

Phonology:  
Contrast and complementary distribution

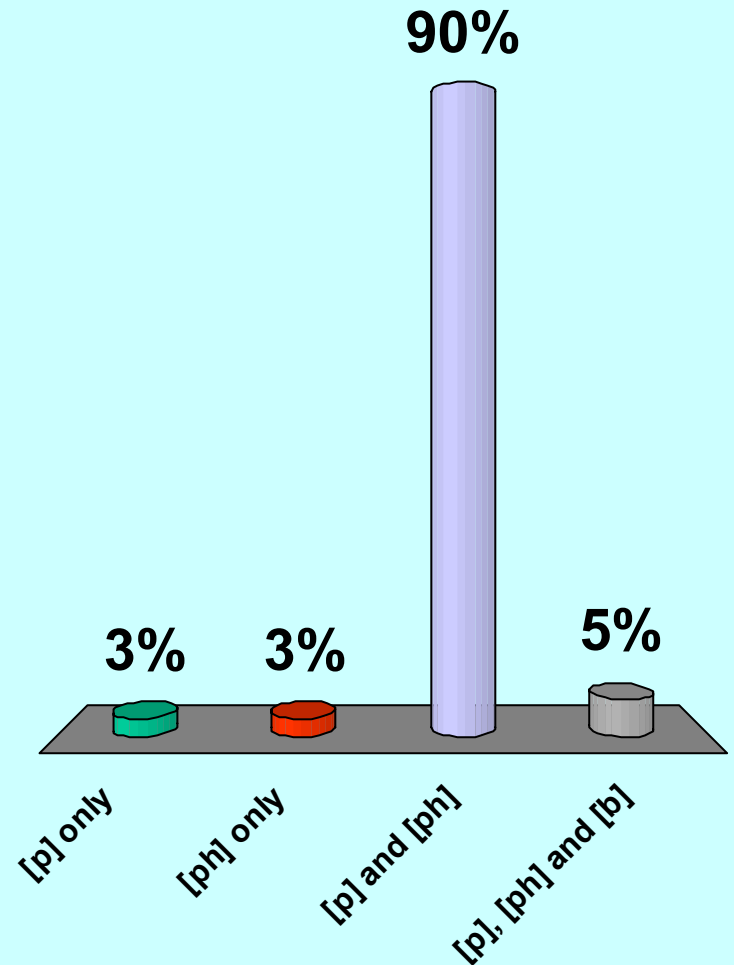
LING 200  
Spring 2006

# Phonemic vs. phonetic representations

- Phonetic representation
  - directly observable
  - contains measurable properties
- Phonemic representation
  - inferred, not observed
  - abstract, streamlined representation of sound

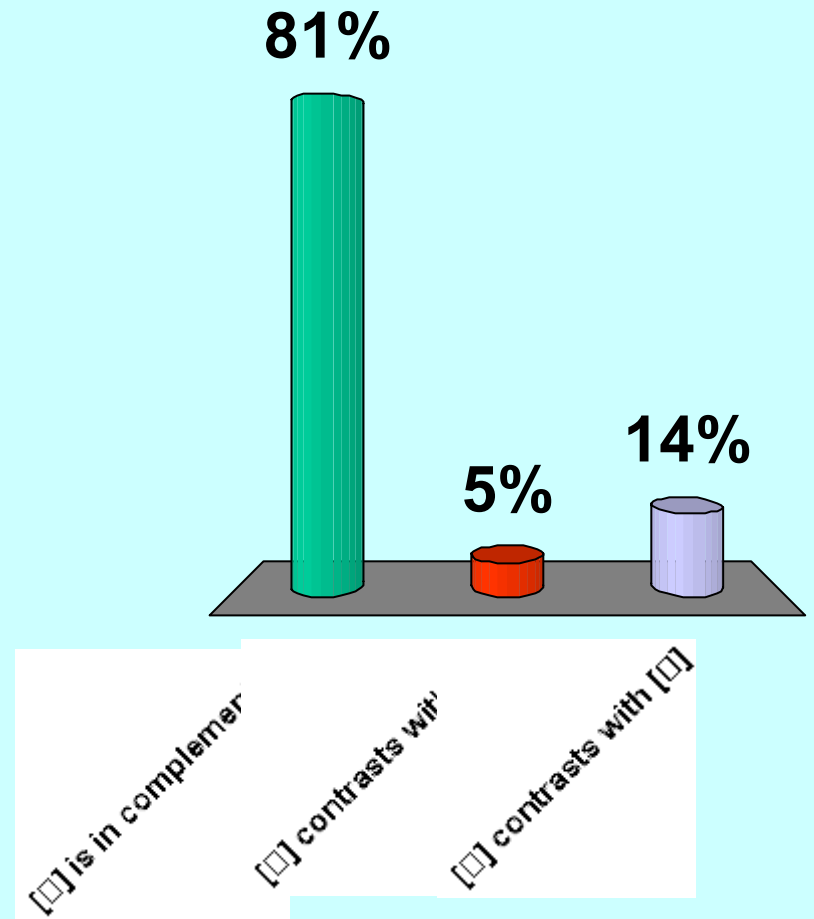
# In English, which of the following sounds are allophones of /p/?

