24.961 Features-3: Underspecification

[1] Generative Phonology before OT:

- Economy of storage for lexical representations
- Predictable features assigned by rules
- Full specification at surface phonetics
- Default rules fill in redundant values

[2] English vs. Mandarin

- English contrasts voiced and voiceless (bin vs. pin) and has predictable aspirated stops; thus [0spread gl] in lexicon
- Lexical contrast is [±voice] and aspiration ([spread gl]) assigned by rule
- Mandarin has contrast of [±spread gl]
- Default rules:

[−sonorant] -> [−spread gl]	English[1]
[−sonorant] -> [−voice]	Mandarin
[+sonorant] -> [+voice]	English and Mandarin

[3] feature geometry curtails scope of some default rules; [lateral] is only relevant for coronals and so it makes no sense to assign vowels and labials [−lateral]

[4] Radical vs. Contrastive Underspecification

- Russian obstruents

  Stops: p, t, k vs. b, d, g
  Fricatives: f, s, ʃ, x vs. v, z, ʒ
  Affricates: ts, tʃ

- Contrastive Underspecification assigns /p/ [−voice] and /b/ [+voice] in the lexicon while /x/ is [0voice] and assigned [−voice] by default rule
- Radical Underspecification (Archangeli 1984, Kiparsky 1982,86) broadens the scope of the default rule to assign [−voice] to /p/ as well.

[5] Evidence: intervention effects

Russian voicing assimilation (Jakobson 1956, Hayes 1984, Kiparsky 1985)

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[1] English also assigns [+spread gl] to voiceless stops at the beginning of a stressed syllable.

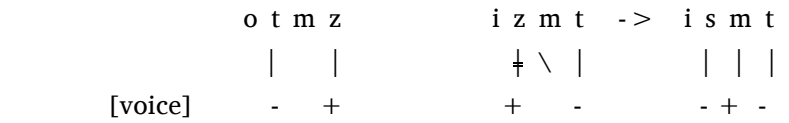
- Obstruents trigger assimilation but sonorants neither trigger or undergo

bez mamy	bes papy	bez dočeri
iz mamy	is papy	iz dočeri
ot mamy	ot papy	od dočeri

- According to Jakobson (1956) sonorants are transparent to assimilation; better attested data in Polish (Rubach 1996)

od mzdy	'from bribe'	is Mtenska	'from Mtensk'
ot Anny	'from Ann'	iz Ameriki	'from America'

- Sonorants are [0voice] until later in/at the end of the derivation



- the [-voice] of /t/ may spread to /z/ across the /m/ without crossing association lines connecting the voice tier to the Laryngeal Articulator node
- the default rule assigning [+voice] to the sonorant [m] creates an illformed autosegmental relation requiring the multiply linked [-voice] associated with /s/ < /z/ and /t/ to be fissioned into separate [-voice] feature specifications

[6] Sanskrit n-retroflexion (nati) (Steriade 1987)

	alveolar	palatal	retroflex
	t	č	ṭ
	s	š	ṣ
	n	ñ	ṇ
			r
anterior	+	−	−
distributed	−	+	−

- suffixal /n/ is retroflexed when root contains a retroflex [−anterior, −distr] consonant

-na: present	
mrd-na: 'be gracious'	iṣ-ṇa: 'seek'
-na passive participle	
bhug-na- 'bend'	pu:r-ṇa 'fill'
	vrk-ṇa- 'cut up'
-a:na middle participle	
marj-a:na- 'wipe'	pur-a:ṇa 'fill'
kṣved-a:na- 'hum'	kṣubh-a:ṇa 'quake'
-ma:na middle participle	
krt-a-ma:na 'cut'	krp-a-ma:ṇa 'lament'

process is blocked by intervening plain coronals but triggered by r, which lacks a [+distributed]counterpart

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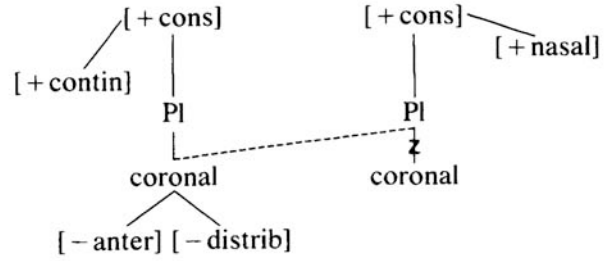

- Since the process applies across labials (cf. krp-a-ma:ṇa), the Place features are not binary but unary and on a separate autosegmental tier
- even though the target is [+nasal] and the trigger [+contin], intervening coronal stops block the rule, as in mrd-na:
- this follows if the contrast between /d/ and /ḍ/ is recorded in the lexical representation as a binary [±anterior] rather than [0anterior] vs. [−anterior]
- but the behavior of /r/ is problematic; since there is no contrast between a retroflex and nonretroflex rhotic, the [−anterior, −distributed] features would be predictable and hence might not be expected to be present at the point the rule applies
- one possible mitigating factor is that the single rhotic has the marked values for [anterior] and [distributed] and so they would be assigned by a rule that is not a default rule assigning the unmarked values of [+anterior, −distrib]
- another perspective: suppose the retroflex gesture is held after the retroflex consonant up until the next coronal consonant (not heard on vowel); it is blocked on a /t,s,n/ by faithfulness
- we will revisit this question when we look at vowel harmony in a couple of weeks

