Phonology
LING 200: Introduction to the Study of Language

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McGill
U N I V E R S I T Y

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Announcements

- **Conferences now open for registration**
    - Register for the section you want the same way you register for a course.
    - Conferences begin **this Friday**.

- **Extension on assignment 1**: If you came off the waitlist, please submit assignment 1 by **Friday at 10:30am**.

Outline

Slides credit: David Pesetsky, Rebecca Starr

Phones, phonemes, and allophones

Key concepts

- **Phones**: the basic unit of speech sound.
  - Phones are concrete: they are what we hear.

- **Phoneme**: phonological units that contrast in a language.
  - Phonemes are abstract, underlying forms.
  - Replacing one phoneme with another creates a different word
    (e.g., the **minimal pair** "tip", "dip")

- **Allophone**: a phone that is one possible realization of a phoneme.
  - Even if we replace one allophone with another, it's still the same word.
  - "create", "created"

- Three types of **distribution**:
  - contrastive,
  - complementary,
  - (free variation).

Phones, phonemes, and allophones

Key concepts

- **Phonology** is concerned with the mental representation of speech sounds (language-specific). **Phonetics** is concerned with the physical realization of speech sounds (language general).

Phonotactics

The syllable

- In addition to knowing the phonemes and allophones of our language, we know the **phonotactics**, rules for how phonemes can be sequenced.
- The **syllable** is a prosodic unit that forms the basis of many phonotactic rules.

	σ (syllable)	
	Rime	
Onset	Nucleus	coda
"trend"	tr	ɛ	nd
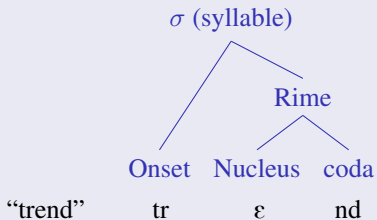
Phonotactics

The sonority hierarchy

- Phonotactic rules across languages are shaped by the **sonority hierarchy**.
  - vowels > glides > liquids > nasals > fricatives > affricates > stops.
  - More sonorous phones tend to be closer to the syllable nucleus.
  - ✓trend, *rtend

Review

Phonemes/allophones?

- Are [l] and [r] in contrastive distribution or complementary distribution? Explain.

1. mul	'water'	7. mal	'horse'
2. mulkama	'place for water'	8. malmaka	'place for horse'
3. mure	'at the water'	9. mare	'at the horse'
4. pal	'foot'	10. səul	Seoul
5. pari	'of the foot'	11. ilkop	'seven'
6. rupi	'ruby'	12. radio	'radio'

- Does the answer help us predict how *Lori Roland* might be pronounced by a Korean speaker of English?

Review

Steps to solving a phonemes/allophones question

- *Are [X] and [Y] in contrastive or complementary distribution?*
  Are [X] and [Y] phonemes or allophones of the same phoneme?

- Can you find **minimal pairs** that differ only in whether they contain [X] or [Y], with everything else held constant?
  - If so, [X] and [Y] are **phonemes**. You're done!

- List all the environments that contain [X] and the ones that contain [Y].
  - Are they in **complementary distribution**? If so, they are **allophones**.

- Formulate a rule to predict when [X] is used and when [Y] is used.
  - Before/after/between certain vowels/consonants?
  - Onset/coda of a syllable?
  - Beginning/end of word?
  - Remember: one allophone may be the default ('elsewhere' case).

Phones, Phonemes and Allophones
Phonological rules

The flapping rule
Aspiration
Assimilation and dissimilation
Insertion, deletion, and metathesis
Vowel lengthening, The Canadian Raising rule

Phonological rules

Remember this?

latter	ladder
matter	madder
mettle	meddle
betting	bedding
outty (belly button)	Audi (car)

➼ These are all pronounced exactly the same:
   both /t/ and /d/ are pronounced here as [ɾ].

