- **Sounds in predictable environments**

Background reading:

- *CL* Ch 3, sec 1 and Appendix

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- Watch the video "German Coast Guard - Lost in Translation" (YouTube, 0:40 sec)

    - What happened?

    - What does this show us about mental grammar?

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    - Which language has [s] and [θ] **not** belonging to different phonemes? | German

1. Which sounds are "the same" or "different"?

- We saw last time:

    - A Hindi speaker hears [p] and [pʰ] as "different", because they belong to **different phonemes** in Hindi

    - Many English speakers hear [p] and [pʰ] as "the same", because they belong to the **same phoneme** in English

- Your phonology controls your brain!
  (that is, it influences your speech perception)

    - The phonological system of your **mental grammar** has a big effect on how you mentally categorize a phonetic/physical speech sound

1. Which sounds are "the same" or "different"?

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

- **Important:** Just because two sounds do, or don't, belong to the same phoneme in a language you know does NOT guarantee that all languages will classify them the same way

  - 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**

2. Determining the status of two sounds

Here is the analysis procedure we will follow:

- **Step 1.** Look for a **minimal pair**

- **Step 2.** Consider the **environments** where the sounds occur — are they:

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

- **Step 3.** If you have found that two sounds are *allophones of the same phoneme*, **state the environments** where each allophone occurs (this is the topic of the next slide set)

2.1 Minimal pair?

Step 1. Look for a **minimal pair**

　　(We saw examples of this last time)

- If you **find** one, the sounds are **contrastive** — they belong to **different phonemes**

  - You have the answer, and your analysis is complete

- If you do **not** find any minimal pairs, the sounds *may or may not* be contrastive

  - No answer yet! Continue to the next step

2.2 Predictable environments?

Step 2. Consider the **environments** where the sounds occur — are they:
- **predictable** (non-overlapping)?
- **unpredictable** (overlapping)?

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Step 2. Consider the **environments** where the sounds occur — are they:
- **predictable** (non-overlapping)?
- **unpredictable** (overlapping)?

- If two sounds are <u>allophones of the same phoneme</u>, the mental grammar **chooses** which to use based on their surrounding (sound) **environment**
  - Given the environment, we can reliably **predict** which of the sounds we will see there

- So **predictable** environments are **evidence** that <u>the mental grammar decides</u> which sound to put where: the sounds are **allophones of the same phoneme**

Step 2. Consider the **environments** where the sounds occur — are they: • **predictable** (non-overlapping)?

• **unpredictable** (overlapping)?

- If two sounds <u>belong to separate phonemes</u>, they are **independent** of each other, so both can occur in (at least some of) the **same** environments

  - Given just the environment, we **can't predict** which of the sounds will appear there

- So **unpredictable** environments are **evidence** that <u>the mental grammar does not determine</u> which sound to put where: **separate phonemes**

2.2 Predictable environments?

- **Where should we look** for predictable environments? These are useful to examine:

    - preceding context (what occurs right before?)

    - following context (what occurs right after?)

    - (for vowels) other nearby vowels

    - preceding & following contexts together

2.2 Predictable environments?
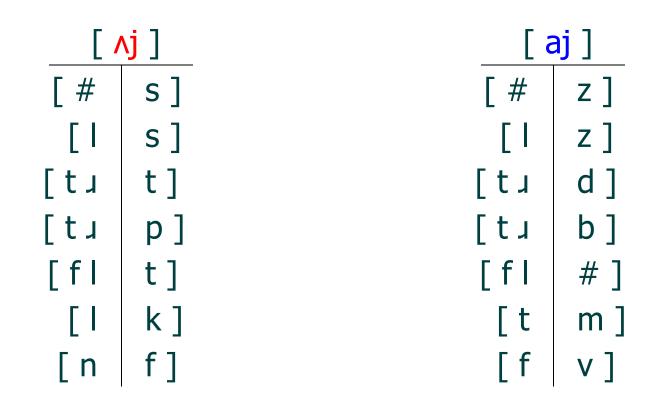
- Try it: "Canadian Raising" example
  (modified from Table 3.3 in CL, p 74)

  Examine the diphthongs [ʌj] and [aj] in the data set (next slide)

  - Are their environments **predictable**, or **unpredictable**?

  - Do they belong to **separate phonemes**, or are they **allophones** of a single phoneme?

