24.961 Harmony-1

[1]. General typology: all the vowels in a domain (e.g. phonological word) agree for some feature; action at a distance: a change in the first vowel of word in Turkish can systematically alter the final vowel, which could be many syllables away:

ılımlı-laş-tır-dık-lar-ımız-dan#mı-sın vs. sinirli-leş-tir-dik-ler-imiz-den#mi-sin?

[back]	Turkish, Finnish
[round]	Turkish, Yawelmani
[ATR]	Kinande, Yoruba, Wolof, Assamese, …
[low]	Telugu
[nasal]	Barasana
[RTR]	Arabic dialects
coronal dependents: [anterior], [distributed]	Chumash, Kinyarwanda

[2]   harmony is nonlocal and iterative

Yawelmani (i,u,a,o)

non-future	gerundive	dubitative	let's V	
xat-hin	xat-mi	xat-al	xat-xa	'eat'
bok-hin	bok-mi	bok-ol	xat-xo	'find'
xil-hin	xil-mi	xil-al	xil-xa	'tangle'
dub-hun	dub-mu	dub-al	dub-xa	'lead by the hand'
ko?-hin	ko?-mi	ko?-ol	ko?-xo	'throw'

- Suffixal vowels agree in rounding with root
- But they must have the same value for [high] (a common restriction)
- Local relation between successive syllables rather than all assimilating to first syllable

max-sit-hin	'procures for'	bok-ko	'find' imperative
ko?-sit-hin	'throws for'	bok-sit-ka	'find for' imperative
tul-sut-hun	'burns for'		

- Stem control: in some systems contrast expressed in root to which affixes (prefixes and suffixes) assimilate (Akan [ATR])

bisa	'ask'	o-bisa-ɪ	'he asked it'
kari	'weigh'	ɔ-kari-i	'he weighed it'

- In other languages affixes may contain a triggering vowel: Kinande [ATR] (Kenstowicz 2009 and references)

i	u	[+ATR]
ɪ	ʊ	[−ATR]
ε	ɔ	[−ATR]
	a	[−ATR]

- [+ATR] variants of nonhigh vowels arise from spread of [+ATR]

ε-rɪ-lɪm-a	'to cultivate'	ε-rɪ-gʊl-a	'to buy'
e-ri-lib-a	'to cover'	ε-rɪ-gʊl-ɪr-a	'to buy for'
		e-ri-huk-a	'to prepare'
		e-ri-huk-ir-a	'to prepare for'

- suffixes may contain a [+ATR] harmonic trigger

      ε-rɪ-lɪm-a   'to cultivate'

      mo-twɐ-lim-**ir**-e 'he cultivated' recent past

      o-mu-lim-**i**   'farmer (agentive)'

[4] domains and direction

- in Johore Malay (Onn 1980) vowels, glides, and laryngeals are nasalized after a nasal consonant

mĩnõm	'to drink'	baŋõn	'to rise'
mãkan	'to eat'	pəŋãw̃ãsan	'supervision'

- in Mbya (Thomas 2010) contrast of nasal vs. oral vowels on final (stressed) syllables
- nasality spreads leftward from final nasal vowel as well as any nasal consonant to nasalize voiced segments and skips over voiceless ones
- thus a word contains a nasal span followed by an oral span
- an underlying nasal consonant plus oral vowel is realized as a prenasalized stop

<u>kãmᵇɯ</u>	'milk'	<u>tʃãkã</u>	'wood'
<u>ɲ̃ãnᵈe-reko</u>	'our life'	tʃe-ro	'my house'
<u>ɲ̃ãnẽ-mᵇaraka</u>	'our guitar'		

- In Kinande [a] is a blocker for left-to-right harmony but not for right-to-left harmony

      e-ri-liban-**ɪr**-a 'to disappear' applicative

      e-ri-sis-**ir**-a to cut hair' applicative

      mo-twɐ-lim-**ir**-e 'he cultivated' recent past   -ir

[5]   blocking: *opaque* vowel blocks spread of harmonic feature

Tangale (Kidda 1986)

	i	u	e	o	ɪ	ʊ	ɛ	ɔ	a
high	+	+	−	−	−	−	−	−	−
low	−	−	−	−	−	−	−	−	+
back	−	+	−	+	−	+	−	+	+
ATR	+	+	+	+	−	−	−	−	−

