

# Phonology

# Today

- Provide a better idea (not answers!) about:
  - What's phonology?
  - Why bother?
  - What phonologists do?

# Phonetics & Phonology reminder

Phoneticians study what speakers are doing when they are producing an utterance.

Phonologists study what speakers know, and how that knowledge is organized as part of a system of rules.

# Sound patterns

- System of rules that native speakers know
- In phonology (as in other branches of linguistics), we typically begin with a **list** of data. By finding patterns, we organize, and hopefully gain a better understanding of, the data.
  - *English oral stops and fricatives*
    - Data: {ʒ, b, d, ð, f, g, k, p, ʃ, s, t, θ, v, z}
      - just a list, not very illuminating
    - Pattern I: In English, oral stops and fricatives come in voiceless/voiced pairs.
      - {ʃ/ʒ, p/b, t/d, θ/ð, f/v, k/g, s/z} — better, more organized
    - Pattern II: In English (as in other languages), consonants occur at basically three places of articulation:
      - LABIAL: p, b, f, v
      - CORONAL: t, d, θ, ð, s, z, ʒ, ʃ
      - DORSAL: k, g.

# Sound patterns (cont'd)

- English CCC clusters
  - Data: {spr, spl, str, skr, skl, skw}
  - Pattern: If C1C2C3 is ok, then C1 must be [s]
- Other examples of sound patterns from this year
  - ...
- Some phonological issues discussed in Roach (Ch 13, 20)
  - Are affricates one or two sounds?
  - Restriction for [h], [ŋ], [ʒ]
  - Is schwa a phoneme or an allophone?
  - How can we describe dialectal differences

# Language-specific vs. universal patterns

- Studying the sound patterns of a single language is useful
  - L2 learning,...
- Looking for sound patterns in general is also useful
  - To what extent are the same phonological patterns found in all languages — in other words, to what extent are phonological patterns **universal**?
  - How much variation do we observe when we compare the phonological patterns of different languages to one another — are there **limits on the variation**?
  - Exploring universal characteristics of sound patterns can help us understand how human mind works

# Example

- **General issue:** How universal are phonological patterns?
  - *Do all languages make a distinction between **consonants** and **vowels**?*
    - Yes
  - *Do all languages make a distinction between **voiced** and **voiceless stops**?*
    - No, recall Hawaiian for example, it only has p, k
    - voiced stops  $\Rightarrow$  voiceless stops, but not vice versa
      - Why?
  - *Do all languages allow words to begin with **CCC** sequences?*
    - No way!
      - [wordCCCV  $\Rightarrow$  [wordCCV, but not vice versa
      - [wordCCV  $\Rightarrow$  [wordCV, but not vice versa
      - [wordCV is nearly universal: almost all languages allow word-initial CV.

# What are the ways of finding these patterns?

- Standard procedure is exhaustive search: investigate as many languages as possible (at least hundreds), in the best case working with both grammars and native speakers.
  - Suppose we find pattern X in every language we investigate. Does this mean X is universal?
- But we can begin with, and sometimes gain a lot of insight from, smaller studies that look at fewer languages.
- Case study: NC clusters in Zoque and North American English.

# NC clusters in Zoque and English

- NC clusters
  - An **NC cluster** is a sequence of two consonants: a nasal (N) followed by any other C.
  - Examples: [mp, ns, ŋk, mn, ...]
  - Here we focus just on NC clusters in which C is an (oral) stop or fricative.

mp	mb	mt	md	mk	mq	mf	mv	ms	mz
np	nb	nt	nd	nk	nq	nf	nv	ns	nz
ŋp	ŋb	ŋt	ŋd	ŋk	ŋq	ŋf	ŋv	ŋs	ŋz

# Research questions

- Are there **universal preferences** for certain NC clusters?
  - Do some languages allow only certain NC clusters? If so, which ones are allowed?
  - Are certain NC clusters more frequent than others (in languages that allow many types)?

