

PHONOLOGY

WHAT IS THE DIFFERENCE BETWEEN PHONETICS AND PHONOLOGY?

Phonetics is the study of speech sounds as physical entities (their articulation, acoustic properties, and how they are perceived), and phonology is the study of the organization and function of speech sounds as part of the grammar of a language.

MINIMAL PAIRS

Any pair of words is called a minimal pair if and only if:

- they have exactly the same number of sounds
- each member of the pair differs from the other by one sound only
- in one place only

- a. pole, toll
- b. toll, coal
- c. till, tall
- d. coal, cool
- e. leap, lean
- f. pat, pad
- g. far, par
- h. zap, sap
- i. pare, pair
- j. neat, teen
- k. writer, rider
- l. suit, shooter

What can we learn from minimal pairs?

Phonologists want to model speakers' knowledge of the languages they use:

- How the sound system of a language is built
- What its basic building blocks are
- And how those blocks are put to work

If speakers of some language pay attention to the difference between sound X and sound Y,

. . . if that difference is important to them for understanding their language . . . then that suggests that X and Y are both **crucial** and **distinct** parts of the phonological system of their language.

Minimal pairs are a kind of experiment:

- If we eliminate all differences between two words except one difference,
- and speakers notice that one difference,
- then that difference must be crucial to their phonological system.
- The building blocks we identify this way are called **phonemes**:

If speakers of some language perceive sound X as different from sound Y in their language, then X and Y represent distinct phonemes in that language

THE ROLE OF ENVIRONMENT

Phonemes are distinct from one another psychologically.

But typically, each phoneme actually shows up in a variety of audibly distinct phonetic forms, or **allophones**.

Very often, the traits displayed by these audible allophones are dependent on the traits of their neighboring sounds:

- Sometimes they become more like neighboring sounds, a process called assimilation
 - e.g. place assimilation: incoming /ɪn/ + /kʌmɪŋ/ → incoming [ɪŋkʌmɪŋ]
- Sometimes less like their neighbors (this happens a little less often), which is called dissimilation
 - e.g. the first of two alveolar stops glottalizes: kitten /kɪt̪ɪ/ → [kɪʔɪ]
- Other kinds of variation can show up too.

Phonemes are abstract collections of speech sounds that distinguish word pairs in a specific language
They are **realised** as **allophones**

Phonemes are language specific

PHONEMIC TRANSCRIPTION

Between forward slashes

- [ðə 'kʰwɪk̚ bɹaʊn 'faks 'dʒʌmp̚s ɒvə ðə 'lezi 'daɪg]
- /ðə kwɪk bɹaʊn faks dʒʌmps ovə ðə 'lezi daɪg/

EXAMPLE

For instance, to English speakers, the liquids /l ɹ/ are distinct sounds. That's why English speakers hear rate [ɹejt] and late [lejt] as different words: they form a minimal pair.

- But /l/ does not always sound exactly the same. Neither does /ɹ/.
- Both phonemes actually vary quite a bit in their physical forms.

They predictably display voiceless variants (allophones) when they follow a voiceless aspirated stop, but voiced allophones otherwise:

plain [p^hlejn]

clays [k^hlejz]

craze [k^hɹejz]

train [t^hɹejn]

lane [lejn]

glaze [glejz]

graze [gɹejz]

drain [dɹejn]

Which form of the liquids—voiced or devoiced—is likely to be the basic (underlying) form? Why?

The allophone that appears in the broadest range of environments is likely to be the more basic form: the so-called elsewhere case.

Complementary distribution: Two allophones [X] and [Y] are in complementary distribution if [X] never appears where [Y] does and vice versa. Suggests that one is a modified (“conditioned”) version of the other

Complementary distribution is rule-governed: you can write a rule that predicts where each allophone will appear

Contrastive distribution: Two sounds [X] and [Y] are in contrastive distribution if swapping one for the other produces a change in word meaning.