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Phonological rules

Remember this?

bu**tt**er	deba**t**e
ma**tt**er	ma**t**erial
ar**t**istry	ar**t**istic
a**tt**estation	a**tt**ested
ar**t**ery	ar**t**erial

➠ What is the *flapping* rule in North American English?

- /t/ and /d/ are pronounced as [ɾ] when they occur between vowels, and the vowel *before* them is stressed.

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Allophones of /t/

- As we have seen, in North American English the phoneme /t/ is sometimes realized as [t] and sometimes as [ɾ].
- Let's look at another type of allophone for /t/.
  - [tʰ]: tar [tʰar], retire [retʰaɪər]
  - [t]: star [star], bit [bɪt], melted [mɛltəd]

Aspiration

- The little *h* in [tʰ] represents a burst of air called **aspiration**.
- Although English-speakers hear the sound in "tar" and "star" as the same "t," they are phonetically different.
  - Try putting your hand in front of your mouth while you say "tar," "star," and "retire."
  - You should feel a sharp puff of air for "tar" and "retire."

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Phonological rules

Aspiration

- What are the contexts that [t] and [tʰ] occur in?
- Can we find a rule that predicts when to use which allophone?
  - [tʰ]: tar [tʰar], retire [rɛtʰaɪɚr]
  - [t]: star [star], bit [bɪt], melted [mɛltəd]

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Developing a theory in linguistics

The scientific method
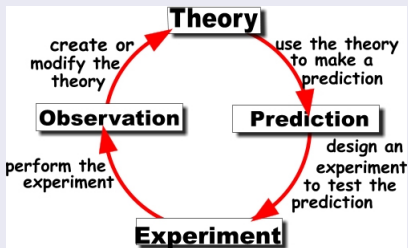
A theory must...

- **Make falsifiable predictions**.
  - We must be able to look for data to decide whether the theory is correct.
- If your theory does not make predictions, it is not a theory.

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Phonological rules

Hypothesis 1:

- Lets start by looking at [tʰ].
- **Hypothesis 1**: use [tʰ] at the beginning of a word.
⇨ Does this rule work?
    - [tʰ]: tar [tʰar], retire [retʰaɪər]
    - [t]: star [star], bit [bɪt], melted [mɛltəd]

- No, it doesn't explain *retire*.

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Phonological rules

Hypothesis 2:

- **Hypothesis 2**: use [tʰ] at the beginning of a syllable.
- ⇨ Does this rule work?
  - [tʰ]: tar [tʰar], retire [retʰaɪər]
  - [t]: star [star], bit [bɪt], melted [mɛltəd]

- No, it predicts that *melted* should have an aspirated [tʰ].

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Phonological rules

Hypothesis 3:

- **Hypothesis 3**: use [tʰ] at the beginning of a stressed syllable.
- ⇨ Does this rule work?
  - [tʰ]: tar [tʰar], retire [retʰaɪər]
  - [t]: star [star], bit [bɪt], melted [mɛltəd]

- Yes!
- Now, what is the rule for [t]?
  - [tʰ]: tar [tʰar], retire [retʰaɪər]
  - [t]: star [star], bit [bɪt], melted [mɛltəd]
- ⇨ We can simply say: use [t] in all other cases.

- The **elsewhere case**: If there is no rule saying otherwise, [t] is the default.

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Phonological rules

Aspiration

- All 3 voiceless stops in English (p/t/k) follow this same pattern:

initial within stressed syllable	after *s* or initial in unstressed syllable	word-final (therefore syllable-final)
p^{h}ot	spot	top
t^{h}ar	star	rat
k^{h}in	skin	nick
up^{h}ón	úpping	
att^{h}áck	áttic	
ak^{h}ín	hácking	

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Phonological rules

Natural classes

- Phonological rules often apply to sets of phonemes that share something in common about how they are produced.
- For example, /p, t, k/ become aspirated at the beginning of a stressed syllable. They are all **voiceless stops**.