[7] Latin –alis (Steriade 1986)

nav-alis	rur-alis		
sol-aris	lun-aris	milit-aris	flor-al-is

- Dissimilation applies across n and t but not [r];

- If [n] and [t] as well as [r] are [−lateral] as postulated by radical underspecification, then the default rule assigning [−lateral] must be split: before dissimilation for [r] in order to trigger dissimilation and after dissimilation for [n] and [t] to allow the dissimilation rule to see past them
- Under Contrastive Specification this bifurcation does not arise since /r/ is [−lateral] in the lexicon by virtue of contrasting with /l/

[8] Lyman's Law (Mester & Ito 1989)

neko 'cat' + šita 'tongue' -> neko-ǰita	redaku
ori 'fold' + kami 'paper' -> ori-gami	rendaku sonorant m is [0voice]
kita 'north' + kaze 'wind' -> kita-kaze	Lyman /z/ is [+voice]
taikutsu + šinogi -> takitutsu- šinogi	Lyman /n/ is [0voice] but g is [+voice]
onna 'woman' + kotoba 'speech' -> onna-kotoba	Lyman /t/ is [0voice]

- here it appears we must treat voiceless obstruents as underspecified [0voice]
- this example is consistent with radical underspecification

[9] Kiparsky (1985) proposed that the default rule filling in contrastive feature applied in Lexical Component while noncontrastive features are assigned Post-Lexically; but this was easily and quickly falsified: predictable features like [sonorant] and syllabification are needed at the earliest stages of the lexical component for rules of prosody and redundant features like [−ATR] on low vowels is needed in some ATR harmony systems such as Kinande.

Kinande vowel phonemes	ị	ụ	[+high, +ATR]
	i	u	[+high, -ATR]
	e	o	[-high, -ATR]
	a		[+low, -ATR]

erí-sába	erí-sab-ír-a	'pray'
ẹrị́-sị́s-a	ẹrị́-sịs-ír-a	'cut hair'
ẹrí-sṵ́k-a	ẹrí-sụk-ír-a	be trapped'
eri-síg-a	eri-sig-ír-a	'wager'
ẹrị́-lị́bán-a	ẹrị́-lị́ban-**ír**-a	'disappear'

- applied suffix –ir assimilates the [+ATR] of the preceding root vowel

- in ẹrị́-lị́ban-**ír**-a the low vowel of the root lị́ban must be [−ATR] to block spread of [+ATR] from the preceding high vowel even though this feature is not contrastive in low vowels and hence should only be assigned later

[10] Phonetic underspecification: SPE assumes full specification for all features at phonological output to instruct the articulators to implement the output of the grammar; but some data suggest that this is too strong a position

Cohn (1990) contrasts the behavior of vowel nasality in Sundanese and English.

- In Sundanese a vowel is obligatorily nasalized after a nasal consonant
- respiratory mask that measures nasal and oral airflow
- compare ŋõbah vs. ŋũliat
- steady state nasal airflow in vowel (at reduced rate compared to nasal consonant)
- sharp transition to oral in [b] vs. more gradual in [l]; inference that [l] is underspecified for [nasal] and transition is interpolation between [+nasal] of [ũ] and [-nasal] of [i]
- [b] would be specified for [-nasal] by virtue of contrast with [m]; but [l] could be distinguished from [n] by [lateral]

Marshallese (Bender 1968) and Choi (1992)

- vowels contrast for four degrees of height and consonants contrast for secondary articulations of palatalization and velarization
- front vs. back is underspecified on vowels and filled in by interpolation between the consonants: [tʲe͡ʌpʷ] 'to return'

English word-medial reduced vowel varies similarly (Flemming & Johnson 2007) as in raps**o**dy, prob**a**ble, suff**o**cate

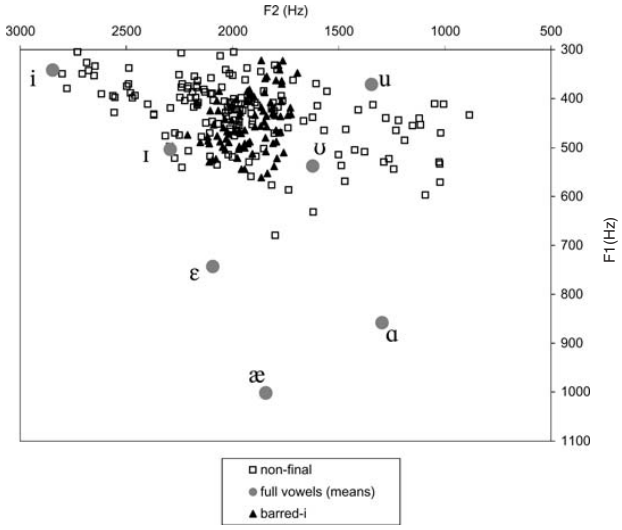

Figure 4 Formant frequencies of all tokens of non-final reduced vowels (open squares) and barred-i from minimal pairs (filled triangles).

