, o → [é ó]. Has capacity to operate across clitic-stem boundary.
- Unstressed raising causes unstressed e, o to raise to [i u]; [a] is transparent. Triggers and targets belong to the word, excluding clitics.
- Regressive.

Some points of analysis not addressed in this handout:

- Stepwise raising in metaphony (see analysis of Ascrea in tomorrow's handout).
- Transparency of [a] in unstressed raising harmony (cf. discussion of transparency in tomorrow's talk).

6 Analysis

6.1 Metaphony

Licensing constraint

- Metaphony in Servigliano extends [+high] and [+ATR] from post-tonic high vowels to a stressed syllable.

(38) LICENSE([+high]/[+ATR]_{post-tonic}, ó):
 "[+high] and [+ATR] in a post-tonic vowel must be associated with a stressed syllable"

Rankings (focus here on licensing of [+High] only)

- Licensing constraint dominates IDENT-ó-IO(high) and IDENT-IO(high)-Left.

(39) LIC(+high) >> IDENT-ó-IO(high), IDENT-IO(high)-Left

/kred-i/	LIC(+high)	IDENT-ó-(high)	IDENT(high)-L
a. [☞] krídi		*	*
b. krédi	*!		

- Harmony does not (fully) raise [ε a o]: LIC(+high)/(+ATR) >> *[+high, -ATR], IDENT-IO(low).

6.2 Unstressed vowel raising

Feature extension constraint

(40) SPREAD(+high)ω

"A feature [+high] in a word must spread to all vowels in that word."

(See previous lecture handouts on issues surrounding the formalization of feature extension constraints.)

(41) Motivation

- Minimizes prominence of unstressed Vs.
- Assists in maximizing V-to-V coarticulation.
- Mitigates perceptually weak [+high] by extending its duration.

Rankings

- SPREAD(+high)ω dominates IDENT-IO(high)-L.

(42) SPREAD(+high)ω >> IDENT-IO(high)-L

/verd-u/	SPREAD(+high)ω	IDENT(high)-L
a. [☞] vir dú		*
b. verdú	*!	

- IDENT-IO(high)-R >> SPREAD(+high) ω obtains regressivity.

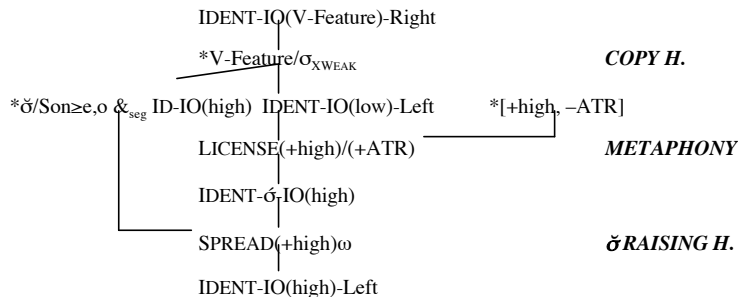
(43) IDENT-IO(high)-R >> SPREAD(+high) ω

/delibbera/	IDENT-(high)-R	SPREAD(+high) ω
a. $\text{d}\text{il}\text{i}\text{b}\text{ber}\acute{\text{a}}$		**
b. $\text{del}\text{i}\text{b}\text{ber}\acute{\text{a}}$		***!
c. $\text{dil}\text{i}\text{b}\text{bir}\acute{\text{a}}$	*!	*

(44) Further details

- IDENT- σ -IO(high) >> SPREAD(+high) ω to obtain:
salút-a=ma=la ‘greet (imper.) her for me’ *salát-a=ma=la
- * $\check{\sigma}$ /Son \geq e,o & seg IDENT-IO(high) >> SPREAD(+high) ω to obtain:
delibberá → dilibberá ‘to set free’ *deleberá, *dalabbará

(45) **Ranking summary**



7. Conclusion and Further Issues

(46) *Servigliano*

- Three distinct but interacting vowel harmonies.
- Harmonies show different degrees of force, a consequence of each harmony-driving constraint’s ranking with respect to faith.
- Copy harmony has capacity to create a (local) trigger for metaphony, which in turn can create a (local) trigger for unstressed raising harmony.

- Harmonies show interaction with morphology and prosody:

Morphology

- Capacity to define domain of harmony-driving constraint (*word* – unstressed raising harmony).
- Reduction via harmony in weak positions (*clitic* – copy harmony).

Prosody

- Capacity to characterize strong targets (*stressed syllable* – metaphony)
- Reduction via harmony in weak positions (*unstressed (post-tonic) syllables* – copy and unstressed raising harmony).

(47) **Some further issues for harmony in general**

- Is harmony a unitary phenomenon?*
 - Evidence points to a negative answer. Compare different properties and constraints involved in long-distance consonant harmony, metaphony (weak triggers/strong targets), feature extension. Plus potentially epiphenomenal harmony in epenthetic vowels.
 - But definitely room for progress on sharpening/narrowing the set of constraints active in harmonies.
- What does harmony share in common with other phonological processes?*
 - Metaphony is connected here with “licensing,” which has diverse applications in phonology (see also tomorrow’s handout).
 - Further exploration needed on degree to which other constraints active in harmony systems are harmony-specific or have a wider function (the latter being desirable theoretically).
- The too-many-solutions problem*
 - A problem that is not specific to harmony in OT, but which confronts the majority of work on harmony in OT. Recent proposals have been advanced by Baković (2000), Baković & Wilson (2000), Hansson (2001, 2006), McCarthy (2004), Blumenfeld (to appear).
 - Further work on this topic: Can the resolution be subsumed under an approach addressing the wider problem of “too-many-solutions” in OT? To what extent is this problem phenomenon-specific or representation-specific?
- Representations*
 - Different perspectives in the literature on representations involved in harmony, e.g., autosegmental features, gestures, spans, domains.
 - Perspectives differ on whether one element is shared across all harmonizing segments or whether there may be multiple occurrences of matching features (or gestures, etc.) standing in a relation to one another. In some work this is related to the nature of the harmony itself (see, e.g., handouts on consonant harmony).

- Dual problems of transparency and locality need further attention. Some cases of putative transparency have been diagnosed as phantom, in the sense that the transparent segment undergoes harmony without perceptible effect. But a sizable residue of cases remain (some discussion in tomorrow's handout).