# Zoque

- How is the possessive prefix realized?
- Find the pattern

N	gloss	'my N'	gloss	N	gloss	'my N'	gloss
pama	'clothing'	Mbama	'my clothing'	tatah	'father'	ndatah	'my father'
burro	'burro'	mburru	'my burro'	disko	'record'	ndisko	'my record'
tsima	'calabash'	ndzima	'my calabash'	kayu	'horse'	ŋgayu	'my horse'
tʃoʔngoya	'rabbit'	ɲdʒoʔngoya	'my rabbit'	gayu	'rooster'	ŋgayu	'my rooster'

N	gloss	'my N'	gloss	N	gloss	'my N'	gloss
faha	'belt'	faha	'my belt'	ʃapun	'soap'	ʃapun	'my soap'
sak	'beans'	sak	'my beans'	lawus	'nail'	lawus	'my nail'

# Zoque summary

- Nasal assimilates in place of articulation to the following stop or affricate
- If a word begins with a consonant other than stop or affricate, the prefix is zero
- The initial stop or affricate assimilate in voicing with the possessive prefix

# English

- Frequencies of NC clusters from an on-line English dictionary
  - The table below shows the number of times that each relevant NC cluster occurs in the CMU dictionary. The most frequent entries in each row/column are in **bold**.
  - <http://www.speech.cs.cmu.edu/cgi-bin/cmudict>
- Describe the patterns that are present in this data: what types NC clusters are especially frequent? what types are especially infrequent/rare?

N \ C	p	b	t	d	k	g	f	v	s	z	Total
m	<b>503</b>	<b>209</b>	7	22	3	1	39	3	38	25	850
n	30	42	<b>1839</b>	<b>1015</b>	184	37	205	122	<b>1110</b>	117	<b>4701</b>
ŋ	3	5	10	5	<b>252</b>	<b>130</b>	6	0	12	44	467
Total	536	256	<b>1856</b>	<b>1042</b>	439	168	250	125	<b>1160</b>	186	6018

# English summary

- All combinations are possible but [ŋv]
- Most frequent combination agree in the place of articulation

# Zoque & English

- Things we found out
  - In many phonological patterns, sounds that are next to one another must be (or become) similar to one another in some respect.
  - Certain types of sequences (e.g., certain NC clusters) are relatively **unmarked** (good, preferred) whereas others are relatively **marked** (bad, dispreferred).
  - Some languages allow only the unmarked sequences, not the marked ones. Other languages allow both types, but the marked ones are usually less frequent.

# Zoque & English

- Things to be careful about
  - We looked at only two languages — we need a much larger sample to support claims about universal preferences.
  - We had very few words from Zoque — we need a much larger sample to support claims about a particular language.
  - Our computerized (and fast!) search of English turned up a number of “words” that maybe we don’t really want to count. For example:
    - *long-term, springtime, Wellington*
    - *bearings, belongings, dealings, ...*
    - *concern, conserve, consider, inspect, inspire, install, uncivil, unsaid, ...*

# Other means of finding patterns

- Second language acquisition (first language too)
- Laboratory experiments
- Speech errors (slips of the tongue)
- Disordered language (aphasia)

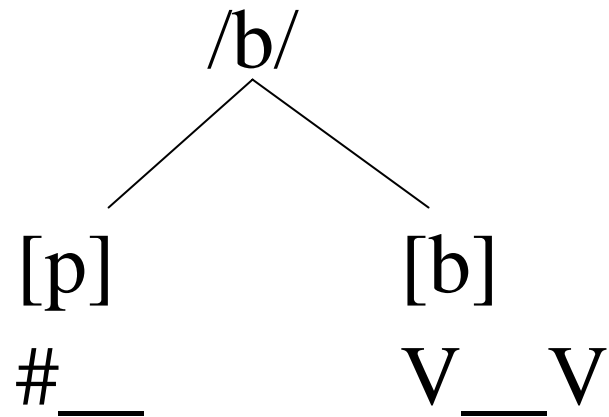
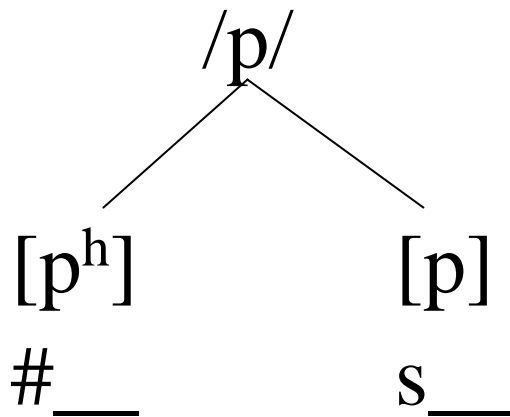
# Abstract vs. concrete level

- /p/ and /b/ are contrastive

- Minimal pair test

- pit bit pet bet park bark
- rip rib lap lab cop cob
- ebay e-pay

- [p<sup>h</sup>], [p], [b] are predictable



# Predictability $\approx$ complementary distribution

- Two sounds are in complementary distribution if one sound never occurs in the environments in which the other occurs.
- $v$  vs.  $\check{v}$  ( $v$  = any vowel): *nap* vs. *nab*
  - $v$  only if followed by [+voice] consonant
  - $\check{v}$  only if followed by [–voice] consonant
- Vocalic length predicts consonantal voicing and voicing predicts length

