

Chapter 7 – Phonology

Phonology

- Phonetics -- What are the sounds? How are they made in the mouth? Studies the production of sounds and their acoustic properties.
- Phonology -- How do sounds combine? How are they memorized? Studies the way sounds pattern in languages.

Speaker's Mind → Speaker's Mouth → Listener's Ear → Listener's Mind

The difference between one sound and another, or one class of sounds and another, can play TWO different roles in a language.

- 1) It can distinguish one word from another: CONTRASTIVE
For example: - French nasalized versus non-nasalized vowels
- English [r] versus [ɹ]

Sounds which can distinguish one word from another are called **phonemes**. A **phoneme** is a contrastive phonological segment whose phonetic realizations are predictable by rule.

Phonemes are written between slashes: / /

- 2) Or the difference between one sound and another can be predictable variation found in particular phonetic contexts:
For example: -English nasalized versus non-nasalized vowels
-Korean [r] versus [ɺ]
-English [l] versus [ɫ]

Predictable variants of sounds (phonemes) are called **allophones**.

Allophones are written between brackets []

For example:

In English, the sounds [r] and [l] correspond to TWO different phonemes: /r/ and /l/.

But in Korean, the sounds [r] and [l] correspond to ONE phoneme: they are alternative ways of pronouncing /l/. They are related to each other by a phonological rule, which determines when the actual sound produced is [r] and when it is [l].

In French, where words are distinguished by nasalization of the vowel:

Nasalized Vowels in French

[lo] *prize* [lõ] *long*

[lɛ] *ugly* [lɛ̃] *flax*

[la] *there* [lã] *slow*

The sounds [o] and [õ] correspond to TWO different phonemes: /o/ and /õ/

But in English, where nasalization is predictable by a phonological rule:

Nasalized Vowels in English

Green [grɪn] greed [grɪd]

Tan [tæn] tab [tæb]

Sewn [sɔ̃n] soap [sop]

The sounds [o] and [õ] correspond to a single phoneme /o/, which is realized as [o] or [õ] depending on its context.

Finding Phonemes

How do we find out what's in someone's mind? How do we figure out how people store the sounds of words in their memories?

One trick that we can use is to look for **minimal pairs** of words. A minimal pair is a pair of words that have **different** meanings and which differ in only **one** sound. Since the difference between the two sounds is **meaningful**, the words **must** be stored differently in memory. Since the words differ in only **one** sound, this difference must be stored in memory. Thus the difference in sounds is significant, and so the **two** sounds must **both** be phonemes.

Here is an example from English:

- [sɪp] and [zɪp]

These two words are **different** words of English. But they differ only in their initial sound. Therefore, the [s]/[z] difference is significant for English speakers. Therefore both [s] and [z] are stored in the memory. Thus, [s] and [z] are part of the English mental alphabet. We notate elements in the memory by putting them in-between slashes /. In this case /s/ and /z/ are part of an English speaker's alphabet for memorizing words.

Another example from English:

- [ræm] and [ræn] and [ræŋ]

These three words are all distinct words of English. Therefore, the speech sounds (in the mouth) [m], [n] and [ŋ] are all significant to the mind. And therefore, English includes the phonemes /m/, /n/ and /ŋ/.

Sometimes it isn't possible to find minimal pairs for all words. But speakers can also tell when a contrast would yield a **distinct possible word**, even if this is not an actual word.

The phonetic context (or frame) [b_t] can be used to find minimal pairs for many English vowels:

- [bit] ("beat") /i/
- [bɪt] ("bit") /ɪ/
- [bet] ("bait") /e/
- [bɛt] ("bet") /ɛ/
- [bæt] ("bat") /æ/
- [but] ("boot") /u/
- [bot] ("boat") /o/
- [bɔt] ("bought") /ɔ/ (You may have [ɑ] here.)
- [bʌt] ("but") /ʌ/

This minimal set establishes all these vowels as mentally distinct, and therefore **phonemic**.

