Phonology

LING 200: Introduction to the Study of Language

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Announcements

- **Conferences now open for registration**
  - Register for the section you want the same way you register for a course.
- **Assignment 1 is due today by 11:59pm**.
  - Submit as a PDF on MyCourses.
  - Group members: make sure all names are on the assignment.
  - One group member submits the assignment.
  - Other group members submit a short doc stating who they worked with.
  - **All group members must have the same TA.**
- If you are waitlisted and can't submit the assignment yet, you will get a short extension. Stay tuned for an update.

Outline

Slides credit: David Pesetsky, Rebecca Starr

Phonetics vs. phonology

Reminder: what is phonetics?

- **Phonetics** is the study of speech sounds.
  - Includes how they are produced and perceived.

➽ Is that all we need to know about speech sounds?

Phonetics vs. phonology

Example

Consider the possible word:

(1) [ŋjih]

- These are all English speech sounds.
- But we know that this is not a well-formed English word.
- ➽ This indicates that our knowledge of English speech sounds is more extensive than what is captured in the study of phonetics.

Phonetics vs. phonology

What is phonology?

- **Phonology** is the study of the structures and patterns of speech sounds within languages.
- Key point: phonology studies sounds at a more abstract level than phonetics.

Phones, Phonemes and Allophones

What is a phone?

- So far we've been using the phrase "speech sound" a lot.
- Let's replace that with a more precise term, "phone."
- **Phones** are the most basic unit of speech.
- They correspond to the IPA symbols that we have learned.
  - [p], [ə], [ʔ], etc.

Phones, Phonemes and Allophones

How many phones are in...

- phlegm 4: flɛm
- knee 2: niː
- go 3: gow
- talking 5: tɔːkɪŋ

Phones, Phonemes and Allophones

Do all languages have the same phones?

- While the IPA lists a universal set of phones, each language does not use every phone.
- For example, English does not use the phone [x], which is a voiceless velar fricative.
- Many languages do not use the phones [θ] and [ð].

Phones, Phonemes and Allophones

Are all phones created equal?

- Sometimes, although two languages both use a phone, it does not operate in quite the same way.
- Let's look at an example phone: [ɾ]
- ➽ This is called a "tap" or "flap."

Phones, Phonemes and Allophones

Is [ɾ] a phone used in English?

- In North American English (and some other dialects), the tap appears in words like the following:
  - water [waɾər]
  - related [rəlejɾəd]
  - battle [bæɾəl]

Phones, Phonemes and Allophones

Is [ɾ] a phone used in English?

- So, why didn't we learn about [ɾ] as one of the sounds of English?
- [ɾ] seems to have some kind of relationship to the phone [t].
- Let's look again:
  - create [kriejt]
  - created [kriejɾəd]
  - import [ɪmpɔrt]
  - importing [ɪmpɔrɾɪŋ]

Phones, Phonemes and Allophones

What is the connection between [ɾ] and [t]?

- A speaker of North American English would think, "these are all basically a 't', I just pronounce the 't' a bit differently sometimes."

- **This is a key concept**: there is a difference between the underlying sound and how it is phonetically realized.

Phones, Phonemes and Allophones

Checking for minimal pairs

- How can we determine whether two phones are different realizations of the same underlying sound?
- Test: Is there any pair of words that is **exactly the same** except that one has a [t] where the other has a [ɾ]?
  - Can we take a word with [t], replace it with a [ɾ], and end up with a new word?
- No. If we replace [t] with [ɾ], we end up with the same word, just pronounced differently.
  - "create" create creaɾe
  - "import" import imporɾ

Phones, Phonemes and Allophones

Checking for minimal pairs

- In contrast, can we take a word with [t], replace it with [d], and get a new word?
  - Yes: pat/pad
    ant/and
  - Other examples?
- This type of word pair, where everything is identical except for one sound, is called a **minimal pair**.

Phones, Phonemes and Allophones

Different types of distribution

- Because we can find no minimal pairs, we say that [t] and [ɾ] are **not contrastive**.
  - In other words, we cannot use [t] and [ɾ] to make two different words.
- The phones [t] and [ɾ] are in **complementary distribution**.
  - They cannot appear in the same phonological context in English.
  - There is a rule that dictates our preference in different contexts, which we will get back to.

