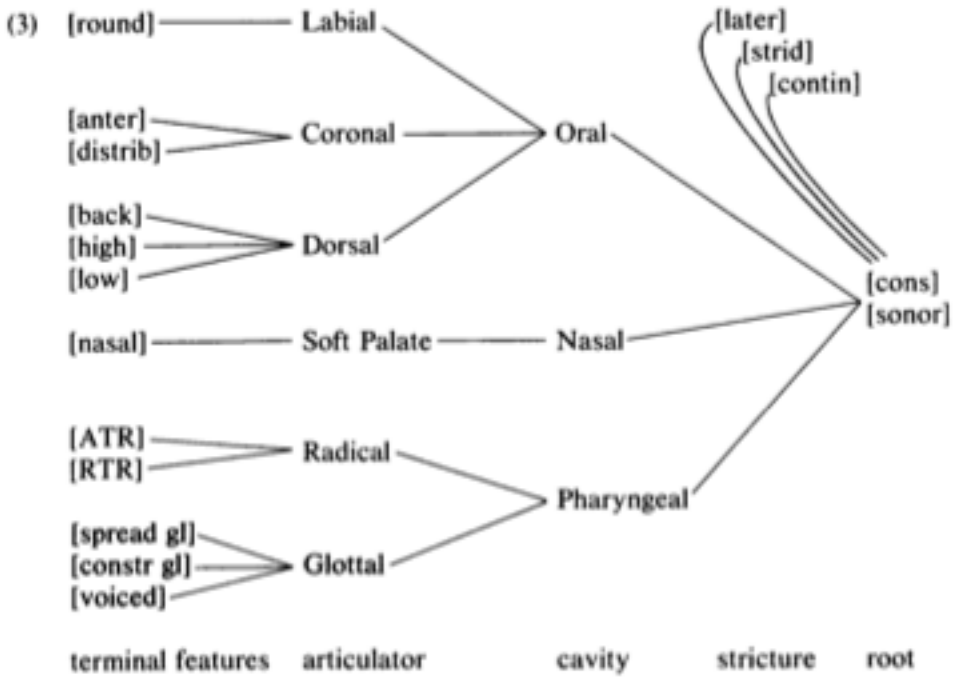
24.961 Features: 2 Organization below the Root Node

[1]. Research from 1980's by Clements, Halle, and others suggested that features are organized into a hierarchy. This general line of study was called Feature Geometry.



[2] root node: gross sound class: [consonantal], [sonorant]

cavity: pharyngeal, supralaryngeal

articulators: Labial, Dorsal, Coronal; Soft Palate, Tongue Root, Glottal (Halle 1982)

terminal features: [nasal], [voice], [anterior], [back], etc.

[3] stricture features of [continuant], [strident], and [lateral] are problematic;

- [lateral] and [strident] are almost exclusively dependents of the Coronal articulator
- most sounds have multiple articulators: e.g. [m]: Labial, Soft-Palate, Glottal
- stricture (manner) features like [continuant] must be linked to the major articulator for proper phonetic interpretation
- Halle-Sagey arrow was a device that assigned manner features to a particular articulator

[4] evidence for the hierarchy

- OCP (Obligatory Contour Principle: Leben 1973)
- Bans two successive segments that are "identical"
- Arabic root constraints defined over major articulators (McCarthy 1991): labial, coronal obstruent, coronal sonorant, dorsal, guttural
- articulators are located on separate tiers; [m b t] and [m t b] both violate OCP and so in order to fall under the *X-X rubric, the [m] must see past the [t] to be penalized by the [b]

a.	labials	[f,b,m]
b.	coronal sonorants	[l,r,n]
c.	coronal stops	[t,d,T,D]
d.	coronal fricatives	[θ,ð,s,z,S,Z,š]
e.	dorsals	[g,k,q]
f.	gutturals	[x̣,ɣ̣,ḥ,ʕ,h,ʔ]

adjacent consonants (C_1 C_2 and C_2 C_3) in triliteral C_1 C_2 C_3 roots

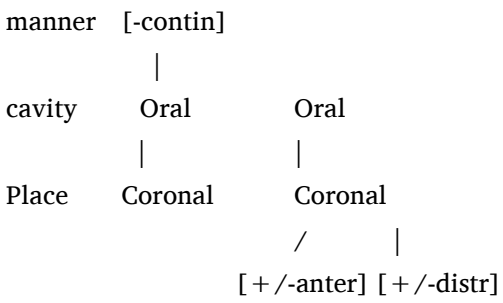
	a	b	c	d	e	f
a	0	210	125	138	82	151
b	196	15	122	161	165	208
c	118	153	7	26	29	105
d	196	211	58	5	89	168
e	118	167	66	105	1	79
f	211	252	148	182	81	11

