24.901 Phonological Constraints

So far we have introduced just one mechanism to express phonological generalizations: the rewrite rule in which a sound or sound sequence is altered on the basis of the phonological, morphological, or syntactic context. But there are many generalizations that are part of a speaker's knowledge of language which are more properly expressed by constraints that state static generalizations over the lexicon, the surface output, or both. These constraints may trigger or block the application of phonological rules.

[1]. Japanese native Yamato and Sino-Japanese vocabulary

kak-u	kusa	sato
'write'	'grass'	'village'
kago	kaze	kado
'basket'	'wind'	'corner'
gake	das-u	buta
'cliff'	'take out'	'pig'
*gVg	*dVz	*bVd

- Lyman's Law: two (or more) voiced obstruents are not permitted in a single stem
- A rewrite rule is not feasible since there is no unique output for a given input: a /gVg/ input could be transformed into a variety of outputs: kVg, gVk, kVk, gVŋ,
- Thus, we need a constraint on morpheme shape

*[-sonorant, +voice] …. [-sonorant, +voice]

[2] *NT

- The contrast between voiced and voiceless obstruents is suspended after a nasal in Yamato
- Only voiced obstruents are found

tombo	kangae
'dragonfly'	'thought'

- Alternations where an underlying voiceless stop is voiced after a nasal

tabe-ru	sin-u	nom-u
tabe-ta	sin-da	non-da
‘eat’	‘die’	‘drink’

- It appears that the rule of post-nasal voicing applies to satisfy the *NT constraint

[3] redaku (sequential voicing) and Lyman’s Law

- The initial obstruent of the second (head) element in a compound is voiced if Yamato (cf. English *mark-s-man*, German *Liebe-s-brief*, etc)

se	‘back’	neko-**z**e	‘hunchback
kaki	‘writing’	yoko-**g**ake	‘horizontal writing’
tosi	‘year’	hebi-**d**osi	‘snake year’
sono	‘garden’	hana-**z**ono	‘flower garden’

- Lyman’s Law blocks rendaku voicing

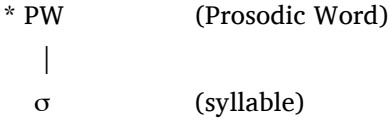
kado	‘corner’	hito-**k**ado	‘first point’
sabi	‘rust’	aka-**s**abi	‘red rust’
tubo	‘jar’	tya-**t**ubo	‘tea jar’
kurage	‘jellyfish’	denki-**k**urage	‘electric jelleyfish’
tokage	‘lizard’	ao-**t**okage	‘green lizard’

- Redundant voicing after a nasal also blocks Lyman’s Law
- If voicing after a nasal assigned by a rule then Lyman’s Law holds over the output of that rule

  kangae ‘thought’ sirooto-**k**angae ‘layman’s idea’
- Conclusion: rules controlling alternations can be blocked (e.g. rendaku) or activated (post-nasal voicing) in order to conform to a constraint (Lyman’s Law, *NT) that governs “static” generalizations of the lexicon
- Outstanding research problem: how do we formalize the relation between rules and constraints?

[4] Lardil

- Minimal word requirement: all words at least two syllables in length



- Blocks apocope rule

mayar	mayara-n	mayara-ɽ	rainbow
mela	mela-n	mela-ɽ	sea
wiɽe	wiɽe-n	wiɽe-ɽ	interior

- Triggers augmentation

yaka	yak-in	yak-uɽ	fish

- Grammar with simplest rules should allow the following derivations

/ wiɽe /	/yak/	
wiɽ	-------	V -> ∅ / __ #
wiɽa	yaka	∅ -> a / σ __ #

- Some notion of minimal departure from input to satisfy the constraint seems necessary
- Let asterisk denote a change, check denote no change

/ wiɽe /	*[σ]PW	Apocope	Epenthesis
wiɽe	√	√	√
wiɽ	*	*	√
wiɽa	√	*	*
/ yak /			
yak	*	√	√
yaka	√	√	*

- In the first case *wiɽe* has the fewest violations and so is best
- In the second case *yak* and *yaka* tie so we must prioritize the constraints so that *[σ]PW dominates Epenthesis or assigns a higher penalty
- Rendaku

/siroto-kanKae/	Rendaku	Lyman's Law	*NT
sirooto-kangae	*	√	√
sirooto-gangae	√	*	√
sirooto-gankae	√	√	*

- In order for *sirooto-kangae* to be the output Lyman's Law and *NT must have higher priority (greater weight) than Rendaku

[5] another motivation for constraints is that many rules can be interpreted as alternative repairs to the same illicit sound sequence or structural configuration

- Cross-linguistic typology (McCarthy 2002)

  *NC̥ avoid a nasal plus voiceless consonant sequence

  i. denasalization

  Toba Batak (Hayes 1986)

