Phonology I

Tuesday, 13 August 2019

Homeworks

How did Homework 1 go?

How did Discussion 1 go?

For each discussion homework please:

- Write one original post engaging with the discussion prompt (2pts)
- Write two response posts engaging with posts made by your peers (1pt ea.)

Extra Credit Opportunity

Practice identifying natural classes from **spectrograms**

Already published on Canvas

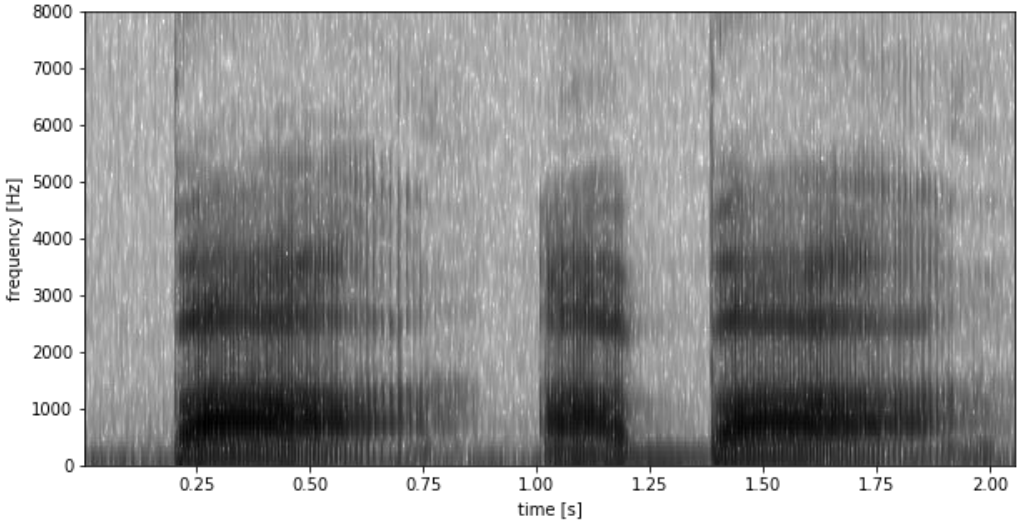
Will be worth up to 1% of your final grade

Spectrogram

A visual representation of an auditory signal.

Three dimensions:

- Time (on the x-axis)
- Frequency (on the y-axis)
- Power (cell darkness)



Review

Let’s transcribe some sound files!

m̥̀.qʰɔ̃ː.nɔ̃̀	Super **narrow transcription**
m̥̀qʰɔ̃ːnɔ̀	No syllables; no centralization
m̥kʰɔːnɔ	/k/ → [q] / _ [+back]; no tone
m̥kʰoːno	No other mid round Vs
m̥koːno	Aspiration is predictable (**broad transcription**) ←
mkono	Orthography

Review

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- File1: dʒæm

Review

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- File1: dʒæm
- File2: mɑɹməleɪd

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- File5b: tʃɹɑpik

Phonology Learning Outcomes

1. Determine whether two sounds are allophones or phonemes.
2. Use prose to describe a phonological rule written in standard form.
3. Identify alternations in small data sets and write rules to describe them.
4. Identify common phonological processes from pairs of forms.

Phonetics & Phonology

- **Phonetics**: the study of speech sounds
  - how they are produced (articulatory phonetics)
  - how they are perceived (auditory phonetics)
  - their physical traits (acoustic phonetics)

- **Phonology**: the study of sound systems
  - the inventory of sounds (both underlying and surface)
  - the rules that govern how those sounds pattern
    - phonotactics
    - alternations

Phonotactics

Phonotactics is the branch of phonology that deals with restrictions in a language on the permissible combinations of sounds.

What are some words you can make with the following sounds?

/ɪ/ /k/ /p/ /s/ /d/

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[skɪp]
[kɪd]
[pɪk]
[sɪp]
[dɪp]
[kɪs]

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[dɪp]
[kɪs]

*[ɪ]
*[k]
*[pɪ]
*[pdɪ]
*[kpsdɪdspk]

Why aren't these good words??

