- **Natural classes**
- **Stating allophone environments**

Background reading:

- *CL* Ch 3, sec 1 and Appendix

1. Allophones of a phoneme vs. two phonemes

Last time, we discussed:

- ***How can we tell*** if two phonetically different sounds belong to **different phonemes** or to the **same phoneme** in a language we are analyzing?

→ We have to **look at data** from the language we are analyzing and **make a case** for the status of the pair of sounds **in that language**

1. Allophones of a phoneme vs. two phonemes

- **Step 1.** Look for a **minimal pair**
- **Step 2.** Consider the **environments** where the sounds occur — are they:

  predictable (non-overlapping)?
  unpredictable (overlapping)?

Our focus this time is:

- **Step 3.** If you have found that two sounds are *allophones of the same phoneme*, **state the environments** where each allophone occurs

But first, some background on **natural classes**

2. Natural classes

- Which of the sounds of English can be **aspirated**?

  [p] [t] [k]

- Why these sounds and no others?

  → These are the only sounds of English that are **voiceless oral stops**

2. Natural classes

- Which of the sounds of English can be **aspirated**?

  [p] [t] [k]

- Why these sounds and no others?

  → These are the only sounds of English that are **voiceless oral stops**

- This kind of pattern is not unusual!
  - In the languages of the world, groups of sounds *with some property or properties in common* tend to **behave as a group** in some way

2. Natural classes

- A set of sounds with some *property or properties in common* is called a **natural class**
- If natural classes often **behave as a group** in native-speaker language behavior, what does that tell us about the mental grammar?
  - Natural classes are determined by sound properties
  - So, the mental grammar **uses sound properties** to **represent** the sounds of language

    → "Phonetic" properties are **mentally relevant**!

2. Natural classes

- What does it mean to say this?
  *The mental grammar uses **sound properties** to **represent** the sounds of language*
  - The mental grammar doesn't actually "see" a speech sound like [u] or [t]
  - Instead, it "sees" a **set of properties** that represents each sound
- In the mental grammar…

  [u] is represented as: high back round tense vowel

  [t] is represented as: voiceless alveolar oral stop

2. Natural classes

- Practice: What properties can we use to **describe** each of these groups of sounds as a **single natural class**, while *excluding* other sounds as specified?

(a) [p g m d ŋ t] but not [s ej w]

(b) [f θ s ʃ h] but not [t z v b]

(c) [i ow u ɑ ej] but not [ɪ æ k m]

(d) [i ɪ] but not [æ ow ɛ ŋ ʧ]

2. Natural classes

- Practice: What properties can we use to **describe** each of these groups of sounds as a **single natural class**, while *excluding* other sounds as specified?

(a) [p ɡ m d ŋ t] but not [s ej w]

stops

(b) [f θ s ʃ h] but not [t z v b]

voiceless fricatives | *it may take >1 property to define a class*

(c) [i ow u ɑ ej] but not [ɪ æ k m]

tense

(d) [i ɪ] but not [u ʊ æ ow ɛ ŋ ʧ]

high unrounded

3. Allophone environments as natural classes

Returning to the topic of allophones:

- **Step 3.** If you have found that two sounds are *allophones of the same phoneme*, **state the environments** where each allophone occurs

- Since putting the allophones of a phoneme in the right places is the job of the **mental grammar**
  - and the mental grammar **represents sounds** in terms of their **properties**

  → **we always state the environment of an allophone in terms of sound properties**

3. Allophone environments as natural classes

- Returning to our Canadian Raising example…

(modified from Table 3.3 in CL, p 74)

[ʌjs]	‘ice’	[ajz]	‘eyes’
[lʌjs]	‘lice’	[lajz]	‘lies’
[tɹʌjt]	‘trite’	[tɹajd]	‘tried’
[tɹʌjp]	‘tripe’	[tɹajb]	‘tribe’
[flʌjt]	‘flight’	[flaj]	‘fly’
[lʌjk]	‘like’	[tajm]	‘time’
[nʌjf]	‘knife’	[fajv]	‘five’

Can either environment (or both) be **stated as a natural class**?

3. Allophone environments as natural classes

Can either environment be stated as a natural class?

[ʌj]	
[#	s]
[l	s]
[ʇ	t]
[ʇ	p]
[fl	t]
[l	k]
[n	f]

[aj]	
[#	z]
[l	z]
[ʇ	d]
[ʇ	b]
[fl	#]
[t	m]
[f	v]

- [ʌj] appears before [s, t, p, k, f] in this data set
  - These sounds are all **voiceless** | *this is a natural class!*

3. Allophone environments as natural classes

Can either environment be stated as a natural class?

[ʌj]	
[#	s]
[l	s]
[ɹ	t]
[ɹ	p]
[fl	t]
[l	k]
[n	f]

[aj]	
[#	z]
[l	z]
[ɹ	d]
[ɹ	b]
[fl	#]
[t	m]
[f	v]

- [aj] appears before [z, d, b, m, v, #] (# = edge of the word)
  - No shared properties (because of #)
  - But this list does **not** include any **voiceless** sounds

3. Allophone environments as natural classes

Can either environment be stated as a natural class?

[ʌj]	
[#	s]
[l	s]
[ɹ	t]
[ɹ	p]
[fl	t]
[l	k]
[n	f]

[aj]	
[#	z]
[l	z]
[ɹ	d]
[ɹ	b]
[fl	#]
[t	m]
[f	v]

- Our analysis of the environments of these diphthongs:
  - [ʌj] appears before **voiceless** sounds
  - [aj] appears **elsewhere**

4. Determining the status of two sounds

Picking up the discussion from before…

- **Step 3.** If you have found that two sounds are *allophones of the same phoneme,* **state the environments** where each allophone occurs

4. Determining the status of two sounds

- **Step 3.** If you have found that two sounds are *allophones of the same phoneme,* **state the environments** where each allophone occurs

  Now we can expand on this:

  - At least one of the two allophones should have an environment that is statable as a **natural class** using **properties** of sounds

  - If one allophone has an environment that is "wherever the other allophone *doesn't* occur", we can state its environment as **elsewhere**

5. Preview of the next topic

- So far, we have seen:
  - **Phonemes** are mental sound categories
  - One phoneme may have multiple **allophones**
  - In that case, some factor in the **environment**—described in terms of **sound properties**—determines which allophone appears
- Next:
  - How does the **mental grammar** make sure that the correct allophones appear in the correct environments? → **Phonological rules**