

Review: Part II.
Formalizing phonological rules

Phonological rules derive *phonetic representations* (PR)
from *underlying representations* (UR).

FOCUS: *input* + CONTEXT: *environment* = **Structural Description** (SD)

output: **Structural Change** (SC)

$$A \rightarrow B / x \text{ — } y$$

Read: A becomes B between x and y

A (input) , x — y (environment), B (output)

NOTATIONS:

C: Represents the features $\left[\begin{array}{l} \text{-syllabic} \\ \text{+consonantal} \end{array} \right]$

V: Represents the features $\left[\begin{array}{l} \text{+syllabic} \\ \text{-consonantal} \end{array} \right]$

Zero subscript **C₀** represents zero or more consonants.

#	word boundary
σ	syllable boundary
+	morpheme boundary

1. *Formalizing feature changing rules*

a. Brace notation

$$V \rightarrow [-\text{long}] / ___ \overset{C}{[-\text{voice}]} \#$$

$$V \rightarrow [-\text{long}] / ___ \overset{C}{[-\text{voice}]} C$$

Combined rule:

$$V \rightarrow [-\text{long}] / ___ \overset{C}{[-\text{voice}]} \left\{ \begin{array}{l} \# \\ C \end{array} \right.$$

The brace notation combines two or more rules that have *identical parts*.

b. Parenthesis notation

$$V \rightarrow [+stress] / ___ \overset{V}{Co} [-tense] \#$$

$$V \rightarrow [+stress] / ___ Co \#$$

Combined rule:

$$V \rightarrow [+stress] / ___ Co \left(\begin{array}{c} V \\ [-tense] \end{array} \right) \#$$

The parentheses notation is used as a formal device for collapsing two similar rules when one contains a specification lacking in the other.

Where *braces* are used, each rule to be collapsed contains restrictions not found in the other. With *parentheses*, only one of the rules has an additional restriction.

These notations are employed only for collapsing rules involving the *same processes*, and *not* any two rules.

2. *Formalizing deletion and insertion rules*

a. Deletion

French:

petit ami [pətit_ami] petit tabloux [pəti tablo]

nos amis [noz ami]nos tableaux [no tablo]

$$C \rightarrow \emptyset / \text{ — } \#C$$

A word-final consonant is deleted if the following word begins with a consonant.

b. Insertion

Hypothetical language:

Gen.Sg.

dubok	dubokut	<i>glass</i>
sanut	sanutut	<i>boy</i>
depe	depet	<i>flower</i>
soldi	soldit	<i>place</i>
kopis	kopisut	<i>hat</i>
siru	sirut	<i>toy</i>
wokub	wokubut	<i>sun</i>

$$\emptyset \rightarrow \begin{matrix} \text{V} \\ \left[\begin{matrix} +\text{back} \\ +\text{high} \end{matrix} \right] \end{matrix} / C \text{ — } C\#$$

3. *Formalizing metathesis and coalescence: Transformational rules*

a. Metathesis

Hanunoo:

ʔusa	<i>one</i>	kasʔa	<i>once</i>
ʔupat	<i>four</i>	kapʔat	<i>four times</i>
ʔunum	<i>six</i>	kanʔum	<i>six times</i>
tulu	<i>three</i>	katlu	<i>three times</i>

The cluster glottal stop and consonant becomes consonant and glottal stop between vowels. (The stems for the numerals are ʔsa, ʔpat, ʔnum, tlu. The *u* is epenthetic to break up the word-initial consonant cluster; the morpheme meaning ‘times’ is –ka).

$$\begin{array}{ccccccc}
 V & \left[\begin{array}{c} -\text{continuant} \\ +\text{CG} \end{array} \right] & C & V & \rightarrow & 1 & 3 & 2 & 4 \\
 1 & & 2 & & 3 & 4 & & &
 \end{array}$$

b. Coalescence

French:

[plɛnə] ‘full’ (Fem.)	[plɛ̃] (masc.)
[tɔnalite] ‘tonality’	[tɔ̃] ‘tone’

$$\begin{array}{ccccccc}
 & C & & 1 & & & \\
 V & [+ \text{nasal}] & \# & \rightarrow & [+ \text{nasal}] & \emptyset & 3 \\
 1 & 2 & 3 & & & &
 \end{array}$$

A vowel plus a nasal consonant becomes a nasal vowel when the consonant is word-final.