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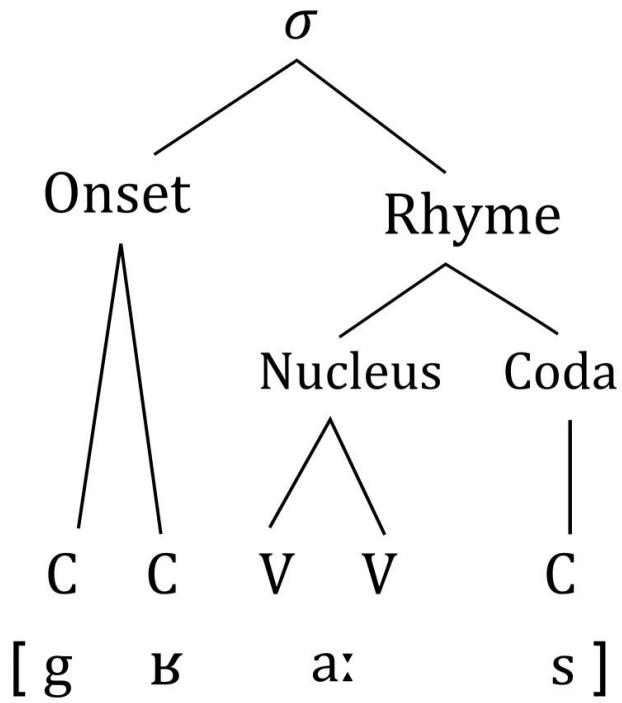
[pɪk]
[sɪp]
[dɪp]
[kɪs]

*[ɪ]
*[k]
*[pɪ]
*[pdɪ]
*[kpsdɪdspk]

Why aren't these good words?? Ultimately… because phonotactics

Syllable structure

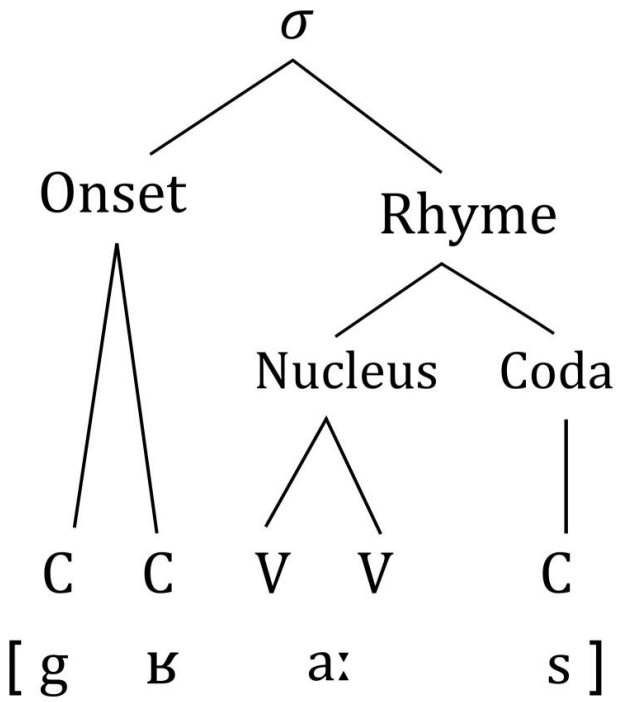


Syllable structure

Phonotactics (permissible sound sequences) are sensitive to syllable structure.

For example:

*[ptɪ]



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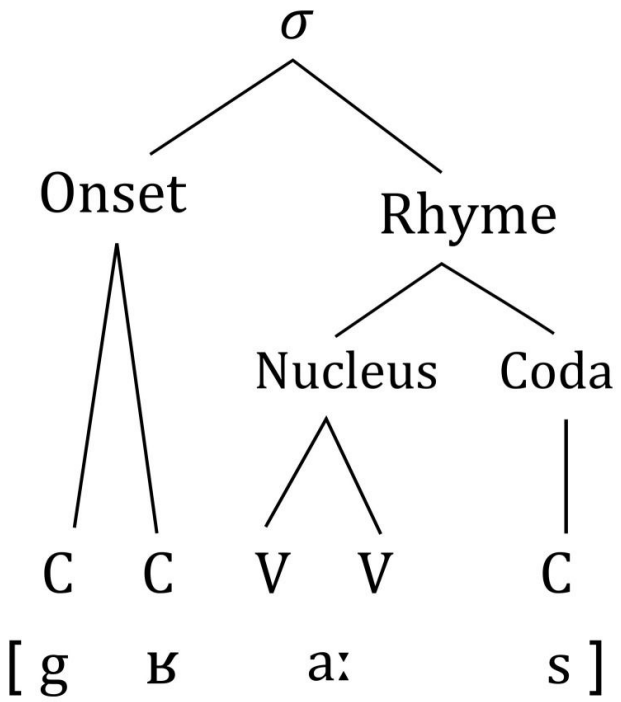
For example:

*[ptɪ]

But **hæptɪk** is an okay word.