1. [p] only
2. [p<sup>h</sup>] only
- ➔ 3. [p] and [p<sup>h</sup>]
4. [p], [p<sup>h</sup>] and [b]



# In Witsuwit'en, [ʌ] is not considered a phoneme because

1. [ʌ] is in complementary distribution with [ə]
2. [ʌ] contrasts with [ɑ]
3. [ʌ] contrasts with [ɔ]



# Inferring the phonemic representation

- Primarily, use evidence from:
  - Minimal pairs/sets (‘contrast’)
  - Distributional properties of sounds (restricted distribution, such as ‘complementary distribution’)

# Minimal pairs

- Two words which differ in meaning and along only one phonetic parameter
  - A minimal pair for voicing
    - [kræbi] vs. [kræpi]
    - therefore, /p b/ in English
  - A minimal pair for labio-dental vs. interdental place
    - [θɪn] vs. [fɪn]
    - therefore, /θ f/ in English
- Minimal pairs
  - contain phonemes
  - are a guide to the phoneme inventory
  - the phonetic difference between the pair is not attributable to context

# Minimal sets

- A minimal set for vowel height
  - [hid] (*heed*)
  - [hɪd] (*hid*)
  - [hed] (*hayed*)
  - [hɛd] (*head*)
  - [hæd] (*had*)

# A near-minimal set

- [tɔjd] (*toyed*)
- [hɑjd] (*hide*)
- [hɑwd] (*how'd*)



# Evidence from restricted distribution

- When aspects of pronunciation are predictable, most likely due to influence of
  - Neighboring sound
  - Position (within word, for example)

# Mohawk

- Iroquoian family; spoken in Quebec, Ontario, and New York



# Voicing in Mohawk

- Observation: [p t k b d g] are all sounds of Mohawk
- Suspicion: there are no minimal or near-minimal pairs for voicing
- Question: Is stop voicing phonemic or predictable?

# Mohawk phonetic data

[V:] = long vowel, [C̥] = voiceless consonant

of interest: [p t k b d g]

[oli:deʔ]	‘pigeon’	[oja:gala]	‘shirt’
[zahset]	‘hide it!’ (sg.)	[ohjotsah]	‘chin’
[ga:lis]	‘stocking’	[labahbet]	‘catfish’
[odahsa]	‘tail’	[sdu:ha]	‘a little bit’
[wisk]	‘five’	[ʃjiks]	‘fly’
[degeni]	‘two’	[desdaʔŋ]	‘stand up!’ (sg.)
[apl̩am]	‘Abram, Abraham’	[de:zekw̩]	‘pick it up!’ (sg.)

# Finding patterns in a mass of data

- Often it is useful to
  - rearrange the data
  - simplify the data
    - eliminate likely extraneous elements by listing what immediately precedes and follows, including position

# Stop distribution

# =  
word  
edge

[p]	[b]
a ___ l	a ___ a
	h ___ e
[t]	[d]
e ___ #	i: ___ e
o ___ s	o ___ a
	s ___ u:
	# ___ e
	# ___ e:
	s ___ a
[k]	[g]
s ___ #	# ___ a:
i ___ s	e ___ e
e ___ w	a: ___ a

# Summarized contexts

[p t k]	[b d g]
___ C	___ V
___ #	

➤ [p t k] and [b d g] are in complementary distribution in Mohawk.