Roots: ŋʊldɛdɛ   'frog'   kelluŋ 'pot'
Suffixes: tuk-ko   'hid'   kʊk-kɔ 'brewed'
             peer-no   'compel me'   pɛd-nɔ 'untie me'

unpaired /a/ triggers [−ATR]
             sa-gɔ   'ate'

/a/ blocks harmony
             peer-na-n-gɔ   'compelled me'
             pɛd-na-n-gɔ   'untied me'

[6] *transparent* (aka *neutral*) vowel allows harmonic change to pass through: Finnish

	i	e	ä	y	ö	o	a	u
high	+	−	−	+	−	−	−	+
low	−	−	+	−	−	−	+	−
back	−	−	−	−	−	+	+	+
round	−	−	−	+	+	+	−	+

- Harmony for [back]

      tava-ta   'to meet'   sor-taa   'to oppress'
      tykä-tä   'to like'   kään-tää   'to turn'

- [i] and [e] trigger front vowel harmony in affixes

      piir-tää   'to draw'
      men-nä   'to go'

- [i] and [e] may co-occur with back vowels in roots

      filma-ta   'to film'   ruve-ta 'to start'   naivi 'naïve'

- [i] and [e] allow harmony to pass over them

  ruve-ta   'to start'

  tyyne-ys   'calmness'   kodi-kas   'cozy'

  kaune-**us**   'beauty'   väri-k**ä**s   'colorful'

[7] For OT harmony poses several challenges

- what is trigger motivating the harmonic change?
- what is the domain? How is directionality expressed?
- how are opaque and neutral vowels accounted for?

[8] Agree constraints (Bakovic 2000)

- Harmony is motivated by a constraint requiring Agreement for a feature [F] between vowels in adjacent syllables in a domain such as the word
- Conflict resolved by positional faithfulness to root, initial, final, or stressed vowel
- Opaque vowel reflects a feature co-occurrence restriction

  Tangale: Ident-[ATR]Root, Agree[ATR] » Id-[ATR]

/kuk-kɔ/	Id-ATR$_{root}$	Agree[ATR]	Id-ATR
> kuk-ko			*
kuk-ɔ		*!	
kʊk-kɔ	*!		

  *[+low, +ATR] » Agree[ATR]

/peer-na-n-go/	*[+low, +ATR]	Agree[ATR]	Id-ATR
> peernangɔ		*	*
peernɐngo	*!		*
peernango		**!	

[9] Wilson (2003, 2006)

- Calls attention to problems with Agree that allows for unattested repairs: Tangale cont'd

/ɗob-ʊɗ-na-m-go/	Id-root	*[+low, +ATR]	Agree[ATR]	Ident-[ATR]
> ɗobʊɗnamgɔ			*	*!
ɗobʊɗnɐmgɔ		*!		
☹ ɗobʊɗnamgɔ			*	
ɗɔbʊɗnamgɔ	*!			

- With Agree there is a tie between maximal extension of the harmonic domain up to the neutral vowel and more minimal extensions: $[+ATR]$ $[+ATR]$ ……$[-ATR]$ vs. : $[+ATR]$ $[-ATR]$ ……$[-ATR]$; each results in a single disharmonic transition and so faithfulness should favor the minimal change[1]
- But this is incorrect: harmony extends up to the opaque vowel
- Also Agree cannot handle directionality: all vowels in a stem should either agree or not; no partial spans as in Malay pəŋãw̃ãsan

[10] Align-[F]

- Harmonic feature is aligned with the left/right edge of the domain (word) by multiple association of the feature; penalize all segments not associated with the harmonic autosegment that intervene between the source of harmony and the right/left edge of the domain
- Can handle directionality

/pəŋawasan/	*[+cons, +nas, +cont]	Align[nasal]-Right	Ident-[nasal]
> pəŋãw̃ãsan		sa	***
pəŋãw̃ãs̃ãn	*!		*****
pəŋawasan		awa!sa	
pə̃ŋãw̃ãsan			****!