Why?



Syllable structure

Phonotactics (permissible sound sequences) are sensitive to syllable structure.

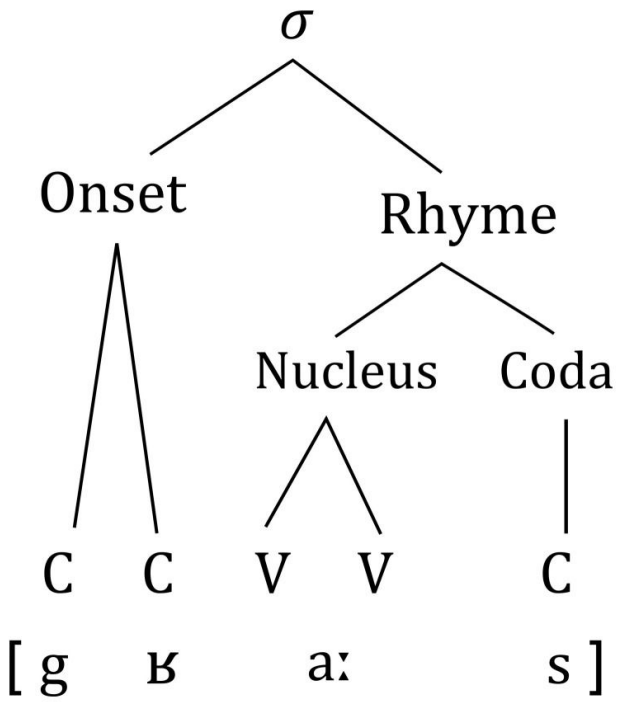
For example:

*[ptɪ]

But **hæptɪk** is an okay word.

Why?

Because the **pt** doesn't form an onset cluster, and the **ɪ** is in a closed, unstressed syllable: /hæp.tɪk/



Review

What are the three properties we used to define **consonants**?

Discuss with a partner seated near you.

Review

What are the three properties we used to define **consonants**?

- Place of Articulation
- Manner of Articulation
- Voicing (or voice quality)

Natural Classes

A **natural class** is a set of sounds that share a common (phonetic) property.

		Bilabial		Labiodental		Interdental		Alveolar		Palatal		Velar		Uvular		Glottal
		[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]
stop		p	b					t	d			k	g			ʔ
nasal			m						n				ŋ			
fricative				f	v	θ	ð	s	z	ʃ	ʒ					h
approximant	central		w						ɹ		j					
	lateral								l							
affricate										ʧ	ʤ					

Natural Classes

Labial sounds use the lips to constrict the oral cavity.

		Bilabial		Labiodental		Interdental		Alveolar		Palatal		Velar		Uvular		Glottal
		[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]
stop		p	b					t	d			k	g			ʔ
nasal			m						n				ŋ			
fricative				f	v	θ	ð	s	z	ʃ	ʒ					h
approximant	central		w						ɹ		j					
	lateral								l							
affricate										ʧ	ʤ					

Natural Classes

Coronal sounds use tip / front of the tongue to constrict the oral cavity.

		Bilabial		Labiodental		Interdental		Alveolar		Palatal		Velar		Uvular		Glottal
		[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]
stop		p	b					t	d			k	g			ʔ
nasal			m						n				ŋ			
fricative				f	v	θ	ð	s	z	ʃ	ʒ					h
approximant	central		w						r		j					
	lateral								l							
affricate										ʧ	ʤ					

Natural Classes

Dorsal sounds use the back of the tongue to constrict the oral cavity.

		Bilabial		Labiodental		Interdental		Alveolar		Palatal		Velar		Uvular		Glottal
		[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]
stop		p	b					t	d			k	g			ʔ
nasal			m						n				ŋ			
fricative				f	v	θ	ð	s	z	ʃ	ʒ					h
approximant	central		w						r		j					
	lateral								l							
affricate										ʧ	ʤ					

Natural Classes

Why are natural classes useful?