  /holom saɔtik/ > holop saɔtik 'somewhat dark'

  ii. nasal deletion

Standard Malay	Kelantan	Malay
pintu	pitu	'door'
hampas	hapas	'husk'

  iii. voicing consonant

  Japanese

Nonpast	past	
tabe-ru	tabe-ta	'eat'
sin-u	sin-da	'die'
yom-u	yon-da	'read'

typology

	NC̥	[+nasal] -> [-nasal]	N -> Ø	[+voice] -> [-voice]
Toba-Batak	-	+	-	-
K-Malay	-	-	+	-
Jap	-	-	-	+
English	+	-	-	-

- In same language (aka "conspiracies")

  Ilokano hiatus resolution (Hayes & Abbad 1989)

  *V V

  High vowel devocalizes to glide

  Low vowel inserts a glottal stop since low vowel glide not possible

Infin	focus	
gataŋ	gataŋ-en	'buy'
saŋit	saŋit-en	'cry'
babawi	babawj-en	'regret'
masahe	masahj-en	'massage'
maneho	manehw-an	'drive'
basa	basa-?en	'read'
saka	pag-saka-?en	'walk barefoot'

[6] Phonotactic constraints: restrictions on the possible shapes of words

- Judgements of wellformedness (Halle 1962)
  - *brick* occurring
  - *blick* nonoccurring but possible
  - *bnick* nonoccurring but impossible
- gradient judgments among nonoccurring

  bnick > *bdick, bzick*

- is this judgment derived from exisiting lexicon or does it involve some UG prior/bias?
- Albright (2008)
  - 30 monosyllabic nonwords
  - subjects rate on 7 point scale ("impossible….fine English word")
  - word pronouced to make sure proper stimulus elicited
  - a bias for rising sonority clusters obtained: bw > bn > bz,bd
  - one model for judging similarity to existing words (Generalized Neighborhood model) fails to distinguish among the unattested clusters
  - AA proposes model that invokes natural feature classes: bw and bn judged better than bz, bd because they fall under a generalized bl, br = [-contin] + [+ sonorant] schema
  - But they also fall under [-contin] + [+ consonantal]
  - Why is [-contin] + [+ sonorant] better? Possible answer: greater perceptibility of stop cues

[7] Constraints in Loanword Adaptation

Mandarin Chinese (Hsieh et al 2009)

- CVC syllable but coda restricted to [w,j,n,ŋ]
- [a] and [ɑ] in complementary distribution
- [an] and [ɑŋ] but *[ɑn], *[aŋ]
- English loans contain all four combinations of {æ,ɑ} + {n,ŋ}
- In case of conflict what decides?

English	Mandarin			
[æn]	[an]	anchovy	an.chou	31/36
[ɑŋ]	[ɑŋ]	Congo	gɑng.uo	5/7
[ɑn]	[ɑŋ]	monsoon	mɑŋ.xun	24/24
[æŋ]	[an]	tank	tan.e	9/13

- Conflict resolved in favor of phonetically more salient vowel over phonologically contrastive nasal place feature

[8] Cantonese loans from English (Silverman 1993)

9. final consonants

Stops:	sharp		[sap]			
	cut		[k^hAt]			
	Jack		[tsik]			
Nasals:	jam		[tsɛm]			
	gin		[tsin]			
	bowling		[poulin]			
s:	lace		[leisi]			
	office		[ɔfisi]			
clusters:						
band	[pɛn]	shaft	[sɐp]	notes	[nuksi]	
friend	[fɛn]	post	[p'ousi]	tips	[tipsi]	
pump	[pɛm]	cast	[k'asi]	licence	[laisɐn]	
stamp	[sitam]	toast	[tɔsi]	inch	[intsi]	
sink	[siŋ]	waist	[wɐisi]			
		yeast	[isi]			
foul	[fAu]	fight	[fAi]			

10. initial cluster reduction
    - disyllabic minimal word preference
    - no complex onsets or codas
    - sC clusters repaired by epenthesis while CR repaired by deletion of liquid--a contrast in contextual saliency
    - but, liquid is retained if output would fall below two syllables (Silverman)
    - data from Chan & Kwok '82 and other sources

CR deleted		CR preserved	
printer	p'ɛn.t'a S 92	brake	pik.lik
broker	puk.k'a	cream	kei.lim
floorshow	fosow	fluke	fu.luk
freezer	fi.sa	clean	ki.lin S 92
place	p'ei.si	flea	fu.li S 92
professor	pou.fa.sa	blonde	pi.lan S 92
high-class	hai.k'a.si	pleat	p'i.lit S 92
blender	p'ɛn.ta S '92	plum	pow.lamY '93
strawberry	sitawpeley Y '93	print	p'i.lin S '92

proton	pow.ton S 92
price	p'ay.si S 92

exceptions

friend	fɛn	dacron	dik.k'ɛk.loeŋ
gross	lɔ	brandy	pɐt.lan.tei
		clutch	kik.lik.tsi

striking contrasts

- fluke > fuluk vs. place > pheisi and blonde > pilan vs. blender > phenta

24.901 Language and Its Structure I: Phonology
Fall 2010