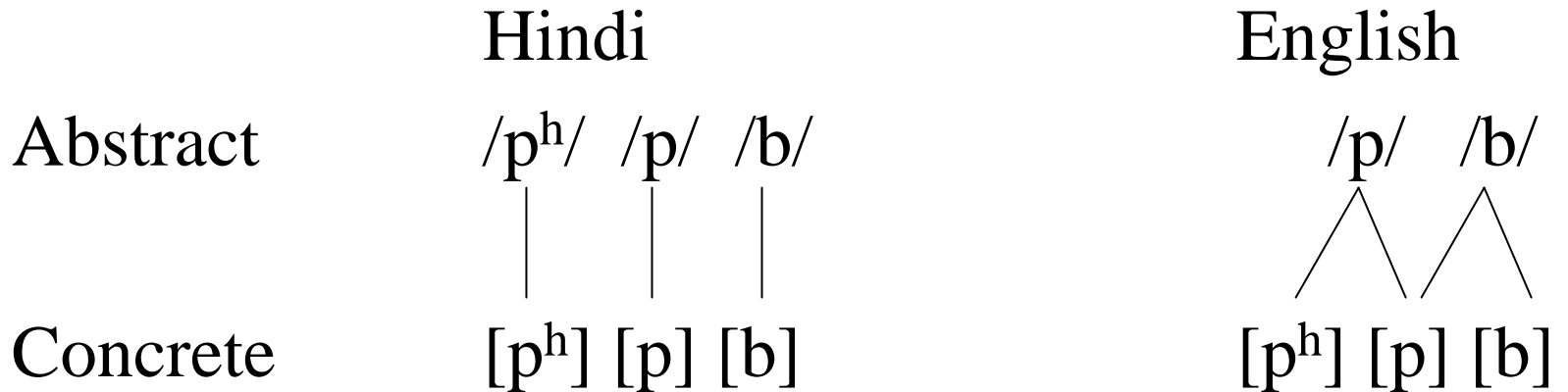
# Division into phonemes & allophones is language specific

- Hindi

[p<sup>h</sup>əɭ] ‘fruit’

[pəɭ] ‘moment’

[bəɭ] ‘strength’



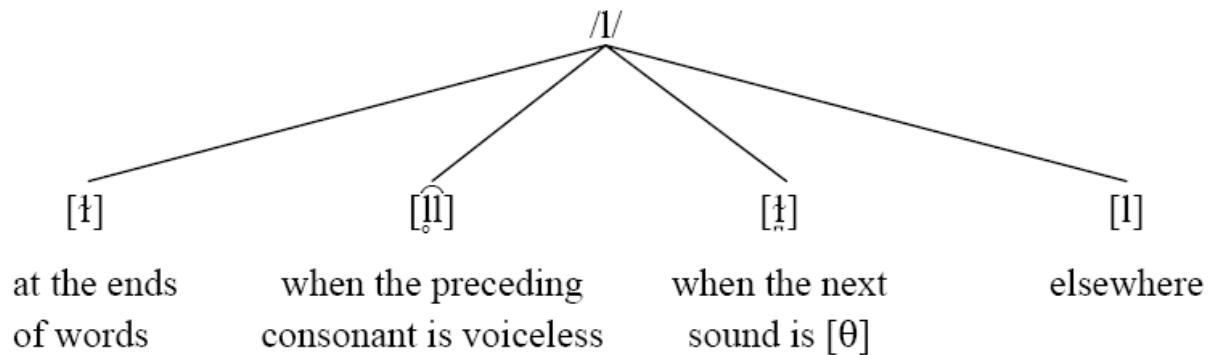
# Determining phonemes & allophones from data

- List local environments in search for complementary distributions
- Determine the allophones and their environments
- Choose the elsewhere (underlying representation) allophone
- Formalize the pattern with rules
- Provide sample derivations

# Allophones of /l/ in English (Hayes)

Words with [ɫ]	Words with [ɭ]	Words with [ɮ]	Words with [l]
file [ˈfaɪɫ]	slight [sɫaɪt]	wealth [ˈweɪɫθ]	listen [ˈlɪsən]
fool [ˈfuɫ]	flight [ˈflaɪt]	health [ˈheɪɫθ]	lose [ˈluːz]
all [ɔɫ]	plow [ˈpləʊ]	filthy [ˈfɪɫθi]	allow [əˈlaʊ]
ball [ˈbɔɫ]	cling [ˈkɪŋ]	tilth [ˈtɪɫθ]	aglow [əˈɡloʊ]
fell [ˈfeɫ]	discipline [ˈdɪsəpɫɪn]	stealth [ˈsteɪɫθ]	blend [ˈblend]
feel [ˈfiɫ]			