Sounds that share properties frequently behave similarly.

- Sounds in the same natural class may trigger or undergo the same *processes* or be subject to the same *restrictions*.

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What does that mean?

Example 1: Vowels are longer before word-final ***voiced stops***

Natural Classes

Review: **Stops** are sounds in which the airflow is completely blocked in the oral cavity.

		Bilabial		Labiodental		Interdental		Alveolar		Palatal		Velar		Uvular		Glottal
		[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	
stop		p	b					t	d			k	g			ʔ
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approximant	central		w						r		j					
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Natural Classes

Review: **Voiced** sounds are produced with vibrating vocal folds.

		Bilabial		Labiodental		Interdental		Alveolar		Palatal		Velar		Uvular		Glottal
		[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	
stop		p	b					t	d			k	g			ʔ
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approximant	central		w						r		j					
	lateral								l							
affricate										ʧ	ʤ					

Natural Classes

Voiced stops are the set of sounds that are both **voiced** and **stops.**

		Bilabial		Labiodental		Interdental		Alveolar		Palatal		Velar		Uvular		Glottal
		[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	
stop		p	**b**					t	**d**			k	**g**			ʔ
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Speech Sound Behavior: Example 1

Vowels in English are longer when they come before word-final voiced stops.

- Compare <heat> vs. <heed>
- How would you transcribe these words?
- What are other pairs of words that illustrate this pattern?

We use a combination of natural classes to describe this pattern in prose.

We use a set of **features** to describe the natural classes in rules.

(Remember: [±voice])

Review: Natural Classes

- **Vowels:** sounds produced with NO constriction in the vocal tract
- **Consonants:** sounds produced with constriction in the vocal tract
- **Voiceless:** sounds produced with open vocal folds
- **Voiced:** sounds produced with vibrating vocal folds
- **Oral:** sounds produced with air escaping ONLY through the mouth
- **Nasal:** sounds produced with air escaping through the nasal cavity
- **Stops:** sounds in which the airflow is completely blocked in the oral cavity
- **Continuants:** sounds produced with continual airflow through the oral cavity

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- **Stops:** sounds in which the airflow is completely blocked in the oral cavity
- **Continuants:** sounds produced with continual airflow through the oral cavity
- **Sonorants**: louder sounds, less obstructed airflow (nasals, approximants, vowels)
- **Obstruents**: quieter sounds, more obstructed airflow (oral stops, fricatives, affricates)
- **Sibilants**: sounds produced with high frequency hissing (alveolar and palatal fricatives and affricates) [s z ʃ ʒ ʧ ʤ]

Natural Classes → Features

• Vowels • Consonants	[±consonantal]
• Voiceless • Voiced	[±voice]
• Oral • Nasal	[±nasal]
• Stops • Continuants	[±continuant]
• Sonorants • Obstruents	[±sonorant]
• Sibilants	[+strident]*

Notice that features are binary!

*We probably won't be using [+strident], but this is the feature that distinguishes sibilants from other continuants

Review

What are the three properties we used to define **vowels**?

