Quick Reminders

- The Course Study Guide (https://sites.google.com/view/matthewzaslansky/lign-101/study-guide) is online.
- The Phonetics/Phonology Quick Reference is helpful!
- Schwa vs. Wedge
  - Read the article on Professor Styler's site!
- Phonology is awesome

Phonology: The Sound Patterns of Language

Matt Zaslansky - LIGN 101

Today's Plan

- What is phonology?
- Phonemic Analysis from three different perspectives
- How to tell if your instructor is actually Batman
- Writing phonological rules

First, a note on notation

- We're going to start differentiating words in IPA between // and [ ]
- /tap/ means 'top' at an abstract level.
- [tap] means that sequence of sounds at a surface level.
- /tap/ exists in the speaker's mind, [tap] exits a person's mouth
- More later…

So, now we know roughly what speech is like

- What sounds we're using in English
- How to describe them
- … and some symbols we can use to talk about sounds, not letters

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… so, we should just be able to put the sounds together and we're good, right?

/ɪ/ /k/ /p/ /s/ /d/

- [skɪp]
- [kɪd]
- [pɪk]
- [sɪp]
- [dɪp]
- [kɪs]

… but wait

- *[ɪ]
- *[k]
- *[pɪ]
- *[pdɪ]
- *[kpsdɪdspk]

/s/ is the plural marker in English, right?

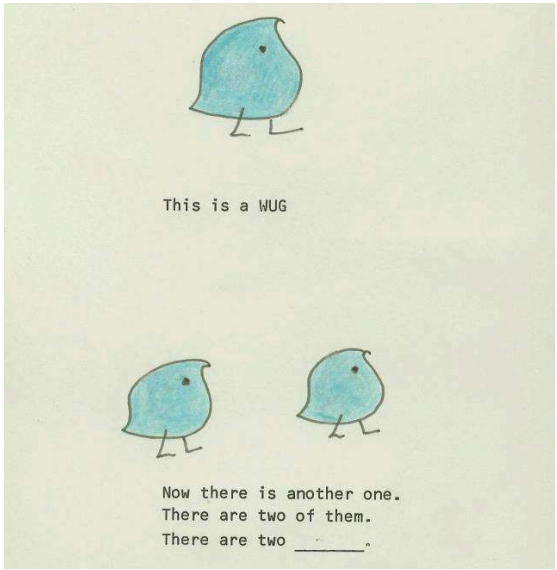
- [skɪps]
- [pɪks]
- but…
- *[kɪds]
  - Should be [kɪdz]
- *[kɪss]
  - **Should be [kɪsɪz]**

Wait. So clearly the plural marker is more than just ‘add an s’

- There are several versions, or “allomorphs”, of the plural marking chunk (the ‘morpheme’)
- Is this just a memorized pattern?
- **What would /s/ become for new words?**

The Wug Test

- Developed by Jean Berko Gleason



Now there is another one. There are two…

A. [wʌgs]

B. [wʌgz]

C. [wʌgɪs]

D. [wʌgɪz]

What if it was a /wʌk/? There are two…

A. [wʌks]

B. [wʌkz]

C. [wʌkɪs]

D. [wʌkɪz]

What if it was a /wʌʃ/? There are two…

A. [wʌʃs]

B. [wʌʃz]

C. [wʌʃɪs]

D. [wʌʃɪz]

How do we know this?!

- … and why are there three different versions of the plural marker in English?!

Phonology

Phonology

Phonology is the study of how sounds pattern in Language and languages

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What do phonologists study?

Within-Language Phonological Questions

- What sounds differentiate words? (Phonemic Analysis)
  - … and what do speakers hear as being “the same sound”?
- How do speakers tend to group sounds together? (Natural Classes)
- What combinations are “legal” or preferred in the language? (Phonotactics)
- How are syllables formed and what kinds are legal? (Syllable Structure)
- How do we assign stress, pitch, and emphasis? (Metrical Phonology)
- *How can we generate a theory that explains all of that?*

Theoretical Linguistics

- In theoretical linguistics, we have three big questions:
  - “How can we model human language and grammar?”
  - “Do these models describe what humans are doing in real language?”
  - “Are these models cognitively real?”

How do we model the patterns we see in language?

- Can we describe the patterns we’re seeing through some linguistic analysis or abstraction?

