Class 2: Rules and extrinsic ordering

Overview
- Review of rule notation, part I
- Extrinsic rule ordering

SPE rule notation review, Part I

1. \( A \rightarrow B / X \_ Y \)

Example: \( \begin{bmatrix} +\text{syll} \\ -\text{low} \end{bmatrix} \rightarrow [+\text{high}] / \_ \text{CC#} \)

means “\( XAY \) is rewritten as \( XBY \)”, or, to put it another way, “\( A \) is rewritten as \( B \) when preceded by \( X \) and followed by \( Y \)”.

- \( A \) is the affected segment, focus, or target of the rule.
- \( B \) is the structural change that the rule requires
- \( X\_Y \) is the context for the rule
- \( XAY \) is the structural description

We’ll use \( A, B, X, \) and \( Y \) to stand for these positions throughout today’s discussion.

2. **Left side of the arrow**

\( A \) can be a feature matrix or \( \emptyset \).

If \( A \) is a feature matrix, like \( \begin{bmatrix} +\text{syll} \\ -\text{low} \end{bmatrix} \), then the rule looks for any segment that is ‘nondistinct’ from that matrix.

Two feature matrices are distinct iff there is some feature \( F \) whose value is different in the two matrices. This means that if \( A \) doesn’t mention some feature \( F \), it “doesn’t care” about it—the rule will look for segments that are either +\( F \) or -\( F \).

- Is \( \begin{bmatrix} +\text{syll} \\ -\text{low} \end{bmatrix} \) distinct from the feature matrix abbreviated by [u]? How about [a]?

Sometimes, if \( A \) is meant to pick out a single sound from the phone inventory, we use an IPA symbol instead:

\( u \rightarrow [-\text{high}] / \_ \text{(C)#} \)

This is a good idea for readability, but keep in mind that, in order to determine how long the rule is, you have to count all the features that would be necessary to pick out that segment from the other sounds in the language.
Sometimes we also use C to abbreviate [-syll] or V to abbreviate [+syll]. Again, this is good for readability. Be careful when reading, though, because some authors, following SPE, use C and V to abbreviate {-voc}, [+cons]} and [+voc, -cons].

- What features would you need to pick out [u] from the inventory {i, u, e, o, a}? How about {i, ɪ, u, ʊ, e, ɛ, o, ɔ, a}?

If $A$ is $\emptyset$, you’ve got an insertion rule (the idea is that insertion changes “nothing” into something):

$$\emptyset \rightarrow [i] / C \_\_ C#$$

- Given that $\emptyset$ is usually used to mean ‘empty set’, why do we use $\emptyset$, not $[]$ for insertion?

### 3. Right side of the arrow

$B$ also can be a feature matrix or $\emptyset$.

If $B$ is a feature matrix, then any of the affected segment’s features that are mentioned in $B$ are changed to the value given in $B$. All other features are left alone.

- What does $\begin{bmatrix} +\text{syl} \\ -\text{low} \end{bmatrix} \rightarrow [+\text{high}]$ do to $[o]$? To $[u]$?

If $B$ is $\emptyset$, then the segment that $A$ matched is deleted.

$$C \rightarrow \emptyset / C \_\_ #$$

Again, we sometimes use abbreviations like an IPA symbol, C, or V.

### 4. Redundancy

The principle that shorter rules are preferred by learners over longer rules means that unnecessary features need to be eliminated from $A$ and $B$.

- What is wrong with each of the following rules?

$$\begin{bmatrix} +\text{syl} \\ -\text{round} \end{bmatrix} \rightarrow [+\text{round}]$$

$$\begin{bmatrix} +\text{nas} \\ +\text{voice} \end{bmatrix} \rightarrow [+\text{ant}]$$ (assume a phoneme inventory like, say, English’s)
5. **Right side of the slash (context)**

$X$ and $Y$ are strings made up of

- feature matrices
- the boundary types # and + (treated in SPE like segments)
- at their outside edges, category boundaries

Feature matrices in $X$ and $Y$ match segments in the same way that $A$ does.