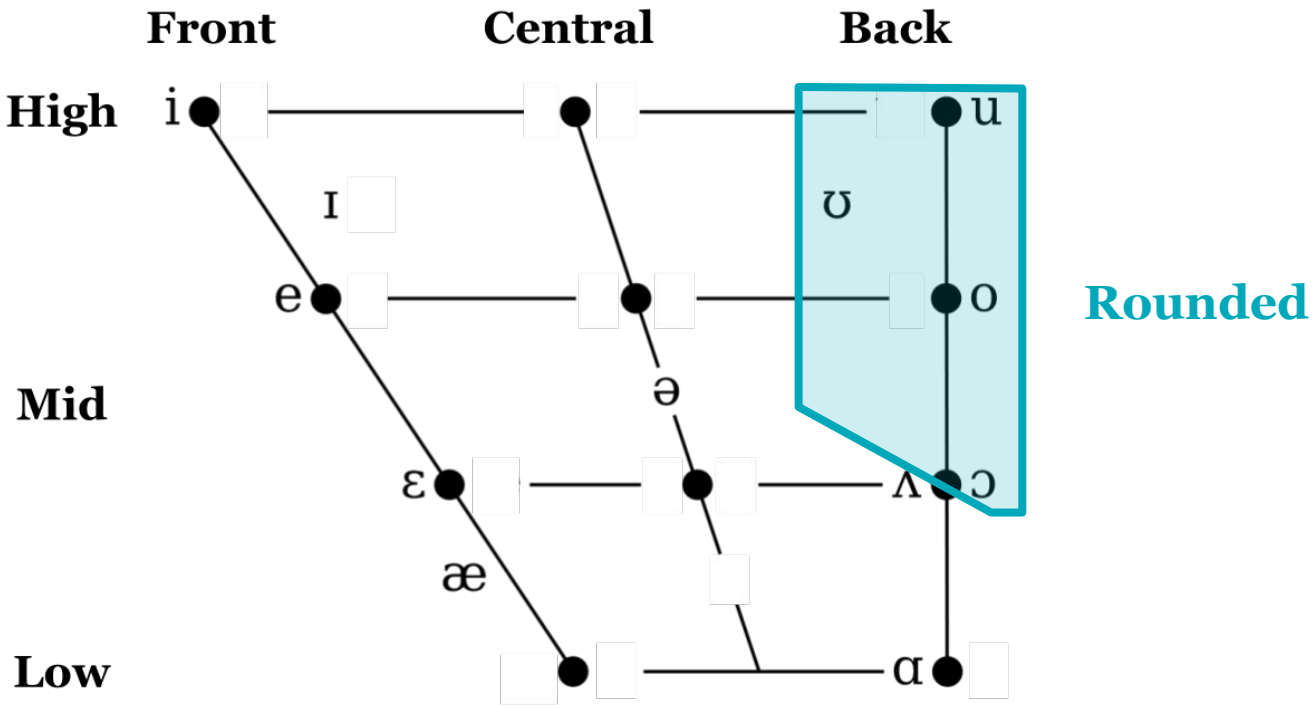
Discuss with a partner seated near you.

Review

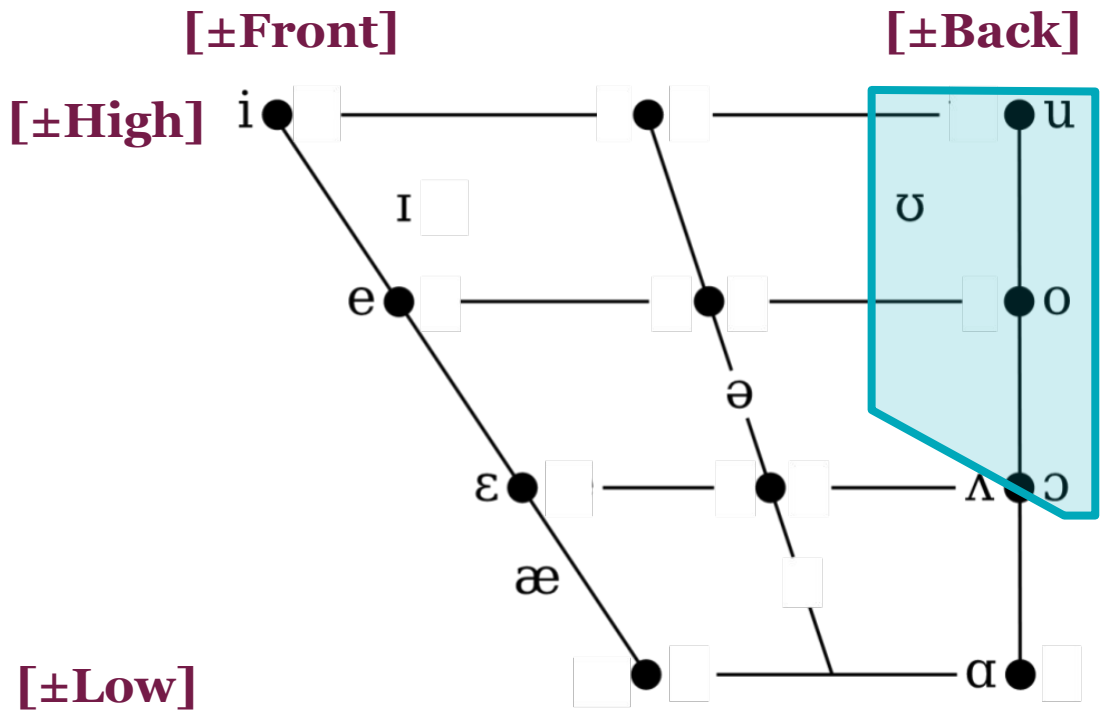
What are the three properties we used to define **vowels**?