Contrastive distribution is NOT rule-governed; you cannot write a rule that predicts where different phonemes will appear.

(It's just another way of saying that [X] and [Y] represent different phonemes.)

Consider the nasal consonants in this dataset drawn from Italian.

- How many different nasal allophones show up in the data?
 - Which nasal allophones are predictable? Which are not?
 - How many nasal phonemes do we therefore have evidence for?
- | | |
|----------------------|-----------------------|
| a. [tinta] 'dye' | g. [tingo] 'I dye' |
| b. [tɛnda] 'tent' | h. [tɛŋgo] 'I keep' |
| c. [dansa] 'dance' | i. [funɡo] 'mushroom' |
| d. [nero] 'black' | j. [bjaŋka] 'white' |
| e. [dʒɛnte] 'people' | k. [aŋke] 'also' |
| f. [sapone] 'soap' | l. [faŋgo] 'mud' |

Minimal pair: Two words that differ according to one sound in one place, like pit and pip. Useful for identifying phonemes.

Phoneme: Sounds that are distinct in Language X represent phonemes in Language X. A mental representation of a sound in a phonological grammar.

Contrastive distribution: when allophones A & B are perceived as different sounds by speakers of language X. No rule for their distribution. Thus, not predictable.

Allophone: surface (audible, physical, phonetic) speech sound. Every phoneme has to have at least one allophone (or else there would be nothing to listen to).

Complementary distribution: If sound A never appears where sound B does, and vice-versa, then A and B are in complementary distribution. A rule can specify which allophone appears in which environment. Thus, predictable.

THE FORM OF PHONOLOGICAL RULES

A phonological rule generally looks like this:

A. start with the underlying /phonemic/ form: the “input”

B. list the possible [allophones]: the “output”

C. finally, indicate the conditions that yield each of those allophones

/A/ → [B] / — [C]

Usually, the “input” or /phonemic/ form is based on the allophone that occurs most often; we name the phoneme after this allophone, e.g. English /l/ or /t/.

Rules can be written informally in plain English, or formally in shorthand.

In English, the rhotic /ɹ/ is realized as devoiced [ɹ̥] following an aspirated voiceless stop, and as voiced [ɹ] elsewhere

Note: [ṁ ṅ] represent devoiced nasal stops

a. [tagi]	egg	f. [kitabu]	book	k. [pa:lika]	fly!
b. [ni]	it is	g. [ɲombe]	cow	l. [matagi]	eggs
c. [dodoa]	pick up	h. [goʃa]	sleep!	m. [babu]	skin
d. [ndimi]	tongues	i. [ɲgoto]	heart	n. [mbeu]	seed
e. [ṅt ^h umbi:]	monkey	j. [ṅk ^h uni]	bedbug	o. [ṁp ^h eho]	wind

Consider the distribution of [n] and [ṅ] in the dataset. Are these two phones allophones of a single phoneme, or of two separate phonemes?

If two phonemes, cite evidence from the data that favors that conclusion. What is the best underlying representation of each phoneme?

If one phoneme, what is the best underlying representation of that phoneme? Provide a rule, written in plain English as well as shorthand, that precisely describes the distribution of each of the two allophones.

Common Phonological Processes

Phonological processes fall into two broad categories:

1. Articulatory: Affect the nature of the segment itself:
 - generally making it more like its neighbors (assimilation, very common)
 - or less like them (dissimilation, much less common)
2. Organisational: Affect the arrangement of sounds:
 - either by deleting
 - inserting
 - or reordering segments

Assimilation (Regressive or Progressive)

Occurs when one segment takes on one or more features from a neighboring segment. This feature may be voicing, place, or less commonly, manner.