Sample models for Wug-taming

- Are we choosing a form among many which does the fewest things we don’t like?
  - “Do we just hate [gs] and [ʃs] clusters and avoid them by replacing them with something else?”
- Are we just remembering the words we’ve heard said before, and doing the rest from analogy?
  - “Are you finding a form for /wʌg+s/ by thinking about /mʌg+s/?”
- Are we using rules that transform ‘underlying’ sounds into one another?

- “Does some process change /s/ into [z] or [ɪz]?”
- **We’re going to take this approach in this class!**

How do these various approaches handle *real data from real languages*?

- Do they **predict all the things** that really happen?
- Do they **avoid predicting crazy things** that *never* happen?
- How do they **account for exceptions** and other weird data?
- Do they work for **all languages**, or just a subset?

Are these models cognitively real?

- Could they be naturally learned and acquired by humans?
- Do they depend on assumptions that some information is *innate*?
- Does this theory describe what’s *actually happening* inside the human mind?
- … or is it just a tool for describing how languages work, which doesn’t claim to be how *humans* make the choices?

We’re going to just scrape the surface of theoretical questions

- … but know that they’re there, and they’re *really* interesting.

Phonology is not the same thing as phonetics

- Phoneticians are more concerned with the physical processes of speech
  - Articulation, Perception, and the cognitive processes underlying both
- Phonologists are more concerned with the patterns of sound structure in different languages
  - Markedness, phonotactics, rules, and cross-linguistic patterns

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You can learn about one by studying the other

- … and phonetic laboratory methods for studying phonological problems is a booming world
- Phonetics 💕 Phonology

… but they are deeply different fields

- Phonologists and phoneticians ask different questions
- We respect each other, and often hang out, but we're not doing the same thing

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You've just jumped out of a plane

Now, you collect data, write a grammar, and write a dictionary

- What are the meaningful chunks of words ('morphemes') in this language?
- What are the words in this language?
- How should this language be written?
- Decisions will need to be made

One of the key questions you'll face is 'which sounds matter to speakers'

- Which sounds carry a *contrast*
- Which sounds *define words*
- Which sounds *cannot be changed without changing meanings*

Phonemic Analysis

- Determining which sound changes *affect the meaning* of a word in a language
  - Phonemic Sounds
- … which sound changes are *predictable*, and don't change word meanings
  - Allophonic Sounds
- … and which sound variations are completely unpredictable and meaningless
  - Free variation

We're going to look at this process using three different perspectives

- 1: By looking at data
- 2: By looking at perception
- 3: By looking at distributions

This is a "threshold concept"

- That's why I'm covering it from three directions
- If you're struggling here, come to office hours
- It's normal and natural to struggle here

Phonemic Analysis I: Let's use some data!

"Oh no. There are sounds everywhere!"

- "People use a huge set of sounds, and I don't know which differences matter!"
- "What changes in sounds are *random*, and don't affect the meanings?"
- "What changes in sounds are *meaningful*, and change the meaning of a word?"
- "What changes in sounds can be *predicted* based on the other elements of the word, and don't change the meaning?"
- "What should I write down in my grammar or dictionary?"

Does the difference between [t] and [t̪] change the meaning?

[t̪im]	[tim]
[t̪iz]	[tiz]
[t̪aj]	[taj]
[t̪ap]	[tap]

It doesn't change the meaning and there's no pattern

- In English, it doesn't matter whether a /t/ is made as a dental sound [t̪] or an alveolar sound [t]
- Speakers can do two things and nobody particularly cares
- There's no pattern, no standard, just maddening chaos
- This is **free variation.**

Does the difference between [k] and [p] change the meaning?

[ki]	[pi]
[kat]	[pat]
[kæst]	[pæst]
[kap]	[pap]
[kul]	[pul]

The meaning is changed, and there's no pattern

- When you change from /k/ to /p/, the meaning of the word changes
  - … but we can't predict which will show up except by knowing the word we want

- We see ‘minimal pairs’ (e.g. /ki/ and /pi/) where that segment is the only thing that’s changed.
- /k/ and /p/ are in a **contrastive** distribution
- They represent **two different phonemes**

Does the difference between [ej] and [ej:] change the meaning?