- Height
- Place
- Rounding

Natural Classes for Vowels



Natural Classes → Features for vowels



If any vowel is followed by <ː>, it's also [+long]

ɑ = [-long]
ɑː = [+long]

Practice

Which one doesn’t belong:

1. ɑ ʊ e u
2. f t ʧ m
3. ɹ æ l w

Which one is a stop: v ð ʤ g
Which one is a sonorant: s l p b
Which one is a high vowel: ɛ ɪ ə ɔ

Natural Classes

Why are natural classes useful?

Sounds that share properties frequently behave similarly.

- Sounds in the same natural class may trigger or undergo the same *processes* or be subject to the same *restrictions*.

What does that mean?

Example 2: Word-initial voiceless stops are aspirated before vowels.

Speech Sound Behavior: Example 2

Voiceless stops in English are aspirated when they are at the beginning of a syllable and before a vowel.

- What are the voiceless stops in English?

Natural Classes

Voiceless stops are the set of sounds that are both **voiceless** and **stops.**

		Bilabial		Labiodental		Interdental		Alveolar		Palatal		Velar		Uvular		Glottal
		[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	[-voi]	[+voi]	
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Speech Sound Behavior: Example 2

Voiceless stops in English are aspirated when they are at the beginning of a syllable and before a vowel.

- What are the voiceless stops in English? **[p t k]**
- What features describe voiceless stops?

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Voiceless stops in English are aspirated when they are at the beginning of a syllable and before a vowel.

- What are the voiceless stops in English? **[p t k]**
- What features describe voiceless stops? **[-voice][-continuant]...**

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- Compare <pot> vs. <spot>
- How would you transcribe these words?

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- Compare <pot> vs. <spot>
- How would you transcribe these words? **[p^hɑt] [spɑt]**
- What are other pairs of words that illustrate this pattern?

Speech Sound Behavior: Example 2

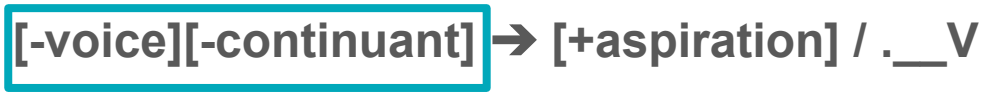
Voiceless stops in English are aspirated when they are at the beginning of a syllable and before a vowel.

[-voice][-continuant] ➔ [+aspiration] / .__V

Target Change Environment

Speech Sound Behavior: Example 2

Voiceless stops in English are aspirated when they are at the beginning of a syllable and before a vowel.



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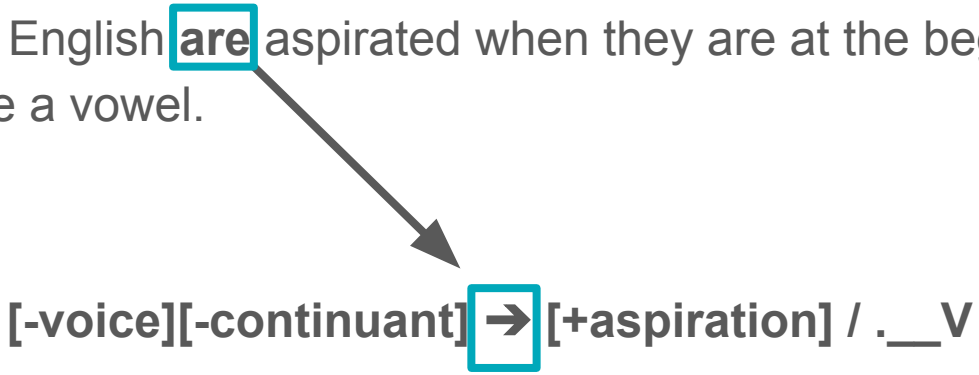
Voiceless stops in English **are** aspirated when they are at the beginning of a syllable and before a vowel.