- Align extends the harmonic domain but predicts that a feature could be shifted to the edge of the word so that /ma?ap/ -> [ba?am] instead of [mã?ãp] with Align-R » Uniformity or by simply denasalizing the harmonic trigger:

/pəŋawasan/	*[+cons, +nas, +cont]	Align[nasal]-Right	Ident-[nasal]
> pəŋãw̃ãsan		sa!	***
©pəgawasan			*

- Like Agree, it optimizes by minimizing the number of disharmonic segments and so it could be satisfied by deleting segments to shorten the domain or blocking epenthesis in a harmonic domain but letting it apply elsewhere

[11] Spans (McCarthy 2004)[2]

- *Span* is defined as a sequence of segments associated with the same autosegment
- The *head* of a span is the segment corresponding to the origin of harmony in the input; it is associated with a faithfulness constraint for that feature

---

[1] This is sometimes called "sour grapes" meaning that if the rule cannot be completely satisfied, then it will fail to apply at all.

[2] Span theory develops ideas of the Optimal Domains model of Cole & Kisseberth (1993 et seq)

- Words are parsed exhaustively into non-overlapping spans for each feature
- Harmony is motivated by a constraint against adjacent spans for a particular feature

    *Ajacent-Span(F): assign one violation mark for every pair of adjacent spans for feature F

- Basic harmony ranking: *Aj-Span[F] » Faith-Head [F] $_{root}$ » Faith-Head [F]

    Tangale (cont'd)

/kuk-kɔ/	*Aj-Span[ATR]	Faith-Head [ATR] $_{root}$	Faith-Head[ATR]
> [ku̲kko]			*
[ku̲k][kɔ̲]	*!		
[ku̲kkɔ]		*!	

- Directionality can be analyzed by constraints requiring left- or right-headed spans

    Mbya (cont'd)

/ɲane-maraka/	Head-Rt	Head-Left	*Aj-Span[nasal]
>[ɲ][ãn̲][ẽ-m̲][araka̲]		****	****
[ɲã][nẽ]-[mãr̃ãkã]	***		***
[ɲ][ad̲][e-baraka]	***		***

- Blocking arises from feature co-occurrence constraints on span heads that require the combination of features that fail to harmonize to appear in the head of a span

    -Head-ATR[+low]: a low vowel must head an ATR span

    - blocks extension of the domain to include the low vowel in Tangale

/peer-na/	Head-ATR[+low]	*Aj-Span[ATR]
> [pe̲er][na̲]		*
[pe̲ernɐ]	*!	

    - extends domain up to opaque vowel

/ɗob-ʊɗ-na-m-go/	Faith-Head-root [ATR]	Head-ATR[+low]	*Aj-Span[ATR]
> ɗ(obuɗn)(agɔ)			*
ɗ(obuɗnɐmgɔ)		*!	
ɗ(ob)(ʊɗn)(amgɔ)			**!
ɗ(ɔbʊɗn)(amgɔ)	*!		*

[12] Application to Wilson's conundrums

- On the assumption that every segment belongs to a span then extending the harmonic domain minimizes the number of *Adjacent Span violations and hence spreading up to the site of the opaque segment is preferred to not doing so
- illustration with Nasal harmony
- Walker (1998) notices that there is a cross-linguistic hierarchy on blockers of nasality spread that correlates with nasalizability; she expresses this as a markedness hierarchy

$$*\underline{b} > *\underline{s} > *\underline{r} > *\underline{w} > *\underline{a}$$

- McCarthy expresses the hierarchy with requirement that these segments head oral spans

  Every Stop heads an oral span

  Every Fricative heads an oral span

  :

  Every Vowel heads an oral span

- Harmony arises from ranking the ban on adjacent nasal spans within this hierarchy
- So in Malay *Adj-Span[nasal] ranks above the constraint promoting glides and vowels as oral spans but below the constraint promoting liquid oral spans

(9) Johore Malay-type system (vowels and glides as undergoers)

/mawasa/	OBSTHDOR	FRICHDOR	LIQHDOR	*A-SPAN(nasal)	GLIHDOR	VOWHDOR
a. ☞ (m̲awa)(s̲a)				*	*	***
b. (m̲awasa)		*!			*	***
c. (m̲a)(w̲a)(s̲a)				**!		***
d. (m̲)(a̲)(w̲)(a̲)(s̲)(a̲)				*****!		