# The next step

- Beyond complementary distribution:  
Writing a phonological rule
- Which of the following rules?
  - Mohawk grammar<sub>1</sub>: Mohawk has /p t k/ and rule of Voicing (stops are voiced before vowels). *or?*
  - Mohawk grammar<sub>2</sub>: Mohawk has /b d g/ and rule of Devoicing (stops are voiceless word finally or before a consonant).



# Writing the phonological rule

- Choose Voicing. Why?
  - Voicing rule is simpler than Devoicing rule
    - Voicing: “...before vowels.”
    - Devoicing: “...word finally or before a consonant.”
  - (A second reason why a linguist would prefer Mohawk grammar<sub>1</sub>: If Voicing, then Mohawk consonant inventory contains /p t k/. If Devoicing, then /b d g/. But there are no languages with /b d g/ which lack /p t k/. I.e. voiced stops → voiceless stops (an implicational universal).)

## A further thought

- What about the voiced affricate [ʃ]?
- One example in this data set:
  - [ʃiks] ‘fly’
- Observation: like [b d g], the voiced palatal affricate occurs before a vowel. (Stops and affricates often pattern together.)

# Mohawk consonant inventory

	labial	alveolar	palatal	velar	glottal
stop	p	t		k	ʔ
affricate			č		
fricative		s			h
nasal		n			
liquid		r			
glide	w		j		

Notice that Voicing applies to all of the stops and affricates in Mohawk (that can be voiced).

# Revised rule

- In Mohawk,

Stops and affricates are voiced before vowels, and voiceless elsewhere.

*(sentence formulation of rule)*

$/p\ t\ \check{c}\ k/ \rightarrow [b\ d\ \check{z}\ g] / \_\_\_\_ V$

$( \quad \rightarrow [p\ t\ \check{c}\ k] / \dots )$       ... = elsewhere

*(‘arrow’ formulation of rule)*

# Writing phonological rules

- A common format

$/A/ \rightarrow B / C \underline{\quad} D$

A = phoneme(s) which undergo the rule

B = aspect of pronunciation changed (allophone created)

/ = in the context of

$\underline{\quad}$  = location of phoneme in context

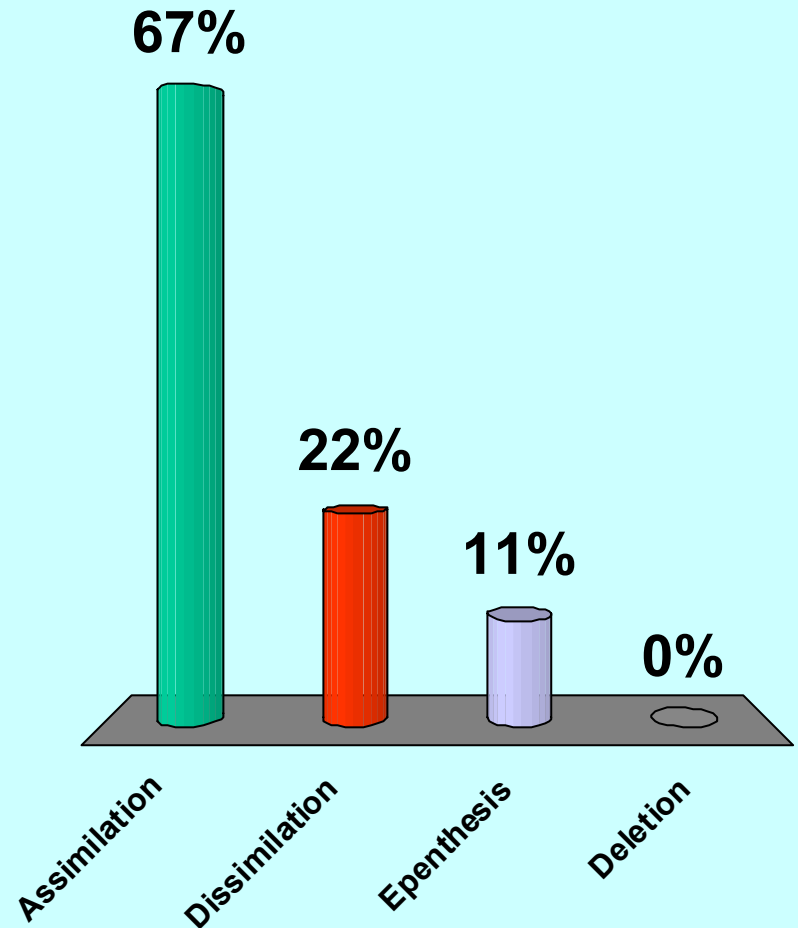
C, D = conditioning elements of the context