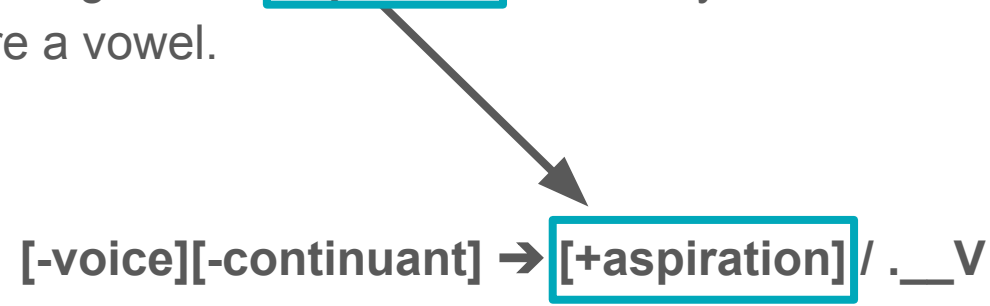


[-voice][-continuant] ➔ [+aspiration] / .__V

“becomes” 🤔

Speech Sound Behavior: Example 2

Voiceless stops in English are **aspirated** when they are at the beginning of a syllable and before a vowel.



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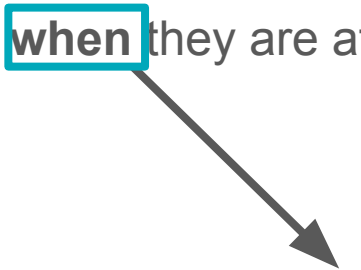
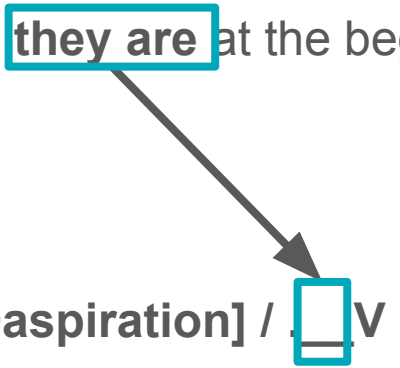


[-voice][-continuant] ➔ [+aspiration] / ___V

“in the environment”

Speech Sound Behavior: Example 2

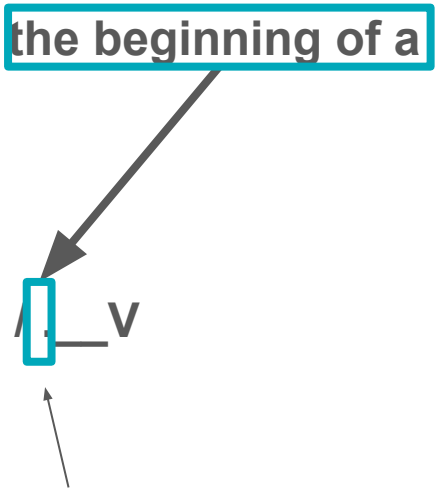
Voiceless stops in English are aspirated when **they are** at the beginning of a syllable and before a vowel.



[-voice][-continuant] ➔ [+aspiration] / _ V

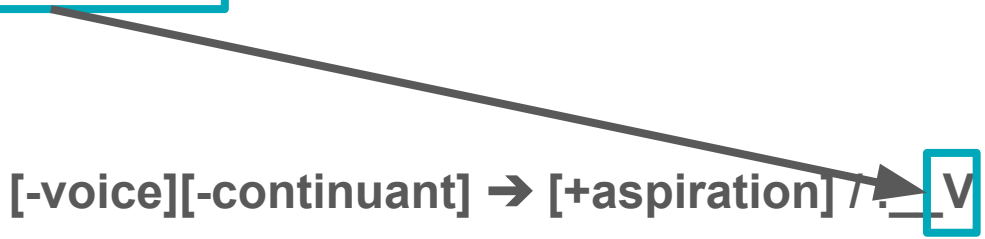
Speech Sound Behavior: Example 2

Voiceless stops in English are aspirated when they are at **the beginning of a syllable** and before a vowel.



Speech Sound Behavior: Example 2

Voiceless stops in English are aspirated when they are at the beginning of a syllable and **before a vowel**.



Speech Sound Behavior: Example 1

Vowels in English are longer when they come before word-final voiced stops.

- What is the target?

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Vowels in English are longer when they come before word-final voiced stops.

- What is the target? **vowels** or **[-consonantal]**
- What is the change?

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Vowels in English are longer when they come before word-final voiced stops.

- What is the target? **vowels** or **[-consonantal]**
- What is the change? **[+long]**
- What is the environment?

Speech Sound Behavior: Example 1

Vowels in English are longer when they come before word-final voiced stops.