Phones, Phonemes and Allophones

Different types of distribution

- **Contrastive distribution:**.
  - Two phones can occur in the same phonological context.
  - This yields **minimal pairs** with different meanings (pat, pad).
- **Complementary distribution**.
  - Two phones never occur in the same phonological context.
  - No minimal pairs.

Phones, Phonemes and Allophones

Different types of distribution

- One more type of distribution: **free variation**.
  - Two phones can occur in the same context, but they do NOT result in a contrast in meaning.
  - For example:

“either”	iðər	ajðər
“economics”	ikənamıks	ɛkənamıks

- More on free variation in a moment.

Phones, Phonemes and Allophones

Introducing the phoneme

- [t] and [ɾ] are in complementary distribution.
- They represent the same underlying abstract sound.
- We call this type of abstract unit a **phoneme**.

- A phoneme is the smallest contrastive unit of sound in a language.

- We indicate phonemes with slashes instead of brackets: /t/

Phones, Phonemes and Allophones

Introducing the phoneme

- We can think of a phoneme as an abstract collection of phones.
- For example, we know that the English phoneme /t/ can be phonetically realized as [t] or [ɾ].
  - In fact, /t/ has a few more possible realizations we will talk about later.
- We call these possible realizations **allophones**.

Phones, Phonemes and Allophones

Two levels of representation for sounds:

Phoneme: /t/

Allophones: [t] [ɾ]

Phones, Phonemes and Allophones

Are phonemes universal?

- Phonemes and their allophones are specific to particular languages.
- For example, in English, [t] and [ɾ] are allophones of the phoneme /t/.
- But in many other languages (Japanese, Korean, Tagalog, etc.), /t/ and /ɾ/ are two distinct phonemes.
- A minimal pair in Japanese:
  /hito/ “person” /hiɾo/ “inquire”

Phones, Phonemes and Allophones

Can one phone be an allophone of more than one phoneme?

- A phone can be the realization of more than one possible underlying phoneme.
- For example, [ɾ] is an allophone of both /t/ and /d/ in North American English.

Phoneme: /t/ /d/

Allophones: [t] [ɾ] [d]

Phones, Phonemes and Allophones

Can one phone be an allophone of more than one phoneme?

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].

Phones, Phonemes and Allophones

Are all phones associated with phonemes?

- If a phone appears in a language, does it necessarily correspond to some underlying phoneme?
- What do you think?

Are all phones associated with phonemes?

- Yes. All phones have an underlying phonemic representation.
  - For all parts of the speech signal, there are two levels: an underlying phonemic level and surface phonetic realization.
  - In other words, everything we say corresponds to a more abstract target that we formulate in our brain.
- **Phonemic level:** /ʃi ɪz drɪŋkɪŋ watər/
  Phonetic level: [ʃi əz drɪŋkɪŋ warər]

Identifying allophones

Can one phone be an allophone of more than one phoneme?

- How can we know for sure whether two phones are allophones of the same phoneme?
- This can sometimes be tricky to decide

Test: complementary distribution

If two phones are:

a. in complementary distribution
(= they never appear in the same phonological context)

b. AND they are phonetically similar
(= they share phonetic features like place or manner of articulation)

... then they are likely to be allophones of the same phoneme.

Identifying allophones

Test: complementary distribution

An analogy:

- Batman and Bruce Wayne never appear in the same place at the same time.
- They both look suspiciously like Christian Bale.
- They are underlyingly the same guy.

Identifying allophones

Complementary distribution is NOT sufficient to identify allophones

- Occasionally, two phones are in complementary distribution but are not considered allophones of the same phoneme.
- Usually because they are too phonetically dissimilar.
  - e.g., [h] and [ŋ] in English
- Kinda like... Batman and Wolverine

Identifying allophones

Not all allophones are in complementary distribution

- Allophones can also be in free variation.
  - iðər or ajðər for “either”
- Here, the choice of allophone is not determined by linguistic context.

Free distribution

- In sociolinguistics, we study how this type of free variation is predicted by non-linguistic factors such as formality.
- But in the field of phonology, this type of free variation is not particularly interesting.
  - From a phonological perspective, free variation is “random.”