[5] assimilation as spreading

- Single terminal feature: voicing in cat[s] vs. dog[z]; nasal in Korean /kuk-min/ > kuŋmin '(Korean) people',
- Complete assimilation: last time Tigrinya t-, Berber n-
- Intermediate node (Clements 1985)

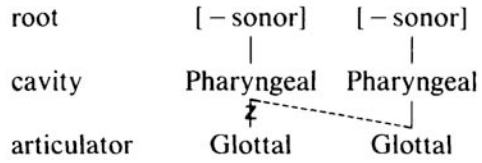
English coronal stops and nasal assimilate the minor place features of following coronal

	[t]	[d]	[n]	
____ θ	eighth	hundredth	tenth	[+distrib, +anter]
____ š	eight shoes	eight gems	insure	[+distrib, −anter]
____ r	tree	dream	enroll	[−distrib, −anter]
____ s	hats	reads	ensue	[−distrib, +anter]



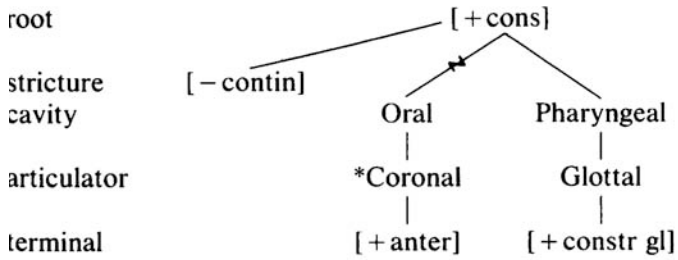
Anc. Gk: assimilation of [voice] and [spread gl] dependents of Glottal articulator

b.	trīb-ō	tɛtrīp-tai	'rub'
	grap^h-ō	gɛgrap-tai	'write'
	pɛmp-ō	ɛpɛmp^h-t^{h}ēn	'send'
	trīb-ō	etrīp^h-t^{h}ēn	'rub'
	klɛpt-ō	klɛb-dēn	'steal'
	grap^h-ō	grab-dēn	'write'



[6] reduction as elimination of parts of tree

- s > h; Caribbean Spanish: me[h], mes-e[h] 'month'
- t > ?; English glottaling of t$^?$



[7]. problems: features that spread together might not form a constituent in the articulator model

Odden 1991 Mari (Eastern Cheremis)

	i	ü	e	ö	a	ə	o	u
high	+	+	-	-	-	-	-	+
low	-	-	-	-	+	-	-	-
back	-	-	-	-	+	+	+	+
round	-	+	-	+	-	-	+	+

- back and round spread but not height
- acoustically based: color features of [back] and [round] reflected in F2 (second formant)

üp-šö	his hair	surt-šo	his house	kit-še	his hand
šös-žö	his milk	boz-šo	his wagon	šužar-že	his sister
				bokten-že	beside it

[8] spreading details

- Oral place nodes Labial, Coronal, Dorsal look past one another in Arabic OCP and hence are located on different tiers
- Padgett's (1991) Generalization: stricture features of [±cons] and [±contin] always spread along with place features in place assimilation: ft > tt, *st; nw > w̃w, *mw
- Stricture features do not spread by themselves: ps -/-> fs;
- Sudanese Arabic (Hamid 1984)

(1)	kitáab 'book'	bít 'daughter'	sámak 'fish'
	kitáa[f] Fáṭḥi	bí[t] Fáṭḥi	sáma[k] Fáṭḥi
	kitáa[p] Samíir	bí[s] Samíir	sáma[k] Samíir
	kitáa[p] Šaríif	bí[š] Šaríif	sáma[k] Šaríif
	kitáa[p] Xáalid	bí[t] Xáalid	sáma[x] Xáalid
	kitáa[p] Ḥásan	bí[t] Ḥásan	sáma[k] Ḥásan

[t]-[ʃ] -> ʃ-ʃ , *tʃ-ʃ

[9] From the OT perspective, much of the work performed by feature classes and nodes is taken over by markedness constraints

Padgett (1994, 2002) Turkish vowel harmony

(18) a.

i ü	ɯ u
e ö	a o

	i	e	ü	ö	ɯ	u	o	a
high	+	−	+	−	+	+	−	−
back	−	−	−	−	+	+	+	+
round	−	−	+	+	−	+	+	−

b.

noun	pl.	acc.	
dal	dal-lar	dal-ɯ	'branch'
kol	kol-lar	kol-u	'arm'
kɯz	kɯz-lar	kɯz-ɯ	'daughter'
kul	kul-lar	kul-u	'slave'
yel	yel-ler	yel-i	'wind'
göl	göl-ler	göl-ü	'sea'
diš	diš-ler	diš-i	'tooth'
gül	gül-ler	gül-ü	'rose'