2.2 Predictable environments?

- Try it: "Canadian Raising" example
  (modified from Table 3.3 in CL, p 74)

[ʌjs]	'ice'	[ajz]	'eyes'
[lʌjs]	'lice'	[lajz]	'lies'
[tɨʌjt]	'trite'	[tɨajd]	'tried'
[tɨʌjp]	'tripe'	[tɨajb]	'tribe'
[flʌjt]	'flight'	[flaj]	'fly'
[lʌjk]	'like'	[tajm]	'time'
[nʌjf]	'knife'	[fajv]	'five'

- Environments **predictable** or **unpredictable**?

2.2 Predictable environments?

- Try this **"T-chart" format** to find each sound's environment

  - Write each word in the chart to **line up** the sounds occurring *before* and *after* the sound we're looking at

  - # indicates the edge of a word—don't forget these!

[ʌj]

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

[aj]

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

2.2 Predictable environments?

- Does looking at the **preceding environment** help us predict whether [ʌj] or [aj] will appear?

<table>
<thead>
<tr><th colspan="2">[ʌj]</th><th></th><th colspan="2">[aj]</th></tr>
</thead>
<tbody>
<tr><td>[#</td><td>s]</td><td></td><td>[#</td><td>z]</td></tr>
<tr><td>[l</td><td>s]</td><td></td><td>[l</td><td>z]</td></tr>
<tr><td>[t ɹ</td><td>t]</td><td></td><td>[t ɹ</td><td>d]</td></tr>
<tr><td>[t ɹ</td><td>p]</td><td></td><td>[t ɹ</td><td>b]</td></tr>
<tr><td>[f l</td><td>t]</td><td></td><td>[f l</td><td>#]</td></tr>
<tr><td>[l</td><td>k]</td><td></td><td>[t</td><td>m]</td></tr>
<tr><td>[n</td><td>f]</td><td></td><td>[f</td><td>v]</td></tr>
</tbody>
</table>

2.2 Predictable environments?

- Does looking at the **preceding environment** help us predict whether [ʌj] or [aj] will appear?

	[ʌj]	
[#		s]
[l		s]
[tɹ		t]
[tɹ		p]
[f l		t]
[l		k]
[n		f]

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

- **No** — the preceding environments are **not distinct**

- [l], [ɹ], and # occur before **both** [ʌj] and [aj]

2.2 Predictable environments?

- Does looking at the **following environment** help us predict whether [ʌj] or [aj] will appear?

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

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

2.2 Predictable environments?

- Does looking at the **following environment** help us predict whether [ʌj] or [aj] will appear?

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

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

- **Yes** — [ʌj] only appears before a **voiceless** sound

- [aj] appears **elsewhere** (before voiced sounds or #)

20

2.2 Predictable environments?

- Back to our questions: "Canadian Raising" example
(modified from Table 3.3 in CL, p 74)

  Examine the diphthongs [ʌj] and [aj] in the data set

  - Are their environments **predictable**, or **unpredictable**?

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2.2 Predictable environments?

- Back to our questions: "Canadian Raising" example
(modified from Table 3.3 in CL, p 74)

  Examine the diphthongs [ʌj] and [aj] in the data set

  - Are their environments **predictable**, or **unpredictable**? | predictable

  - Do they belong to **separate phonemes**, or are they **allophones** of a single phoneme? | they are allophones of the same phoneme

- <u>Audio examples</u> of Canadian Raising
from Gabriele Azzaro

2.2 Predictable environments?

Step 2. Consider the **environments**

- If the environments are **predictable** (non-overlapping), some **factor** in the environment determines which of the sounds will occur

  - That is, if we know the environment, we can **predict** which of the two sounds will appear

  - The sounds are in **complementary distribution** (they are **dividing the labor**, each doing <u>part</u> of the work)

  - They are **allophones** of the same phoneme: they are part of the **same** mental sound category (and are <u>not contrastive</u>)

2.2 Predictable environments?

Step 2. Consider the **environments**

- The environments are **unpredictable** (overlapping) when there is <u>no meaningful difference</u> between the environments where the two sounds can occur

  - That is, it is **not possible to predict** which of the two sounds will appear just from knowing what the environment is

  - The sounds are in **contrastive distribution** and belong to **distinct phonemes**
    (even if no minimal pairs were found!)

3. Checking in

Here is what we have learned so far:

- **Step 1.** Look for a **minimal pair**

- **Step 2.** Consider the **environments** where the sounds occur — are they:

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

In the next slide set, we will continue with:

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