Nasal consonant place assimilation

English nasals assimilate the place of articulation of a following consonant. For instance, the prefix in- shows the following forms:

impossible [ɪm'pʰasɪbəl]

insincere [ɪnsɪn'sɪr]

incomplete [ɪŋkəm'pʰlɪt]

inattentive [ɪnə'tʰɛntɪv]

irresponsible [ɪrɪ'spənsɪbəl]

illogical [ɪ'lɒdʒɪkəl]

/ɪn-/ → [ɪŋ] before a velar C

[ɪm] before a bilabial C

[ɪ] before a liquid C (this part is actually deletion)

[ɪn] elsewhere

Dissimilation: segments become less like one another

ex. Latin: genitive suffix

nav-alis ‘of navies’

crimin-alis ‘of crime’

flor-alis ‘of flowers’

milit-aris ‘of soldiers’

sol-aris ‘of the sun’

ex. English: colonel

colonnello → coronnel → colonel

Organisational: Insertion, Deletion, Metathesis:

Epenthesis: insert a segment into a word, where none previously existed.

Prothetic vowels in Romance:

Insert a vowel before word-initial fricative-stop clusters (an historical change, this time):

Latin schola → Spanish escuela
→ OFr escole → Mod. French école

Deletion: an underlying segment is not articulated.

i. Delete word-final nasals:

Dutch

Leiden /ləjdən/ → [ləjdə̃] (city name)

zitten /zitən/ → [zitə̃] 'to sit'

ii. Simplify complex consonant clusters:

English:

what's that? /wʌtsðæt/ → [wʌts_æt] /ð/ deleted

pretend /prɪ'tɛnd/ → [prɪ't^hɛn] /d/ deleted

Metathesis: occasionally, a language will reverse the order of segments in a given context. Pretty unusual.

Historically, this has happened fairly often in English:

OE bridd → MdnE bird

bridde → third

waps → wasp

though it didn't happen consistently:

bricg → MdnE bridge

prysce → thrush

Tojolabal

Mayan language spoken in Chiapas, Mexico, ~70,000 speakers.

Note: [kʔ] represents a glottalized voiceless velar stop.

a.	[kɨsim]	my beard	g.	[sak]	white
b.	[tsakʔa]	chop it down	h.	[kʔiʃin]	warm
c.	[koktit]	our feet	i.	[skutʃu]	he is carrying it
d.	[kʔak]	flea	j.	[kʔuutes]	to dress
e.	[pʔakan]	hanging	k.	[snika]	he stirred it
f.	[kʔaʔem]	sugar cane	l.	[ʔakʔ]	read

Consider the distribution of the phones [k] and [kʔ]

Canadian French

French language as spoken in Canada, ~7,300,000 speakers.

[ts] is a voiceless alveolar affricate

[dz] is a voiced alveolar affricate

[y] is high front round tense vowel

[ʏ] a high front round lax vowel

a. [tu] all

b. [abutsi] ended

c. [tɛl] such

d. [tab] stamp

e. [tsimɪd] timid

f. [tsit] title

g. [tɔrdzy] twisted

h. [telegram] telegram

i. [tre] very

j. [kyltsyr] culture

k. [minyt] minute

l. [tsyb] tube

m. [tsy] you

n. [dzyr] hard

Consider the distribution of the phones [t] and [ts]. What about [d] and [dz]?

Syllables

Structure between the segment and the word

Thus far, we have primarily considered phonological structure at the level of the segment,

And to a lesser degree, at the level of the word.

But there is ample evidence that there is an intermediate level of structure, between the segment and the word: the **syllable**

Evidence for the syllable

1. Spoonerisms*

- a. You have hissed all of my mystery lectures!
- b. I'm fiving as drast as I can!
- c. Is it cistomary to kuss the bride?

2. Word games

- a. Pig Latin

3. Rhyme

- a. lime, rhyme, time
- b. tile, rile, file, Kyle
- c. light, lime, like
- d. tyke, time, tile

4. Native speaker intuition about phonotactics

*named after William Archibald Spooner (1844-1930), a divinity professor at Oxford University,

4. Native speaker intuition about phonotactics

Which of the following words are possible English words?