- What is the target? **vowels** or **[-consonantal]**
- What is the change? **[+long]**
- What is the environment? **__[+voice][-continuant]#**

Speech Sound Behavior: Example 1

Vowels in English are longer when they come before word-final voiced stops.

- What is the target? **vowels** or **[-consonantal]**
- What is the change? **[+long]**
- What is the environment? **__[+voice][-continuant]#**

[+voice][-continuant] ➔ [+long] / __[+voice][-continuant]#

A Few Notational Conventions

C -- can be used to mean any consonant

V -- can be used to mean any vowel

. -- denotes a syllable boundary

-- denotes a word boundary

+ -- denotes a morpheme boundary

∅ -- denotes the empty set (means ‘nothing’ / ‘the absence of something’)

Practice

Pair up and write rules for the following descriptions:

- /l/ is deleted at the end of a word.
- A vowel is high when it’s preceded by a high vowel.
- A vowel is deleted when it’s followed by another vowel.
- Glottal stop is inserted at the beginning of onsetless syllables.
- Sonorants are nasal when they are followed by a nasal.

Types of Rules

When linguists look across many languages, we see there are some types of patterns that are very common, so we give them special names.

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When linguists look across many languages, we see there are some types of patterns that are very common, so we give them special names.

- **Assimilation**: a phoneme surfaces as an allophone that is **more like** one of the sounds near it.
  - What rule(s) would describe the pattern of Akan negative marking here?

Akan	**Gloss**	**Akan**	**Gloss**
mɪ pɛ	‘I like’	mɪ mpɛ	‘I don’t like’
mɪ tɪ	‘I speak’	mɪ ntɪ	‘I don’t speak’
mɪ kɔ	‘I go’	mɪ ŋkɔ	‘I don’t go’

Types of Rules

When linguists look across many languages, we see there are some types of patterns that are very common, so we give them special names.

- **Assimilation**: a phoneme surfaces as an allophone that is **more like** one of the sounds near it.
  - [+nasal] → [+labial] / __[+labial]
  - [+nasal] → [+coronal] / __[+coronal]
  - [+nasal] → [+dorsal] / __[+dorsal]

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- **Dissimilation**: a phoneme surfaces as an allophone that is **less like** one of the sounds near it.
  - Example: the Latin suffix *-alis* (used to form adjectives) surfaces as *-aris* when an /l/ is in the noun. We can still see this dissimilation in English.

-al	**-ar**
anecdot-al	angul-ar
annu-al	annul-ar
ment-al	column-ar
pen-al	perpendicul-ar
spiritu-al	simil-ar
ven-al	vel-ar

Types of Rules

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- **Epenthesis / Insertion**: a sound that isn't in the underlying form occurs in the surface form.
  - The rules for forming plurals, possessives, and third person singular verb agreement in English all involve an epenthesis rule.
  - Insert [ə] before the plural /z/ when a regular noun ends in a sibilant.
  - ∅→ə / [+strident]__[+strident]
    - Example words??

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  - ∅→ə / [+strident]__[+strident]
    - Example words?? **tʃəɹtʃəz leɪsəz dʒʌdʒəz ….**

Types of Rules

When linguists look across many languages, we see there are some types of patterns that are very common, so we give them special names.

- **Deletion**: a sound that is in the underlying form does not occur in the surface form.
  - Frequently sounds are deleted during fast speech (i.e. /mɛməɹi/ ↦ [mɛmɹi])
  - The deletion of [g]:

English	**Gloss**	**English**	**Gloss**
sɑ̃ɪn	‘sign’	sɪgnətʃə˞	‘signature’
dəzɑ̃ɪn	‘design’	dɛzɪgneɪʃə̃n	‘designation’
pʰæɹədɑ̃ɪm	‘paradigm’	pʰæɹədɪgmærɪk	‘paradigmatic’

Big Picture Review

Our learning goals for phonology are to develop the skills to:

1. Determine whether two sounds are allophones or phonemes.
2. Use prose to describe a phonological rule written in standard form. ✅
3. Identify alternations in small data sets and write rules to describe them.
4. Identify common phonological processes from pairs of forms. ✅

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Which of these skills is the most difficult for you right now?

Homework

Please complete the discussion homework

- one original post
- two response posts

Due before class on Thursday.

Take a look at the extra credit assignment