- What excludes (m̲)(a̲wasa)?

/mawasa/	Stop	Fric	Liq	*A-span	Glide	Vowel
>(m̲awa)(s̲a)				*	*	***
(m̲)(a̲wasa)		*!				**
(m̲)(a̲wa)(s̲a)				**!	*	***

Thus, in a language with no (nasal) harmony, each segment constitutes its own "harmonic" domain and faithfulness for [nasal] ranks above *A-span; recall ODT's Basic Alignment

English: Nasa [næsa] : every fricative, liquid, glide, vowel heads a [-nasal] span; every nasal consonant heads a [+nasal] span

/næsa/	FricHdOral	VowelHdOral	*Adj-Span
> (n)(æ)(s)(a)			****
(nǽs̃ã)	*!		
(nǽ)(sa)		*!	*

[13] motivations for harmony

- perceptual magnification of a feature (Walker 2005, Kaun 1995, 2004)
- extending a feature over a longer domain presumably enhances the perceptibility of that feature
- segments that are less distinct for a feature may preferentially disprefer to either undergo or trigger harmony
- Kaun (2004) observes that labiality (F2) is less pronounced in a lower vowel like [o] in comparison to [u]; in Turkish labial harmony targets just high vowels while backness harmony targets both high and nonhigh vowels
- in Western Mongolian non-high round vowels are restricted to first syllable; also there is no spread of [round] to later syllables, unlike in Turkish
- parsing: extending a feature across a word makes pairs of words more distinct (Gallagher 2010)
- articulatory motivation: (rapid) shifts from [+F] to [−F] may require more effort than leaving the articulator in a single state

[15] Transparency

- Typically consonants are transparent for vowel harmony features unless they are specified for features that are incompatible with the spreading feature such as palatality (high F2) and pharyngealization (low F2) in Arabic (Davis 1995).
- vowels can be transparent for some consonantal features such as [anterior] in sibilant harmony; but in some cases the vowel might really be retroflexed but with minimal or no auditory effect.
- genuine transparency: the neutral vowels in Finnish and Hungarian and voiceless stops in nasal harmony languages
- how to treat these cases remains an outstanding problem

- Kiparsky & Pajusalu (2003) note that if Finnish /i/ and /e/ trigger harmony on back vowels then marked segments arise: [y] and [ö] and [ä]
- For them transparency arises from constraint conjunction: Agree[back] & ([$-$back] -> [$-$low, $-$round]) : a violation is assigned if there is an agree back violation and in addition if there is a back vowel in the harmonic domain, then the vowel is also not [$-$low, $-$round]; i.e. it picks out [i,e].

/ kodi-kas/	Agree[back] & [$-$back] -> [$-$low, $-$round]	Agree [back
> kodikas		**
kodikäs	*!	*
/ piir-taa/		
> piirtää		
piirtaa		*!

Selected References

Bakovic, Eric 2000 Harmony, Dominance, and Control. Ph. D. diss., Department of
      Linguistics, Rutgers University.
Kaun, Abigail. 2004.
Kiparsky, Paul & Karl Pajusalu. 2003. Towards a typology of disharmony. Linguistic Review 20, 217-41.
McCarthy, John. 2004.Headed spans and autosegmental spreading. Unpublished, University of
      Massachusetts Amherst. ROA
Thomas, Guillaume. 2009. Nasal harmony in Mbya. MIT Generals Paper
Walker, R. 1998. Nasalization, Neutralization and Opacity Effects. UCSC Ph. D. Dissertation.
Wilson, Colin 2003 Unbounded spreading in OT (or, Unbounded spreading is local spreading
    iterated unboundedly).
_____2006. Unbounded spreading is myopic. Unpublished, UCLA.

24.961 Introduction to Phonology
Fall 2014