[fslux]

[ptitsə]

[mɲɐɲə]

[ʃtʃi]

[kna]

[ptɹ]

[ɡnam]

[hɪmn]

[ək.'na.lɪdʒ]

['hɛ.lɪ.kap.tɹ]

[ɪɡ.'na.mɪ.ni]

['hɪm.nɪ]

Further Evidence:

The organizational basis for many, many unrelated writing systems:

- Sumerian & cuneiform generally
- Japanese katakana and hiragana
- Mayan writing (in part)

Easy for speakers to identify

- even young children can accurately count syllables in a given word

Many, many phonological patterns built around the syllable

→ All these points suggest that the syllable is a non-arbitrary unit of speech

What is a syllable, exactly?

→ Can be thought of as a sonority peak within a word.

The sonority hierarchy, in order of increasing sonority:
stops > fricatives > nasals > liquids > glides > vowels

How many sonority peaks in each of these words? How many syllables, then?

banana
b ə n æ n ə

candle
k æ n d l

bluster
b l ʌ s t ɹ

Each sonority peak constitutes a nucleus—the core of a syllable

- Sonority dips on either side of the peak constitute the edges of the syllable
- Vowels are the most sonorant segments, so they make the best nuclei
- Stops are the least sonorant, so they are practically never nuclei
- In the middle we find a range of possibilities, depending on the language
- Phonetically, sonority is realized as a big energy peak

Analyzing syllable structure

Step 1: Find the nucleus

Vowels are maximally sonorous.

Therefore, there is a syllable for each vowel in a word:

‘box’ = 1 syllable, ‘boxing’ = 2 syllables.

The vowel forms the nucleus: the single indispensable part of the syllable.

Step 2: Build the onset

Once you have nuclei, proceed leftward to create the syllable onset, the leftmost constituent of the syllable. The onset will consist of all those segments to the left of the nucleus that the language allows: there is considerable variation in this.

(We may refer to this guideline as the Maximal Onset Principle: the “MOP”.)

A good way to figure out onsets is to see what’s allowed word-initially in that language

Step 3: Build the coda

Codas are formed from the “leftovers.”

→ Segments that are not nuclei, and which cannot be included in any onsets due to some phonotactic restriction, will be swept into the coda.

Step 4: The rhyme

Together, the nucleus and the coda form the rhyme of the syllable.

Step 5: The syllable

Put the onset and the rhyme together, and you have your syllable.