Transformational rules are used when two or more segments are simultaneously affected.

3. *Rules with variables*

$$[-\text{sonorant}] \rightarrow [+voice] / \text{_____} \begin{pmatrix} -\text{sonorant} \\ +voice \end{pmatrix}$$

$$[-\text{sonorant}] \rightarrow [-voice] / \text{_____} \begin{pmatrix} -\text{sonorant} \\ -voice \end{pmatrix}$$

Combined rule:

$$[-\text{sonorant}] \rightarrow [\alpha \text{ voice}] / \text{_____} \begin{pmatrix} -\text{sonorant} \\ \alpha \text{ voice} \end{pmatrix}$$

(e.g., French obstruent clusters).

4. *Rules with multiple variables*

Turkish (Poss. Suffix)

diş	<i>tooth</i>	dişim	<i>my tooth</i>
ev	<i>house</i>	evim	<i>my house</i>
gönül	<i>heart</i>	gönülüm	<i>my heart</i>
göz	<i>eye</i>	gözüm	<i>my eye</i>
baş	<i>head</i>	başım	<i>my head</i>
kol	<i>arm</i>	kolum	<i>my arm</i>

-im, -üm, -îm, -um -- Assimilation: Vowel Harmony!

$$\begin{matrix} V \\ [+high] \end{matrix} \rightarrow \begin{pmatrix} \alpha \text{ back} \\ \beta \text{ round} \end{pmatrix} / \begin{matrix} V \\ \begin{pmatrix} \alpha \text{ back} \\ \beta \text{ round} \end{pmatrix} \end{matrix} \text{Co} + \text{Co} \text{_____}$$

If two rules are identical except for the values of the *same feature*, then the two rules can be replaced by a single rule. The values which are different in the two rules are replaced by a variable -- the Greek letter *alpha* -- in the new rule.

5. Formalizing dissimilation

Slovak:

Masc.	Fem.	Neuter	
kruti:	kruta:	krute:	<i>cruel</i>
slovenski:	slovenska:	slovenske:	<i>Slovak</i>
ľu:ti	ľu:ta	ľu:te	<i>merciless</i>
zaťati:	zaťata:	zaťate:	<i>stubborn</i>
druhi:	druha:	druhe:	<i>other</i>
tata:rski	tata:rska	tata:rske	<i>Tartar</i>
ri:ž̩i	ri:ž̩a	ri:ž̩e	<i>genuine</i>

$V \rightarrow [-\alpha \text{ long}] / [\alpha \text{ long}] \text{ ______}$

- α is the formal means for expressing the notion “opposite in value to”

6. Angled bracket notation

English:

critical	[k]	criticism	[s]
opaque	[k]	opacity	[s]
analogue	[g]	analogize	[dʒ]
regal	[g]	regicide	[dʒ]

Velar Softening Rule:

$$\begin{pmatrix} +\text{dorsal} \\ -\text{sonorant} \\ -\text{continuant} \\ < -\text{voice}> \end{pmatrix} \rightarrow \begin{pmatrix} +\text{coronal} \\ +\text{strident} \\ \begin{matrix} < +\text{anterior} \\ +\text{continuant} \end{matrix} \end{pmatrix} / \text{ — } [+VS]$$

[+ VS] -- Suffixes that condition the change of velars as in this rule.

If [- voice], then $\begin{pmatrix} +\text{anterior} \\ +\text{continuant} \end{pmatrix}$
in addition to $\begin{pmatrix} +\text{coronal} \\ +\text{strident} \end{pmatrix}$

The angled bracket notation is used with rules that involve dependencies between two feature specifications by way of adding a condition to the rule of the form

“if *a*, then *b*”