- high vowels assimilate [round] and [back]; nonhigh vowels only [back]
- traditionally two separate rules: palatal and labial harmony
- but most Turkic lgs have reflexes of both, suggesting a single process
- feature classes are indicated by co-indexing: $[back]_c$ and $[round]_c$

(16)

UR: /son-I/	Spread(Color)	Ident
a. {[son-]$_{+B}$}$_{+R}$-I	*!*	
b. ☞{[son-u]$_{+B}$}$_{+R}$		**
c. [{son-}$_{+R}${ɨ}$_{-R}$]$_{+B}$	*!*	**
d. {[son-]$_{+B}$[ü]$_{-B}$}$_{+R}$	*!*	**
e. [{son-}$_{+R}$]$_{+B}$ [{ɨ}$_{-R}$]$_{+B}$	*!***	**

- spread of color features but dominated by markedness constraint *[−high, +round]

UR: /son-lAr/	*[+rnd, -hi]	Spread(Color)	Ident
a. {[son-lor]$_{+B}$}$_{+R}$	**!		**
b. ☞ [{son-}$_{+R}${lar}$_{-R}$]$_{+B}$	*	**	**
c. {[son-]$_{+B}$[lör]$_{-B}$}$_{+R}$	**!	**	**
d. [{son-}$_{+R}$]$_{+B}$ [{lar}$_{-R}$]$_{+B}$	*	***!*	**

positional faithfulness for root

(24)

UR: /pul-lAr-In/	Ident$_{Rt}$	*[+rnd, -hi]	Spread(Color)	Ident
a. {[pul-lor-un]$_{+B}$}$_{+R}$		*!		****
b. ☞ [{pul-}$_{+R}${lar-ɨn}$_{-R}$]$_{+B}$			***	****
c. [{pul-}$_{+R}${lar-}$_{-R}${un}$_{+R}$]$_{+B}$			****!**	
d. {[pɨl-lar-ɨn]$_{+B}$}$_{-R}$	*!			*****

[10] nasal-fricative sequence (Padgett 2002)

- In many languages nasals assimilate in place to a following stop. But before a fricative they may delete (Lithuanian), harden the fricative to a stop (Kpelle), lenite the nasal to a nasalized continuant (Polish), or fail to assimilate (English). The following typology emerges:

Lithuanian: *[+ nasal, + contin][1], Ident-[contin], Agree-Place » Max-Nasal

sa[m]-buris sa[n]-taka sa[ŋ]-kaba sa:-skambis, sa:-šlavos

/san-buris/	Agree-Place	*[+ nasal, + contin]	Ident-cont	Max-Nasal
> samburis				
/san-ska../				
> sa:-ska…				*
saš-ska		*!		
sanska	*!			
santska			*!	

Kpelle: *[+ nasal, + contin], Agree-Place, Max-Nasal, » Ident-[contin]

/N-polu/ mbolu
/N-tia/ ndia
/Nkɔɔ/ ŋkɔɔ
/N-fela/ ɱvela
/N-sua/ n**ʤ**ua

/N-sua/	Agree-Place	*[+ nasal, + contin]	Max-Nasal	Ident-[contin]
> n**ʤ**ua				*
nsua		*!		
sua			*!	

Polish: Agree-Place, Max-Nasal, Ident-[contin] » *[+ nasal, + contin]

ząb	[zamp]	tooth
węgiel	[veŋg'el]	coal
mąż	[mowʃ̃]	husband
węch	[vewx̃]	smell

/monʃ/	Ident-[cont]	Max-nasal	*[+ nasal, + contin]
> mowʃ̃			*
moʃ		*!	
montʃ	*!		

[1] Nasal fricatives are cross-linguistically marked since significant oral airflow is needed to produce a (strident) fricative but nasal sounds shunt air into the nasal cavity.

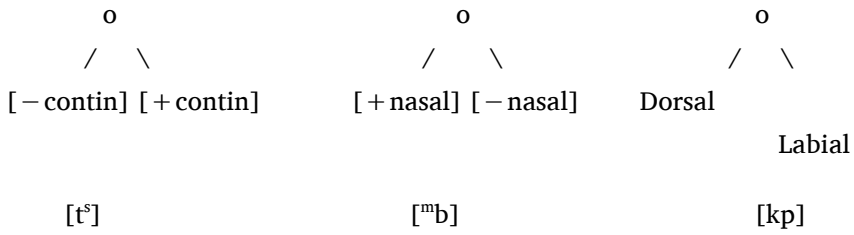
English: *[+nasal, +contin], Max-Nasal, Ident-[contin] » Agree-Place