The pattern turns out to be as follows:



State the rules capturing this pattern verbally

# Rules describing /l/

Underlying representation: /l/

Phonological rules:

## /l/ Devoicing

$$/l/ \rightarrow [l̥] \quad / \left[ \begin{array}{l} +\text{consonant} \\ -\text{voice} \end{array} \right] \_\_\_$$

## /l/ Dentalization

$$/l/ \rightarrow [l̪] \quad / \_\_\_ \theta$$

## /l/ Velarization

$$/l/ \rightarrow [l̠] \quad / \_\_\_ ]_{\text{word}}$$

# Derivations

*file*    *slight*    *wealth*    *listen*

/faɪl/    /slaɪt/    /weɪlθ/    /'lɪsən/

—    s̺laɪt    —    —

—    —    wɛɹ̺θ    —

fɑɹ̺t    —    —    —

[ˈfɑɹ̺t]    [s̺laɪt]    [ˈwɛɹ̺θ]    [ˈlɪsən]

underlying representations

application of phonological rules:

/l/ Devoicing

/l/ Dentalization

/l/ Velarization

surface (phonetic) representations

# Setswana [l] and [d]

## (Botswana)

lefifi	'darkness'	loleme	'tongue'
selepe	'axe'	molomo	'mouth'
xobala	'to read'	mmadi	'reader'
medisa	'make swallow'	lerumo	'spear'
xonala	'to marry'	leṅ	'when?'
loxadima	'lightning flash'	dīḷo	'food'
dumela	'greetings'	feedi	'sweeper'
lokwalo	'letter'	k <sup>h</sup> udu	'tortoise'
mosadi	'woman'	podī	'goat'
badisa	'the herd'	hudi	'wild duck'

# Sundanese (Java)

## long vs. short consonants

abuabu	'grey'	bəddil	'gun'
gəttih	'blood'	akar	'root'
səddih	'sad'	jənnəŋŋān	'name'
bərrəkkah	'useful'	bagoŋ	'wild pig'
babi	'pig'	kinā	'quinine'
təbbih	'far'	bapa	'father'
bibir	'belt'	ŋəppel	'sweep'
bənnər	'correct'	sikit	'sharp'
panās	'hot'	məddəm	'dark'
hukum	'law'	sərrat	'letter'
kamēja	'shirt'	pačul	'shovel'
bənnāŋ	'thread'	dada	'torso'
pəttis	'fish sauce'	jaŋkuŋ	'tall'
asəm	'tamarind'	wawəs	'tooth'

# Sundanese consonants (cont'd)

- What consonants are long?
- Pattern (initial)
  - Cs are long if preceded by [ə]
  - Check if the patterns covers:

asəm

'tamarind'

wawəs

'tooth'

- Hypothesis #1: /m/ and /s/ are not long in Sundanese
- Hypothesis #2: Cs are not geminated word-finally
- What data can help us choose between H1 and H2

# Natural classes

- Sound processes tend to affect groups of sounds, not just individual sounds
  - Palatalization in Slovak
  - Aspiration in English

<u>American</u>	<u>British</u>
am[yu]se	am[yu]se
b[yu]ty (beauty)	b[yu]ty
c[yu]be	c[yu]be
d[u]pe	d[yu]pe
f[yu]me	f[yu]me
l[u]rid	l[yu]rid
n[u]ws (news)	n[yu]ws
p[yu]ny (puny)	p[yu]ny
pre[zu]me (presume)	pre[zyu]me
st[u]pid	st[yu]pid
s[u]t (suit)	s[yu]t

# What if there are more processes?

- Sometimes, the order in which these processes apply is crucial.
  - In American English *writer* and *rider* are almost homophones, but the quality and the length of the stressed vowel is slightly different: it is a bit longer and the tongue is lower in *rider*.
  - Two processes apply
    1. Flapping: t,d → [ɾ] in unstressed syllables
    2. Vowel shortening: v → ʌ̃ if followed by unstressed consonant in the same syllable
- The processes must apply in this order: #2, #1. The other order does not produce the observed difference between *writer* and *rider*.

# Big picture & take-home message

- There are multiple ways of looking at human speech
- Each can tell us a lot about how our cognitive abilities
- The main purpose of this course was to develop basic awareness for English sound patterns
- How far you take this awareness into your own English production depends on you!