Spanish Minimal Pairs:

Using the minimal pairs technique, 5 vowel phonemes can be identified in Spanish and 19 consonant phonemes. The five vowel phonemes can be established on the basis of the following five-way minimal contrast:

<i>pi</i> so	/i/
<i>pe</i> so	/e/
<i>pa</i> so	/a/
<i>po</i> so	/o/
<i>pu</i> so	/u/

Identifying the consonant phonemes is not quite as straightforward, although it is still a routine matter. In the first place, the 17-way minimal contrast shown below establishes the separate phonemic status of /p, t, k, b, d, g, θ, s, tʃ, x, m, n, ɲ, l, j, r, r/:

<i>capa</i> 'cape'	/p/
<i>cata</i> 'tasting'	/t/
<i>caca</i> 'shit'	/k/
<i>cava</i> (= sparkling wine)	/b/
<i>cada</i> 'each'	/d/
<i>caga</i> 'shits'	/g/
<i>caza</i> 'hunt'	/θ/
<i>casa</i> 'house'	/s/
<i>cacha</i> 'butt'	/tʃ/
<i>caja</i> 'box'	/x/
<i>cama</i> 'bed'	/m/
<i>cana</i> 'grey hair'	/n/
<i>caña</i> 'cane'	/ɲ/
<i>cala</i> 'cove'	/l/
<i>calla</i> 'shut up'	/j/
<i>cara</i> 'face'	/r/
<i>carra</i> (= part of stage)	/r/

French Minimal Pairs:

Here is a minimal set in French:

Cire *wax*

Sûre *sure*

Soeur *sister*

Sieur *sir*

Sueur *sweat*



To an Anglophone, some or all of these sound alike, because the [œ] sound does not exist in English. A minimal triplet of consonants is

bête noire [be tɲwar] *black beast, pet peeve*

baie noire [be nwar] *black berry* (not **blackberry**, which is mûre)

baignoire [be ɲwar] *bathtub*



[tɲ] is not a single phoneme in French, so this shows a minimal pair between the presence and absence of [t] next to [ɲ], which shares its point of articulation. [ɲ] and [ɲ̥] differ only in point of articulation.

Phonemes versus Allophones

Phonological rules apply to **phonemes** to produce variants (**allophones**) in different environments.

Phonemes: seen between / /, are the individual sounds and are abstract mental units. They are not physical sounds.

Allophones: seen between [], are the actual pronunciations of those abstract units in different environments.

We call the mental representation a **phoneme**, and we call the distinct pronunciations **allophones**.

English: 2 phonemes

1 allophone for each phoneme

/s/

/z/



[s]

vs.

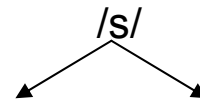
[z]

sip

zip

Spanish: 1 phoneme

2 allophones



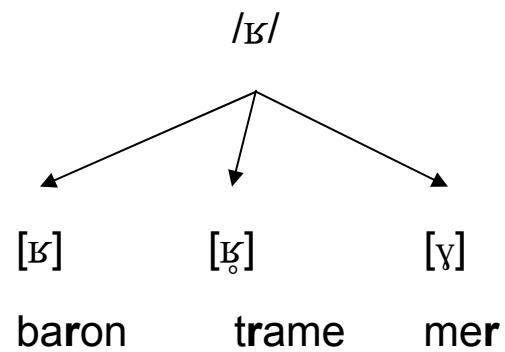
[s]

[z]

casa

mismo

French: 1 phoneme
3 allophones



Complementary Distribution:

The situation in which phones never occur in the same phonetic environment.

English: [p] and [p^h] in English.

Spanish: [g] and [ɣ]

French: [ʁ] and [ʁ̥] and [ʁ̥̄]

So, what does a phonological rule do?

It determines how a phoneme is pronounced in a given context. For example, What allophone of a phoneme will appear in a given context?

We also know that rules affect natural classes of sounds, and that they apply in particular environments, which also can be identified as involving natural classes.

English and French have the same sounds: both have the oral (non-nasal) vowel [o] and the nasalized vowel [õ], **but the sounds behave very differently in the two languages.**

Korean and English both have the sounds [l] and [r] but they stand in a different relationship in the two languages.

Korean has a phonological rule which requires [r] between vowels, and [l] everywhere else.

RULES OF PHONOLOGY

SEGMENTAL PHONOLOGY

*The relationship between the **phonemic** representations (phonemes) of words and the **phonetic** representations (allophones) that reflect the pronunciation of these words is **rule-governed**.*

Although the specific rules of phonology differ from language to language, the **kinds** of rules, **what** they do, and the **natural** classes they refer to are the same cross-linguistically.

A few types of Phonological Rules:

- **Assimilation** A segment becomes like a neighboring segment.

e.g. vowels become nasal before a nasal consonant.