- = ‘A becomes or adds B when preceded by C and followed by D’

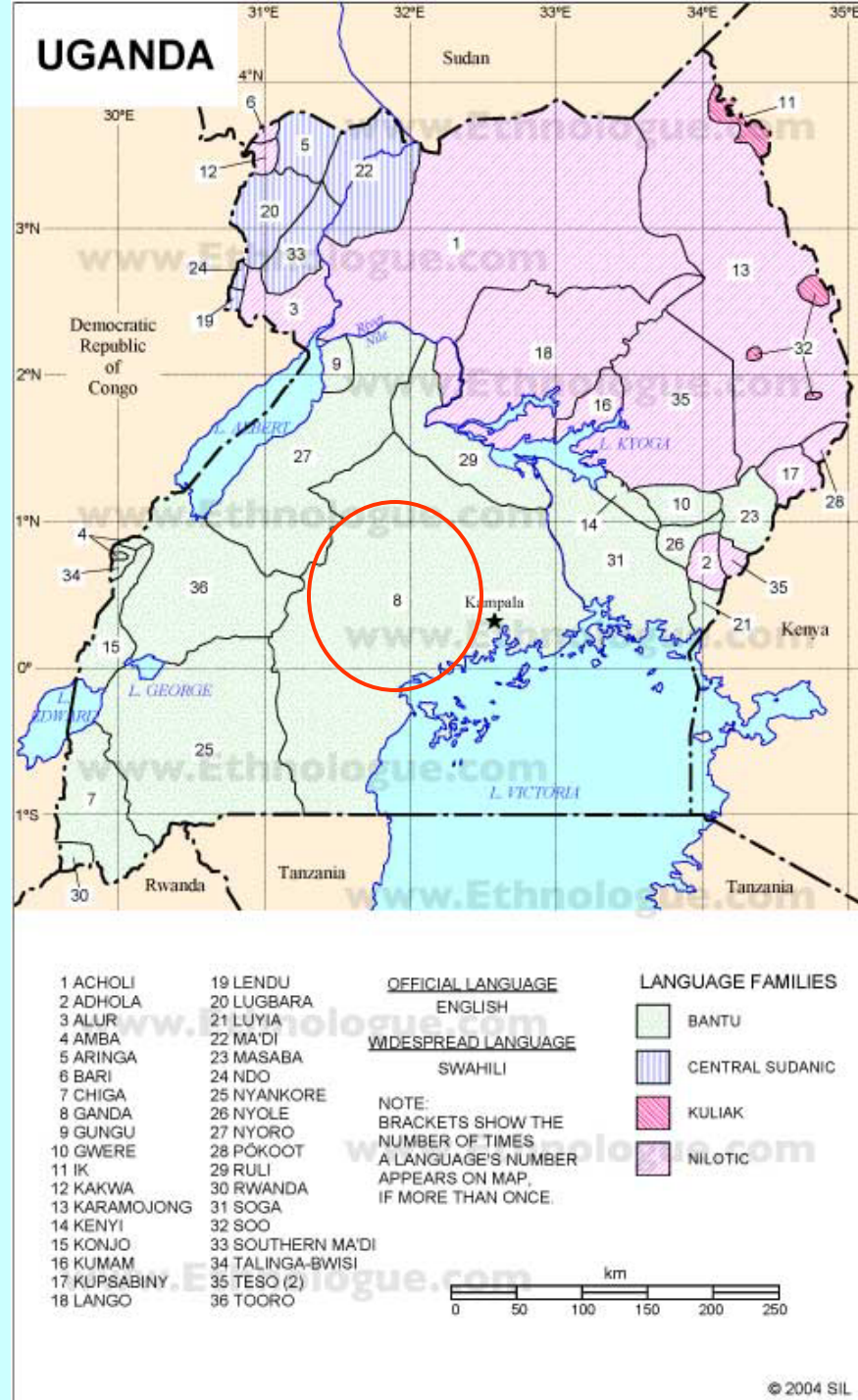
# What kind of phonological rule is Mohawk Voicing?