[sejf]	[sej:v]
[ejp]	[ej:b]
[mejt]	[mej:d]
[ejtʃ]	[ej:dʒ]
[ejk]	[ej:g]
[mejs]	[mej:z]

It doesn’t change the meaning, but we can predict when it happens!

- Changing from a short to long [ej] doesn’t change the meaning for speakers
- Vowel length is *predictable* based on the voicing of the next consonant
- Short and long vowels are in a **complementary** distribution
- They are **allophones of the same phoneme**

How are you feeling about this material?

A. 😀 I feel like I understand it well!

B. 🙂 I’m following, no problem.

C. 😐 I’m not quite sure if I get it.

D. 😕 I feel a bit confused.

E. 😭 I feel completely lost!

Phonemic Analysis II: Let's think about perception

Spanish speakers hear…

- **"Cabo"**
- When somebody says either
- **[kabo] or [kaβo]**

Spanish speakers hear…

- **/b/**
- When somebody says either
- **[b] or [β]**

English has two /l/ sounds

- Light l ([l] as in 'lip')
- 'Dark' or Velarized l ([ɬ] as in 'pill')
- The 'Dark' L happens at the end of a syllable

English speakers hear…

- **"Pill"**
- When somebody says either…

[pɪl] or [pɪɬ]

English speakers hear…

/l/

- When somebody says either…

[l] or [ɬ]

Speakers of language hear…

The phoneme

- When somebody says…

Any of the allophones of that phoneme

Phonemes are groups of sounds which trade places predictably!

- … and that trading is opaque to speakers
- The /l/ phoneme has two allophones in English: [l] and [ɬ]
  - As in ‘lip’ and ‘pill’
- The /t/ phoneme has many allophones in English: [t], [tʰ], [ʔ], [t̚], [ɾ], [ɾ̃]
  - As in ‘stop’, ‘top’, ‘button’, ‘cat’, ‘later’, ‘winter’
- Every sound produced is an allophone of some phoneme
  - … but not every phoneme has multiple allophones

How are you feeling about this material?

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Phonemic Analysis III: Looking at distributions

Allophones are *predictable*

- They always show up in specific environments, and don't affect the meaning of the word
- [ɱ] shows up in English *only* when there's an /m/ before an /f/
  - 'Same' [sejm] but 'Symphony' [sɪɱfəni]
- [n̪] shows up in English *only* when there's an /n/ before an Interdental sound
  - 'Pine' [pajn] but 'Pine thug' [pajn̪ θʌg]
- [ɬ] shows up in MUSE *only* at the end of a syllable
- 'lip' [lɪp] but 'pill' [pɪɬ]

Allophones show up according to rules

- If a sound is *variant* that only shows up according to a *rule*, it's an allophone of another phoneme

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Phonemes are *unpredictable*

- There is no pattern which dictates where they show up
- They can occur in the same environments
- They form 'minimal pairs', different words which differ only in that sound
  - (or sometimes near minimal pairs e.g., te[ð]er vs. mea[ʒ]ure)

If a sound has its own identity in the language's structure, it's a phoneme.

- If it's just another 'persona', it's an allophone

To determine this, consider a simple question…

Is Matt Batman?

- 

How do you find out if your instructor is secretly Batman?

- You look at the distributions!

If you see Batman and Matt in the same context, they're two different people.

- Finding two people talking to each other in the same place is a good indication that they're independent entities
- Two different personas can't be in the same place at the same time!
- They're in **contrastive** distribution
  - They happen in the same contexts
- If two sounds show up in an identical context, *they're independent phonemes*

If you only see Matt when there's no crime, and only see Batman where there's crime…

- This is a potential sign that Matt *could be* the same being as Batman
- If Matt runs into the bathroom when crime happens and Batman emerges, that's pretty good evidence
  - We call this an "alternation"
- They're in **complementary** distribution
  - One shows up in one context, the other in another context

- *If two sounds only show up in different contexts, or a sound suddenly changes, they're probably allophones of one phoneme*

Complementary Distributions

(Batman and his alter-ego, Bruce Wayne)