- **Dissimilation** A segment becomes unlike a neighboring segment.

Fifth [fifθ] vs. fifths [fifts] * [fifθs]

- **Insertion**

Since [sɪnt̩s] tense [tɛnt̩s]

- **Deletion** Some segments occur in certain contexts but not in others.

(These are NOT silent letters!)


In French, for example, word-final consonants are deleted when the following word begins with an obstruent, a liquid, or a nasal consonant, but are retained when the following word begins with a vowel or a glide. (p. 308 for table)

/pətit tablo/	[pəti tablo] <i>small picture</i>
/pətit livr/	[pəti livr] <i>small books</i>

-**Movement (Metathesis)** Order of segments is reversed.
[æsk] vs. [æks] (which actually stems from Old English!)

Children's speech: *animal vs. aminal*
 Spaghetti vs. Pasghetti.

French: *la gymnastique vs. l'élastique*

 Isabelle vs. ABC 

Spanish Phonological Rules

REGRESSIVE ASSIMILATION (next sound affects previous)

1) Assimilation of nasals (Consonants)

- /n/ → [m] before bilabials (envidia)
- [ɱ] before labiodentals (enfrente)
- [ɲ] before dentals and interdental (antes, un circo))
- [ɲ] before alveopalatals (un chico)
- [ɲ] before palatals (cónyuge)
- [ŋ] before velars (un gato)

2) Lateral Assimilation (Consonants)

- // → [l̪] before dentals (aldea)
- [l̪] before alveopalatals (el chico)
- [ʎ] before palatals (al yunque)

3) Voicing assimilation of /s/

- /s/ → [z] before voiced consonants
- es rico [ez.ri.ko] mismo [miz.mo]

4) Dental assimilation

- /s/ → [s̺] before dentals este [es̺.te]

*However, if the first consonant is a tap/trill, the tap/trill determines the point of articulation of the following consonant:
carta, with an alveolar **t**.

5) Lenition (fricativization of voiced stops)

Voiced stops (/b/, /d/, /g/) become voiced fricatives ([β] [ð] [ɣ]) when preceded by a vowel or a non-nasal consonant, and followed by a vowel or a liquid (tap/trill).

*However, **d** remains a stop after **l** (rule #4)

6) Affricativization of /j/

The palatal fricative /j/ becomes an affricate [dʒ] after a pause or after a nasal consonant. ¡Yo! Inyección

PROGRESSIVE ASSIMILATION (preceding sound influences following)**7) Trills**

/r/ → [r] after l and n (alrededor, Enrique)

Deletion Rules**8) Identical vowel reduction**

Two sequential identical vowels are pronounced as a single one.

Este helado → [eʃ.te.la.ðo]

9) GLIDE FORMATION RULES

A high vowel [i, u] becomes a semivowel [j, w] before another vowel and [i, u] after another vowel.

Mi abuela [mja.βwé.la]

Está unido [es.táu.ni.ðo]

French Phonological Rules

1) Fricativization of word final -r

Word final /ʀ/ becomes a voiced velar fricative [ɣ]

Example: Par [paɣ]

2) Lengthening of [ø, o, a]

The vowels are lengthened when followed by a consonant in the same syllable.

Example: Creuse [kʁø:z]

3) Vowel lengthening

A vowel is lengthened before a word final voiced fricative [v, z, ʒ, ʁ]

Examples: Rose [ʁo:z] sage [sa: ʒ]

4) Nasal vowel lengthening

A nasal vowel is lengthened when followed by a consonant in the same syllable.

Examples: blonde [blɔ̃:dɛ] but blond [blɔ̃]

5) Voicing assimilation in stops and fricatives

In a sequence of two consonants, if the first one is a stop, it agrees in voicing with the following consonant (regressive assimilation); if the first one is fricative, however, it determines the value for voicing of the following consonant (progressive assimilation).

Voiced stops (d, g, b) + voiced
 Voiceless stops (t, k, p) + voiceless
 Fricative + fricative

Medecin	[mɛ.tsɛ̃]
Pas de table	[pa.t tabl]
Cheval	[ʃɛ.fal]
à jeter	[a ʒte]

6). **Resonant devoicing**

Resonants (nasals and liquids) are devoiced when they follow a voiceless consonant.

Prisme [pʁ̥ism]

Temple [tã p̥]

Trame [tʁ̥am]

7) **Liquid deletion**

A liquid (r,l) is deleted when preceded and followed by a consonant.