Identifying allophones

Review: Key Points for phones, phonemes, and allophones

- **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., “Tim”, “dim”)
- **Allophone**: a phone that is one possible realization of a phoneme.
- Three types of **distribution**:
  - contrastive,
  - complementary,
  - free variation.

Review

Phonemes/allophones?

Are the voiceless velar stop [k] and the voiceless uvular stop [q] contrastive in Classical Arabic (i.e. are they separate phonemes or allophones of one phoneme)? Why or why not?

1. kalb	‘dog’	5. kuds	‘heap’
2. quds	‘sanctity’	6. kari:m	‘noble’
3. kubba	‘meatloaf’	7. qalb	‘heart’
4. qari:b	‘near’	8. qubba	‘dome’

Review

Phonemes/allophones?

Are the voiceless velar stop [k] and the voiceless uvular stop [q] contrastive in Classical Arabic (i.e. are they separate phonemes or allophones of one phoneme)? Why or why not?

1. kalb	'dog'	7. qalb	'heart'
2. quds	'sanctity'	5. kuds	'heap'
3. kubba	'meatloaf'	8. qubba	'dome'
4. qari:b	'near'	6. kari:m	'noble'

- [k] and [q] contribute to changes in meaning:
- We can find several **minimal pairs**.

⇨ Therefore, [k] and [q] are **contractive** (= they are **phonemes** in the language).

Phonotactics

How languages organize phonemes

- We saw that languages differ in their **phonemic inventory**: that is, what are possible sounds in the language.
- Languages also differ in *how* they uses their phonemes.

  /pit/

- Is this a possible word in English? Yes, "Pete."
- Is this a possible word in Japanese? No. Why?

Phonotactics

How languages organize phonemes

- /p/, /i/, and /t/ are all phonemes in Japanese.
- But /pit/ is not a possible Japanese word, because syllables have to either end with a vowel or with a "ŋ."

Phonotactics

- The constraints on where phonemes can appear in a language are called **phonotactics**.
- Our knowledge of English phonotactics tells us what is a possible English word:
  - frink
  - rfink

Phonotactics

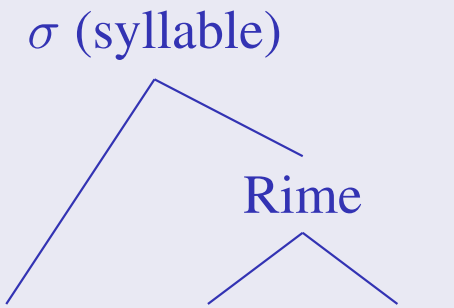
The syllable

An important unit in phonotactics is the **syllable**.

- Syllables are the primary **prosodic unit** in most languages, including e.g. English and French.
  - Prosody refers to the rhythm, stress, and intonation of a language.
- For example, in English, stress is placed on particular syllables.

Phonotactics

The syllable

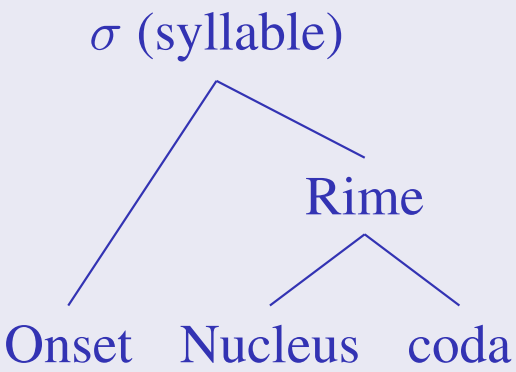


“sprint”	spr	ɪ	nt
“pine ”	p	aj	n
“I ”		aj	
“me ”	m	i	
“twelfths ”	tw	ɛ	lfθs

Phonotactics

A few phonotactic constraints of English:

All syllables must have a nucleus, but onsets and codas are optional.