Hint: vowels are voiced (unless transcribed with diacritic for voicelessness, [V̥]).

- ➔ 1. Assimilation
- 2. Dissimilation
- 3. Epenthesis
- 4. Deletion



# Ganda, a.k.a. Luganda



# Ganda Liquids

[kola]	‘do’	[wulira]	‘hear’
[lwana]	‘fight’	[beera]	‘help’
[buulira]	‘tell’	[ɟɟukira]	‘remember’
[lja]	‘eat’	[erjato]	‘canoe’
[luula]	‘sit’	[omuliro]	‘fire’
[omugole]	‘bride’	[effirimbi]	‘whistle’
[lumonde]	‘sweet potato’	[emmeeri]	‘ship’
[eddwaliro]	‘hospital’	[eraddu]	‘lightning’
[oluganda]	‘Ganda language’	[wawaabira]	‘accuse’
[olulimi]	‘tongue’	[lagira]	‘command’



# Ganda transcription notes

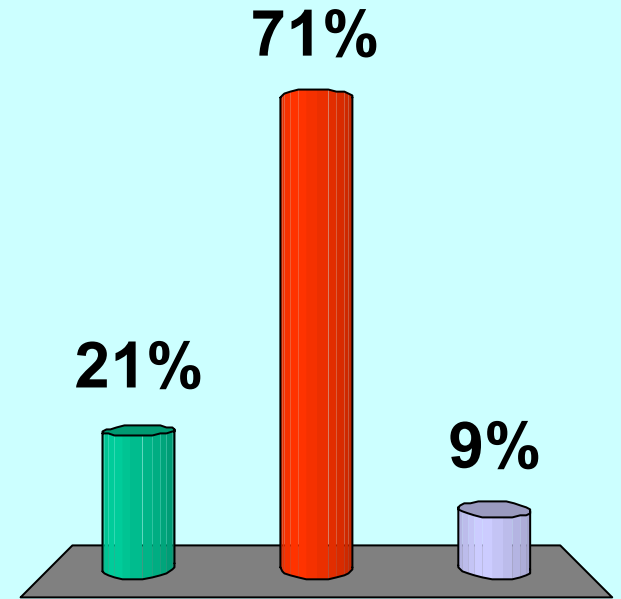
- [a] = low back unrounded vowel
- [ɟ] = voiced palatal stop (cf. [c])
- [uu] = long [u] ([u:])
- [dd] = long [d] ([d:])

# Ganda liquids

- [r] and [l] are in complementary distribution in Ganda. State the conditions under which appears.

# In Ganda,

1. /r/ → [l] / back V \_\_, #  
\_\_; [r] / ...
2. /l/ → [r] / front V \_\_; [l] / ...
3. None of the above.



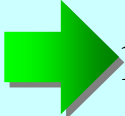
/r/ → [l] / back V \_\_  
/l/ → [r] / front V \_\_; [l] / ...  
None of the above.

# Ganda liquids in loanword phonology

- In loans from other languages, sometimes Ganda has [r] where the source language has [l], etc.
- Why?

[ebendera]	‘flag’
[leerwe]	‘railway’
[luula]	‘ruler’
[ssaffaali]	‘safari’ (loan from Swahili)

# In borrowed words, why do Ganda speakers sometimes have [l] where the source language has [r], and vice versa?

- 
1. Ganda speakers cannot pronounce liquids properly.
  2. Ganda speakers pronounce liquids according to Ganda phonology.
  3. The distribution is random.
  4. Liquids in borrowed words are pronounced according to the phonology of the source language.