in-ert, im-possible, im-bue, in-finite, in-valid

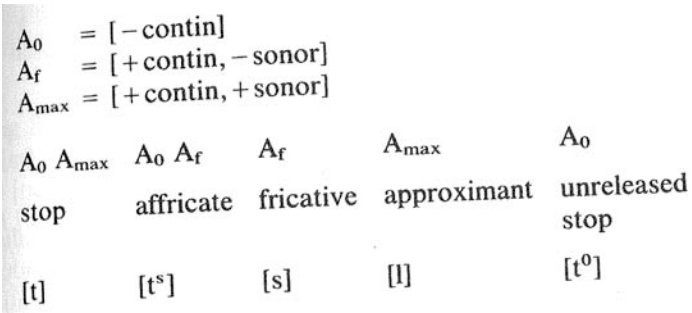
/in-valid/	Ident-[cont]	Max-nasal	*[+nasal, +contin]	Agree-Place
> invalid				*
imbalid	*!			
ivalid		*!		
iw̃valid			*!	

[11] timing within the segment

- In the classic Jakobsonian feature matrix all features in the segment are simultaneous
- But order is needed for affricates and prenasalized stops while in labio-velars like kp the two constrictions are simultaneous; a given instance of time cannot be both [+F] and [−F] but two simultaneous closures by different articulators are possible



[12] Steriade (1993) represents stops and affricates as having two phases: closure followed by release



- Release phase is attachment site for laryngeal features like [spread gl] and [constr gl]
- Loss of release entails loss of these features: cf. Korean pat^{h}-ɨl 'field, acc', pat˺ citation; nac-ɨl [d^{z}] 'day, acc., nat˺ citation
- The left face of an affricate behaves like a stop while right-face behaves like a fricative: cf. English in-justice bush-ɨz [ʃɪz] crutch-ɨz [t^{ʃ}ɪz]

Yucatec Mayan

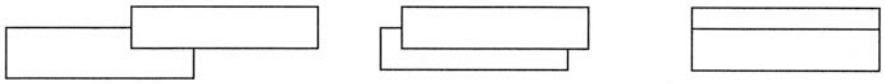
/k + k / -> [h + k], /t + $t^{ʃ}$ / -> [h + $t^{ʃ}$], /t^{s} + t / -> [s + t], [$t^{ʃ}$ + t / -> [ʃ + t]

[13] Articulatory Phonology (Browman & Goldstein 1989, Gafos 2002)

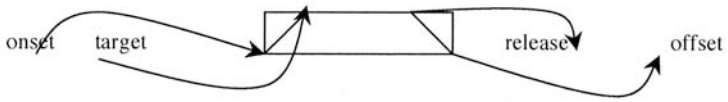
- a speech sound involves a constriction in the vocal tract
- Gesture is a representation of the constriction in terms of three simultaneous specifications

  Active articulator: tongue tip, lips, tongue dorsum, etc
  Constriction site: dental, alveolar, postalveolar, etc
  Constriction degree: max, min, etc.

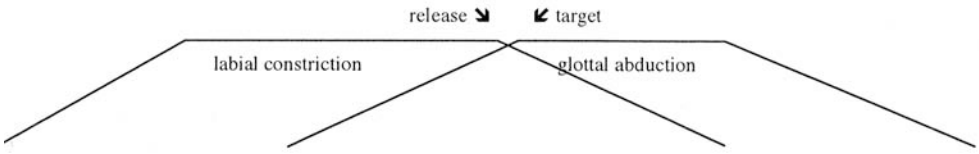
  • Pairs of adjacent gestures can stand in several degrees of overlap:



  • A precise characterization of the extent of overlap can be given if each constriction has a specified time course, and temporal landmarks: onset, target attainment point, release, offset.



  The extent of overlap is determined by the alignment of landmarks of one gesture to landmarks of another. Below: glottal abduction's target aligned to the release of oral closure, as in p^{h}.



-
- given that a gesture is single entity, assimilation involves extending the entire unit in time relative to an adjacent gesture
- the simultaneous spread of place and constriction stipulated in Padgett's Generalization then follows necessarily
- also the fact that stricture features never spread independent of place also follows: xt -/-> kt; we don't find xt > kt; but there can be dissimilation for stricture features as in tt > st
- Vowel copy within the same syllable has been represented as the "unveiling" of a vocalic articulation that occurs simultaneously with the onset consonant

  Dorsey's Law in Winnebago CRVC > CVRVC

  ʃ-wa-ʒok > ʃawaʒok you mash

hikroho -> hikoroho he prepares

- Cf. Slavic polnoglasie: CVRC > CVRVC berz-a 'birch' berez-a Russian
- The fact that the copying is most likely to happen across a liquid/sonorant could have its roots in simple co-articulation with the sonorant reflecting the formants of the adjacent vowel

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