[11] Privative features

- While some feature contrasts such as [±high] and [±back] readily show harmony for both values, for other features just one value is phonologically active and the other is largely inert: secondary articulations like labialization, palatalization, nasality, voicing.
- Some researchers hypothesize that this distinction is drawn in the representation: instead of [±round] we have just [round] and the absence of [round] is interpreted phonetically as no lip protrusion—the default state
- More controversial is extension of this proposal to [voice], [nasal]
- intervention effects and autosegments are used as a probe for such inert features: e.g. rendaku and voice in Japanese where rendaku arises from a floating [voice] and Lyman's Law defined over [voice] not voiceless and voiceless is transparent
- but reference to [−voice] is needed for the vowel length distinction in English *writer-rider* (cf. Bermudez-Otero 2014) and in many languages with right-to-left nasal harmony underlying /ama/ is realized as [ãmba] where it appears that the [−nasal] of the second vowel is spread to the preceding nasal consonant to give a prenasalized stop
- can such cases be circumscribed under the heading of "phonetic enhancements" and not part of the phonology proper?
- Elan Dresher and Keren Rice at U Toronto have pursued these questions of contrast and underspecification in a number of publications
- another diagnostic of underspecification is various asymmetries in language processing

[12] Fowler and Brown (2000)

- baCə and bãNə recorded and cross spliced to give congruent [batə] and [bãnə] and two incongruent stimuli [banə] and [bãtə]
- experimental task is to identify the medial consonant as quickly as possible; record accuracy and reaction time
- since this is the only source of vowel nasality in English, a nasal vowel implicates a following nasal consonant and an oral vowel implicates a following oral consonant
- results: congruent stimuli are faster than incongruent ones and incongruent [bãtə] is faster than incongruent [banə]
- the vowel provides information for the identity of the following consonant and the nasal vowel has different status from oral: more salient (?) or "no match" if vowel nasality is underspecified and thus the oral [a] in [banə] provides no information about the upcoming consonant

[13] Hwang, Monahan and Idsardi (2010)

- similar format to Fowler's study: cross-splicing of [uts] and [udz] and time normalized
- subjects monitor for final [s] or [z]

- in English clusters there is voicing agreement; hence [t] implicates a following voiceless consonant and [d] a following voiced one
- under full specification both [utz] and [uds] are equally ill-formed while underspecification and/or unary [voice] draws a distinction
- results: accuracy: ds < dz, ts, tz; reaction time: ds < ts, tz < dz
- interpretation: the specified [voice] of d biases subjects to expect z while the underspecified t leads to no bias and hence ts and tz are equal in accuracy while dz is fastest and ds is slowest;
- the authors interpret this as a top-down effect from the lexicon as opposed to a statistical surface phonetic effect: in casual speech voicing fades out so /dz/ may be realized as [ds] but /tz/ is never realized as [tz]. Thus, [ds] should be more accurate and faster than [tz] since speakers have experience with the former but not the latter; however, the results are the opposite; ds is less accurate and slower

Choi, John D. 1992. Phonetic Underspecification and Target Interpolation: An Acoustic Study of Marshallese Vowel Allophony. *UCLA Working Papers in Phonetics* 82.

Cohn, Abigail. 1990. Phonetic and phonological rules of nasdalization. Working Papers in Phonetics 74. UCLA.

Flemming, Edward and Stephanie Johnson. 2007. Rosa's roses: reduced vowels in American English.

Fowler, Carol and Julie Brown. 2000. Perceptual parsing of acoustic consequences of velum lowering from information for vowels. Perception and Psychophysics 62, 21-32.

Hayes, Bruce. 1984. The phonetics and phonology of Russian voicing assimilation. Language Sound Structure, Mark Aronoff and Richard Oehrle, eds. MIT Press. 318-28.

Hwang, So-One, Philip Monahan and William Idsardi. 2010. Underspecification and asymmetries in voicing perception. Phonolgy 27, 205-224.

Ito, Junko and Armin Mester. 1989. Feature predictability and feature specification. Language 65, 258-93.

Rubach, Jerzy. 1996. Nonsyllabic analysis of voice assimilation in Polish. Linguistic Inquiry 27, 69-110.

Steriade, Donca. 1987. Locality conditions and feature geometry. NELS 17, 595-618.

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