Contrastive Distribution

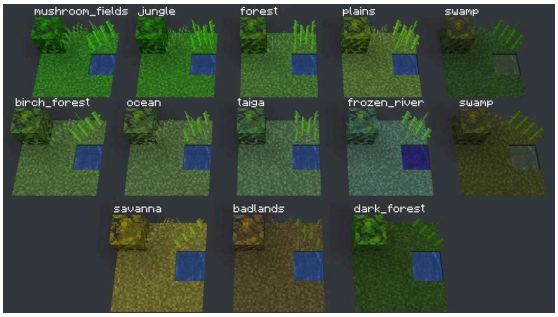
(Batman and Superman, two different heroes)

So, to sum up the pop culture references…

- Batman and Bruce Wayne are really just one being
  - Bruce shows up in some circumstances, Batman in others
- [ej] and [ej:] are just one sound /ej/ in English phonology
  - [ej] shows up in some places, [ej:] shows up in other ones
- Batman and Matt Zaslansky are different individuals

- … or so Matt wants you to think!

One more cultural reference…



So, that's three different perspectives on phonemic analysis

- You can look at the data and see when the meaning changes
- You can look at perception, and see what changes listeners "hear"
- You can look at the distribution, and see what sounds occur when.

How are you feeling about this material?

A. 😀 I feel like I understand it well!

B. 🙂 I'm following, no problem.

C. 😐 I'm not quite sure if I get it.

D. 😕 I feel a bit confused.

E. 😭 I feel completely lost!

Where does free variation fit in?

Cool. So… how do we do phonemic analysis?

Step 0: Check for minimal pairs

If you have a minimal pair where the meaning changes, the sounds are different phonemes and your work is done. Always.

If you have a minimal pair, the sounds are different phonemes and your work is done.

Phonemic Analysis in four easy steps!

- 0: Check for Minimal Pairs, if none…
- 1: Collect all the environments the sound you're interested in can occur in
- 2: State the distribution of the sounds.
- 3: Decide which allophone is the basic *underlying* form
- 4: Write rules to derive the other allophone(s) from it based on environment

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0: Check for Minimal Pairs, if none…

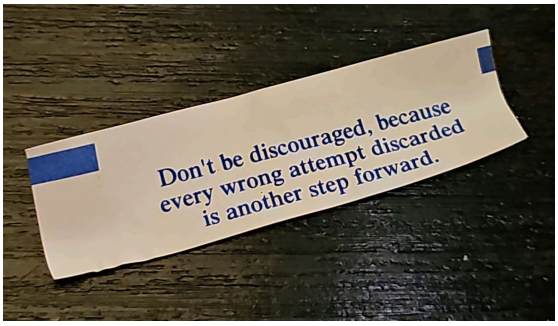
- Please. PLEASE.

1: Collect all the environments the sound you're interested in can occur in

- Write down what follows and precedes them
- Use __ to help focus your brain on the context

2: State the distribution of the sounds.

- “This one occurs before/after/around/near __”
- Sometimes you can only describe where one happens
- Test hypotheses!



3: Decide which allophone is the basic *underlying* form

- Choose the one you can’t predict
- Often it’s the “everywhere else” allophone

4: Write rules to derive the other allophone(s) from it based on environment

- We’ll talk about writing rules more shortly

All sorts of environments trigger changes

- Adjacent sound or sounds
- Adjacent *types* of sound
- Word boundaries
- Syllable boundaries
- Sounds or later earlier in the word
  - This is a bit more rare, but really neat!

Phonological Rules

So, you've figured out that sounds are allophones of the same phoneme!

- They're in a *complementary* distribution
- You can predict which one will show up based on the environment
- **How do I express that prediction to somebody else?**

Phonological Rules

You describe the distribution of the allophones of a phoneme with phonological rules

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Phonological Rule Format

- "X turns into Y in environment Z"
- "X -> Y" means "X turns into Y"
  - -> is an arrow, but just easier to type.
- Then the "/" which means "in the environment"
- Then you add a blank, representing where the sound goes that's getting transformed "__"
- … And you position that blank relative to the conditioning environment.

If /n/ turns to an /ŋ/ before velar sounds…

- /n/ -> [ŋ] / __ [velar sounds]
- If it happened after velar sounds…
- /n/ -> [ŋ] / [velar sounds] __

Other Symbols

- "#" means "the boundary of a word"
- "V" means "any vowel"
- "C" means "any consonant"
- "ø" means "Nothing"

- A /t/ being deleted is /t/ -> ø / …
- A /t/ being inserted is ø -> [t] / …

All of this is on your quick reference chart

- Use it!