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Natural classes

- A **natural class** is a group of phones that can be defined by some phonological similarity.
    - This is why we spent time learning about key distinctive features of consonants last week.
    - Vowels can also be characterized in similar ways, but we will not talk about that in this class.

- Example: how can we define [b, d, g] in a way that distinguishes them from all other English phones?

- [b, d, g] are **voiced stops**.

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Phonological rules

Simplest set of rules

- Let's focus just on /t/ again.
- We identified one allophone of /t/, [t], which seems to be the default, while the other allophones are more restricted.
    - [t] is the basic allophone of /t/ (which is why we write /t/ as /t/).
- We could hypothetically restate these rules to make [tʰ] the basic allophone, but the rules would look much more complex.
- When developing phonological rules, create the simplest set of rules that account for the data: **maximize parsimony**.

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Common phonological processes

- Assimilation: two nearby sounds become more similar.
- Dissimilation: two nearby sounds become more different.
- Insertion (epenthesis): a phone is added.
- Deletion: an underlying phoneme is not realized on the surface phonetic level.
- Metathesis: two sounds are switched.

Reasons for phonological changes to words

- Make words easier to articulate.
- Make words easier to understand.
- Make speech more efficient.

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Assimilation and dissimilation

Assimilation: Nasals

- The English *in-* prefix changes its form depending on the word it attaches to: what is the pattern?

possible	impossible
potent	impotent
tolerable	intolerable
tangible	intangible
consequential	inŋconsequential
considerate	inŋconsiderate

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Assimilation and dissimilation

Dissimilation

- When two postvocalic /r/'s occur in consecutive syllables, it is common to delete the first one:

  turmeric → "tumeric"
  berserk → "beserk"
  surprise → "suprise"
  governor → "govenor"

- Have you ever noticed this before? Can you think of other examples?
  - Fun fact: The city of *Alburquerque* dropped the first *r* from its name some time in the 19th century.
  - Feb(r)uary, lib(r)ary, f(r)ustrated, qua(r)ter, adve(r)sary, ente(r)prise, cate(r)pillar, Southe(r)ner

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Insertion, deletion, and metathesis

Insertion (Epenthesis)

- Voiceless stops often added between a nasal and voiceless fricative:

  hamster → [hæmpstər]
  something → [sʌmpθɪŋ]
  dance → [dænts]
  strength → [strɛŋkθ]

- What is the rule that defines which stop (p, t, k) is inserted?
  - The inserted stop has the same place of articulation as the preceding nasal.

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Insertion, deletion, and metathesis

Deletion

- The deletion of /h/:

  "He handed her his hat"
  /hi hændəd hər hɪz hæt/   ← **phonemic** (underlying) representation
  [hi hændəd ər ɪz hæt]   ← **phonetic** (actual) realization

- /h/ is deleted in unstressed syllables.

- How do we know that the "h" is a part of the underlying representation?

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Insertion, deletion, and metathesis

Deletion

- In Singapore English, /{t, d}/ in syllable-final consonant clusters are often deleted:

  sent → [sɛn]
  attend → [əttɛn]
  hold → [hol]
  recently → [risənli]

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Insertion, deletion, and metathesis

Metathesis

- **Metathesis** occurs when there is a change in order of sounds
- Standard North American English pronunciations for these words:
  - Notice how /r/ runs to the end of the syllable, switching places with what came after it:

  iron → [aɪərn]
  comfortable → [kʌmftərbəl]
  prescription → [pərscription]

More metathesis

- Another instance of metathesis:
  ask → [æks]

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Metathesis

Discuss with your neighbor:

- Do you think it's *wrong* or a mistake to say [aɪərn] or [kʌmftərbəl]?
- Why do you think we tend to pay more attention to [æks] than [aɪərn]?