“aim”		ej	m
“oh”		ow	
“too”	t	u	

Phonotactics

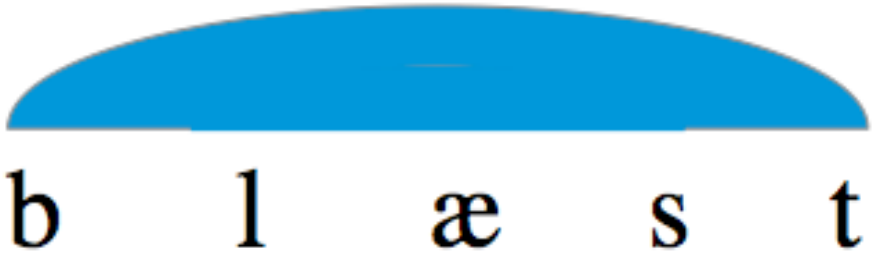
A few phonotactic constraints of English:

- If the first consonant in a complex onset is not an /s/, the second must be a liquid or glide.
  - trap, glum, break, please, cute, quake.
  - stare, sphere, scare, spare.
  - *ksare, *tfare
- If the second consonant in a complex coda is voiced, so is the first.
  - bend, bent, best
  - *besd

Phonotactics

The sonority hierarchy

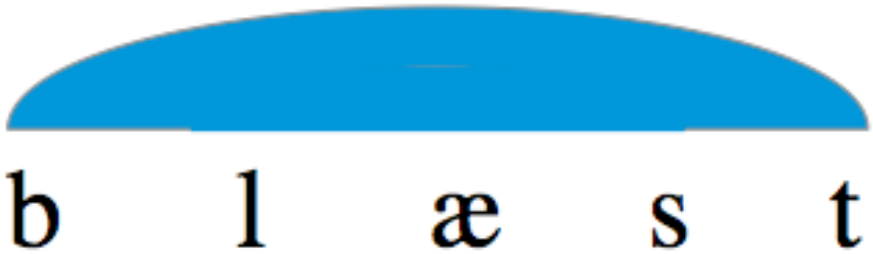
- Across different languages, phonotactic rules for syllables tend to follow the **sonority hierarchy**.
  - Sonority refers to how "loud" phones are.
  - vowels > glides > liquids > nasals > fricatives > affricates > stops.
- More sonorous phones tend to be closer to the syllable nucleus.



Phonotactics

The sonority hierarchy

- This is why we feel that *frink* is possible word of English, but *rfink* is not.
- *Frink* doesn't violate any rules of English phonotactics, it just happens not to be a word.
- But *rfink* could never be a word of English!



Phonotactics

Review: Key points from phonotactics

- 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.
- Phonotactic rules across languages are shaped by the **sonority hierarchy**.

Phonotactics

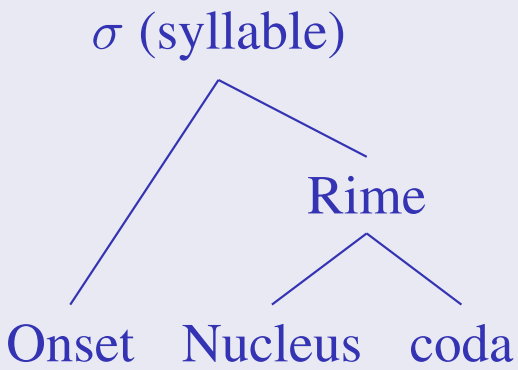
How many syllables are in these words?

1. phonotactics /fɔ.nə.tæk.tɪks/ = 4 syllables
2. rhythm /rɪ.ðəm/ = 2 syllables
3. amongst /ə.mʌŋst/ = 2 syllables
4. flurries /flʌ.rɪs/ = 2 syllables

(Optional dots indicate syllable boundaries in IPA.)

Phonotactics

Analyze the syllable structure of "amongst"



/ə/		ə	
/mʌŋst/	m	ʌ	ŋst

For next time...

- **Assignment 1** is due today at 23:59. Submit on *MyCourses*.
- **Assignment 2** will be posted later today, will be due next Monday (January 25).
- **My office hours**:
  Mondays, 15:00-16:30, 1085 Dr. Penfield Ave, room 101.
- **TA office hours**:
  Mondays, 16:30-17:30, 1085 Dr. Penfield Ave, room 204.
- **Read**: Mihalicek & Wilson "Language Files", chapter 3.1-3.3 (pages 101-123), in course pack.