Some Phonological Rules

- /t/ -> [t̪] /__[dental C]
- /ej/ -> [ej:] / __[+voice]
- /V/ -> [Ṽ] / __[nasal]
- Bruce Wayne –> Batman / [Crime]__[Crime]

Often, you'll describe entire groups of sounds in your rules

- These groups will all share a 'feature'
  - 'voiceless', 'velar', 'consonants', 'high vowels'
- [stops] -> [fricatives] / __[back vowels]
- Any group of sounds which share an articulatory feature can be called a 'natural class'
- We'll talk more about these next time

You'll hear about 'allomorphs'

- These are chunks of meaning ('morphemes') like the plural /s/ or past tense /d/ which change depending on nearby sounds
- The English plural "s" can be [s], [z], or [ɪz]
  - Cats, Dogs, and Dishes
- The English past tense "ed" can be [t], [d], or [əd]
  - "Walked", "Buzzed", "Rounded"

Here’s some practice data!

When do the three types of English Past Tense marker appear?

-t verbs	-d verbs	-ɪd verbs
[wakt]	[sɪnd]	[ɻʌstɪd]
[pæst]	[sʌnd]	[tʌftɪd]
[lɪkt]	[glʌvd]	[bɔɻdɪd]
[waʃt]	[buzd]	[pɪrɪd]
[lust]	[stownd]	[sajtɪd]

One solution to these data

- /-d/ -> [-t] / [voiceless C]__
- /-d/ -> [-d] / [voiced C]__
- /-d/ -> [-ɪd] / [alveolar stop/tap]__
- *The English past is more complicated than this, in practice!*

Are [l] and [n] allophones in Russian?

[l]	Gloss	[n]	Gloss
[lʲet]	‘year’	[sin]	‘son’
[lʲubl̪u]	‘I love’	[nʲet]	‘no’
[slon]	‘elephant’	[maʃina]	‘car’
[dʲelal]	‘did’	[novʲi]	‘new’

[bʲeli]	‘white’	[rajon]	‘district’

Nyet! There’s a minimal pair!

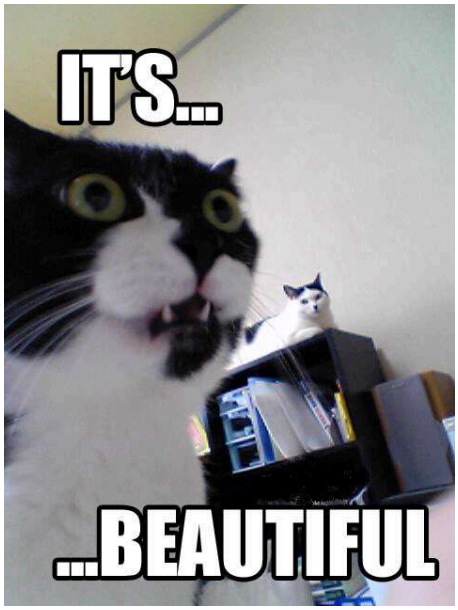
- If ‘lʲet’ and ‘nʲet’ differ in meaning and differ only by that segment, they can’t be allophones of the same phoneme!

Have some Spanish data with [d] and [ð]

[d]	**Gloss**	**[ð]**	**Gloss**
[daɲo]	‘damage’	[kaða]	‘each’
[pared]	‘wall’	[seða]	‘silk’
[red]	‘network’	[reðes]	‘networks’
[dentro]	‘inside’	[oða]	‘ode’
[vendo]	‘I sell’	[kaðena]	‘chain’

This one’s awesome (and allophonic!)

- /d/ -> [ð] / V__V
- Also, /b/ -> [β] / V__V
- And, /g/ -> [ɣ] / V__V
- “Voiced stops become fricatives at the same place of articulation between vowels”



Whoa. You're doing Phonology!

- Amazing!

Wrapping up

- Phonology is the study of how sounds pattern
- Phonemic analysis is how we determine which sounds have an identity in the language
  - … and which are just personas of other sounds
- Matt *may* be Batman
- Phonology is fun!

Next time

- Four common phonological processes
- Phonotactics
- More data!

Thank you!