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Vowel lengthening and the Canadian Raising rule

Vowel length in English

- Vowels are shorter before voiceless sounds than before voiced ones:

safe	save	lut	lud
meet	mead	nis	niz
Ape	Abe		
mate	made		
mace	maze		
H	age		
ache	Haig		
loss	laws		

- Nonce words also show this behavior, too.
- Side note: this is how we know about syllable-final voicing when we whisper.

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Vowel lengthening and the Canadian Raising rule

Steps to creating a phonological analysis

1. Identify the allophones that alternate.
2. (Re)-organize your data.
3. Identify the environments where each allophone occurs.
4. Decide which allophone corresponds to the underlying phoneme.
5. Formulate the simplest, most general rule you can.

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Practice: Canadian Raising

- Write a phonological rule that accounts for these data in Canadian English:

height	[hʌɪt]	stride	[straɪd]
ride	[raɪd]	strife	[strʌɪf]
sight	[sʌɪt]	bike	[bʌɪk]
pine	[paɪn]	bide	[baɪd]
rhyme	[raɪm]	lies	[laɪz]
life	[lʌɪf]	high	[haɪ]

➧ Step 1: Identify the allophones that alternate.

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Practice: Canadian Raising

➼ Step 2: (Re)-organize the data.
Let's have all the data with [ʌɪ] on the left and the data with [aɪ] on the right:

height	[hʌɪt]	stride	[straɪd]
strife	[strʌɪf]	ride	[raɪd]
sight	[sʌɪt]	pine	[paɪn]
bike	[bʌɪk]	bide	[baɪd]
life	[lʌɪf]	high	[haɪ]
		lies	[laɪz]
		rhyme	[raɪm]

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Practice: Canadian Raising

➽ Step 3: Identify the environments where each allophone occurs.
   TIP: look before and after. Check for patterns.

vless fricative [h___t] vless stop

voiced liquid [r___f] vless fric.

vless fricative [s___t] vless stop

voiced stop   [b___k] vless stop

voiced liquid [l___f] vless fric.

voiced liquid [r___d] voiced stop

voiced liquid [r___d] voiced stop

vless stop   [p___n] voiced nasal

voiced stop [b___d] voiced stop

voiceless fric. [h___#] word final

voiced liquid [l___z] voiced fric.

voiced liquid [r___n] voiced nasal

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Practice: Canadian Raising

➨ Step 4: decide which allophone corresponds to underlying phoneme.
TIP: which allophone is LEAST restricted in context?

height	[hʌɪt]	vless stop	stride	[straɪd]	voiced stop
strife	[strʌɪf]	vless fric.	ride	[raɪd]	voiced stop
sight	[sʌɪt]	vless stop	pine	[paɪn]	voiced nasal
bike	[bʌɪk]	vless stop	bide	[baɪd]	voiced stop
life	[lʌɪf]	vless fric.	high	[haɪ]	word-final
			lies	[laɪz]	voiced fric.
			rhyme	[raɪm]	voiced nasal

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Practice: Canadian Raising

➠ Step 5: create simplest, most general rule you can.
[aɪ] becomes [ʌɪ] before a voiceless phone.

height	[hʌɪt]	vless stop	stride	[straɪd]	voiced stop
strife	[strʌɪf]	vless fric.	ride	[raɪd]	voiced stop
sight	[sʌɪt]	vless stop	pine	[paɪn]	voiced nasal
bike	[bʌɪk]	vless stop	bide	[baɪd]	voiced stop
life	[lʌɪf]	vless fric.	high	[haɪ]	word-final
			lies	[laɪz]	voiced fric.
			rhyme	[raɪm]	voiced nasal

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For next time. . .

- We are done with phonetics/phonology.
- Next week: Morphology—the study of the structure of words and their parts!
- **Read**: Rowe & Levine "A Concise Introduction to Linguistics," chapter 4 (pages 89-114), in course pack.

- **Conferences start this Friday**.
  Make sure you are signed up for a conference!
  Attendance will be taken, and counts toward the final grade.