Some generalizations

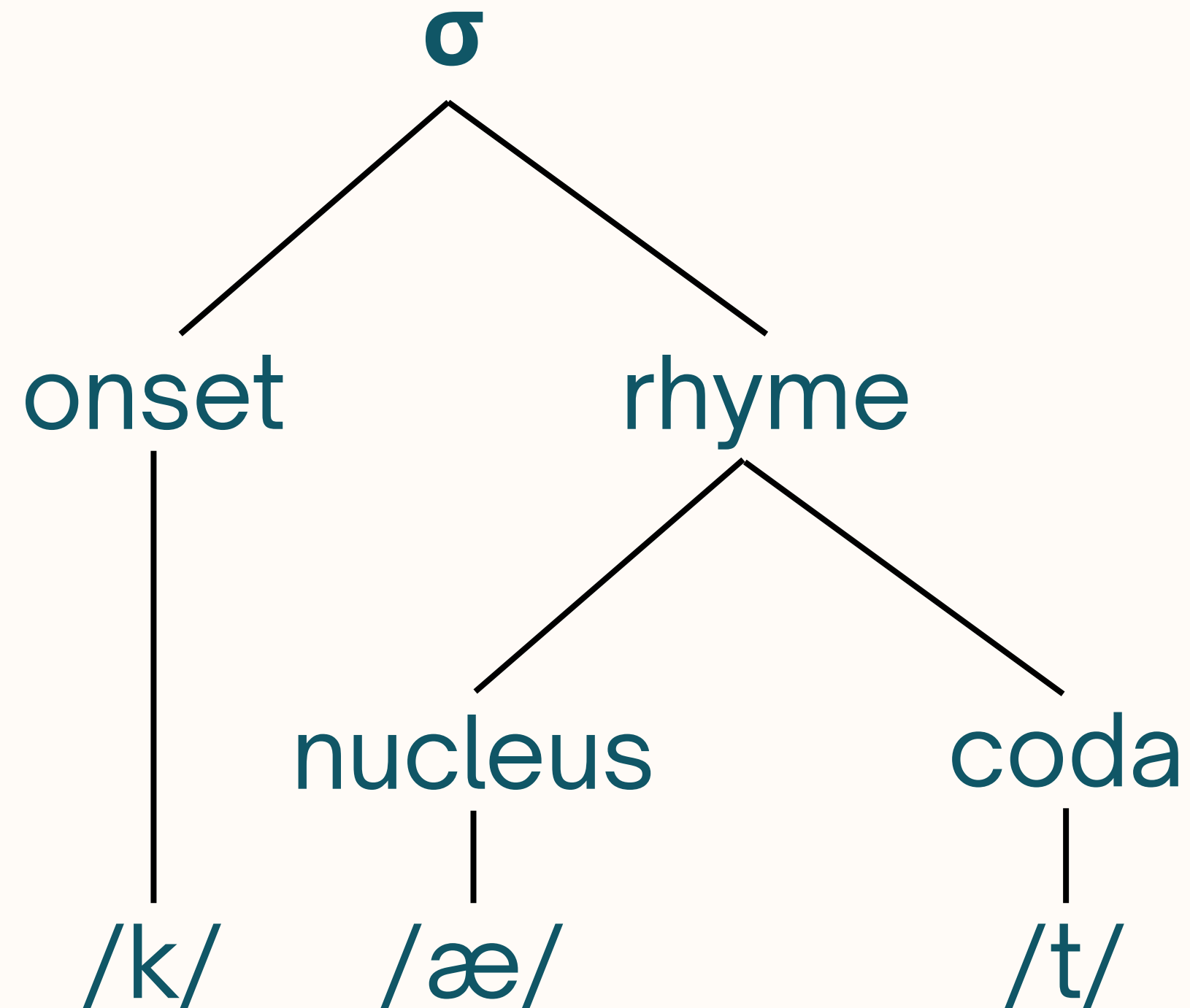
1. CV universally preferred; all other structures rank lower in preference
 - a. Every language has syllables.
 - b. Every language permits syllables of the type CV.
 - c. Some languages also permit syllables of the type V, or VC.
 - d. Some languages permit only syllables of the type CV or V.
 - e. No language permits syllables of the type VC while prohibiting CV.
2. Onsets tend to be favorable environments:
 - a. Clusters, if permitted, are generally more complex in onsets than codas
 - b. Segment inventories in onsets are generally more diverse than codas
 - c. Neutralization, deletion are more common in codas than onsets

Some syllable-related terminology

- **Nucleus**, also called peak: The core or main part of the syllable. In many languages, a syllable nucleus must be a vowel. In all languages, the set of allowable nuclei includes vowels. Diphthongs and long vowels are often considered to form complex/ long/heavy nuclei.
- **Onset**: The part of the syllable that precedes the nucleus. All languages allow simple/single onsets. Some languages also allow complex onsets/onset clusters.
- **Coda**: Consonant(s) in the syllable following the nucleus. Some languages disallow codas entirely. Others have a restricted inventory of possible coda consonants. As with onsets, some languages allow complex codas/coda clusters.
- **Rhyme** (sometimes spelled rime): The part of the syllable that includes both the nucleus and the coda, if there is a coda. In other words, the rime is the non-onset portion of a syllable.
- A **closed** syllable is a syllable with a coda.
- An **open** syllable is one with no coda.

Syllable Trees

Cat /kæt/



Draw trees for:

Pumpkin /pʌmpkɪn/

Spring /sprɪŋ/