Pauvre garçon

autre personne

8) **Glide insertion**

A glide is inserted when the vowel /i/ is preceded by two consonants and followed by a vowel.

Prions [pʁi jɔ̃]

Plions [pli jɔ̃]

Note: There is no phonological rule for the nasalization of vowels since the nasalized vowel and its non-nasalized counterpart correspond to TWO different phonemes.

For example: The sounds [o] and [õ] correspond to TWO different phonemes: /o/ and /õ/

REMEMBER:

A PHONOLOGICAL RULE EXPLAINS WHY A PHONEME HAS MORE THAN ONE ALLOPHONE.

PARALANGUAGE

This is an area beyond the regular sound system (segmentals and Suprasegmentales). Interjections, onomatopoeic sounds, semantic signals

The melody of language:

SUPRASEGMENTAL (a.k.a. Intonational or Prosodic) features

Segmental Features: Vowels and consonants are segmental sounds of language.

Suprasegmental Features: When some vowels and consonants can be modified in several important ways by other features. These modifications are also referred to as **INTONATIONAL** or **PROSODIC** features.

A. Stress (accent) (relative loudness)

1) Volume / intensity / syllable

2) i.e., esta vs. está ; límite vs. límité ; ánimo vs. animó

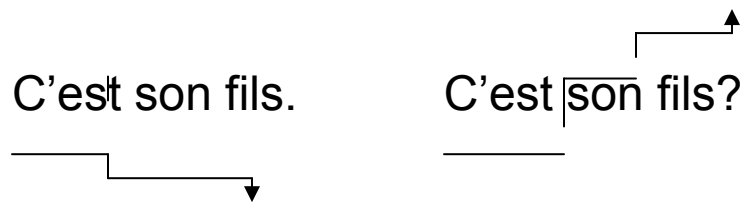
B. Pitch (intonation)

Musical tone. Questions vs. statements:

Está lloviendo (descending) vs. ¿Está lloviendo? (ascending)



C'est son fils (descending) vs. C'est son fils? (ascending)



C. Rhythm Length of stressed and unstressed syllables.

D. Syllabification (Linking)

Each syllable has a nucleus. Each nucleus is a vowel.

Spanish Syllabification

SPANISH

Rule #1: V-CV **o-so** **ho-la** **re- be- la- do**
 V-CV V-CV CV-CV-CV-CV

Rule #2: Clusters

V-CCV **chi- fla- do** **i- gle- sia**
 CV-CCV-CV V-CCV-CV

SPANISH CLUSTERS:

[bl]; [br]

[kl]; [kr]

[dr]

[fl]; [fr]

[gl]; [gr]

[pl]; [pr]

[tr]; [tl]

Rule #3: Sequences

VC-CV per- la fút- bol
 CVC-CV CVC-CVC

Rule #4:

VC-CCV **hom-bre** **sal- drá**
 VC- CCV CVC-CCV

Rule #5:**VCC-CV****trans- por- te****ins- tan- te****CCVCC-CVC-CV****VCC-CVC-CV****Rule #6:****VCC-CCV****trans- plan- te****obs- truc- ción****CCVCC-CCVC-CV****VCC-CCVC-CVVC****Rule #7:****V-V**

cre-a

po-e-ta

dí-a

Rule #8: Diphthongs**VV***(vja-je)**(swa-ve)**(con-ti-nwo)***VV***(vein-te)**(eu-ro-pa)***Rule #9: Triphthongs****VVV***(gra-dwájs)***graduáis**

French Syllabification

Schema	Example	
V	ou	You can have a vowel make up a syllable
V-CV , CV	mou	
V-CCV, CCV	bleu	Syllables starting with clusters (group of two consonants that never are divided).
	[bl] [br]	[tr], [tʃ]
	[kl] [kr]	[vr]
	[dr]	[sp], [st], [sk], [sf]
	[fl] [fr]	[ps], [pn]
	[gl] [gr]	[str]
	[pl] [pr]	
	[spl], [skr]	
C ₁ C ₂ C ₃ V	strophe	C ₁ = s, C ₂ = p, t, k, C ₃ = r (never l)
VC ₁	œuf	C ₁ = cannot be n, z, s, v (which are always followed by mute e [ə])
VCC(ə)	disque	
VCCC(ə)	astre	