**Boundaries**, # (word boundary) and + (morpheme boundary), are treated in SPE as feature matrices that happen to be [-segmental]:

$$
\begin{align*}
# & \text{ is } \begin{bmatrix}
-\text{seg} \\
-\text{FB} \\
+\text{WB}
\end{bmatrix} \\
+ & \text{ is } \begin{bmatrix}
-\text{seg} \\
+\text{FB} \\
-\text{WB}
\end{bmatrix}
\end{align*}
$$

([FB] is “formative (roughly, morpheme) boundary” and [WB] is “word boundary”).

There are some complications about #: in SPE, it’s not equivalent to the place where you’d write a space. At least for now, though, we’ll treat it as though it were.

SPE also proposes a third boundary type, =, which has the features

$$
\begin{bmatrix}
-\text{seg} \\
-\text{FB} \\
-\text{WB}
\end{bmatrix}
$$

and is more or less the boundary between nonproductive or nontransparent affixes and stems (e.g., English $\text{com}=\text{pre}=\text{hend}$).

The term ‘unit’ is used in SPE to refer to all feature matrices, including true segments and boundaries.

**Category boundaries** (labeled brackets) like ]_\text{Noun} and _\text{Verb}[ can also be used, but only at the edges of $X$ _ $Y$ (and if both edges have labeled brackets, the labels have to match):

$$/ \_ VC[_\text{N}]$$

$X$ (or $Y$) matches (is not distinct from) some part $M$ of a form iff $X$ and $M$ are the same length $n$, and the $i^{th}$ unit of $X$ matches (is not distinct from) the $i^{th}$ unit of $M$ for all $1<i<n$, using the definition discussed above for $A$.

6. **+ is special**

If + is included in $X$ and $Y$, then it is required $V \rightarrow \emptyset / \_ + V$ does not apply to $\text{ibau}$

But extra plusses in the form are always OK: $V \rightarrow \emptyset / \_ V$ does apply to $\text{iba+uns}$

# does not work this way; it works like any other feature matrix.
7. Basic rule application
A rule applies to a form if the form contains a string that is nondistinct from $XAY$.

- So what happens if $X$ or $Y$ is blank?

Expansion conventions (we may delay this till next class, depending on time)
Devices like parentheses, curly brackets ("braces"), and angle brackets are used to collapse related rules into a single rule schema.

Rather than adjusting the definition of nondistinctness, SPE gives expansion conventions to turn those schemas into rules that can then be applied using the simple definition of nondistinctness.

8. Parentheses
Used to indicate optionality.

For example, the rule schema $V \rightarrow \emptyset / \_V(C)\#$ is expanded into these two rules (in that order—but we’ll come back to that in a later week):

- $V \rightarrow \emptyset / \_V C\#$
- $V \rightarrow \emptyset / \_V \#$

- Do you ever need parentheses in a feature matrix?

9. Braces, a.k.a. curly brackets
Used to indicate multiple possibilities

For example, the rule schema $\{i\} \rightarrow \emptyset / \_V$ is expanded into these two rules:

- $i \rightarrow \emptyset / \_V$
- $o \rightarrow \emptyset / \_V$

- Can you imagine a way to translate all parentheses into braces? Try it with $V \rightarrow \emptyset / \_V(C)\#$

Rule ordering
If a language has more than one rule (and they all do), the rules have to find a way to get along. It’s usually assumed that they are ordered and apply one by one, but we can imagine other scenarios...

10. Imagine simultaneous application
Say we’ve got two rules:

labialization: $[-\text{labial}] \rightarrow [+\text{round}] / u \_ V$

harmony: $u \rightarrow i / i C_0 \_ V$

Ling 200A, Phonological Theory I. Fall 2003, Zuraw/Martin
o What happens to the underlying forms below if each rule just finds any segments in the underlying form to which it applies (i.e., \(A\) matches) and performs the structural change?

\[
/dalbuge/ \quad /dibumpo/ \quad /griluda/
\]

11. Ordered rules
If rules apply instead one by one (in *ordered* fashion), there are two possible outcomes with the same two rules.

o Fill in the derivations:

\[
/dalbuge/ \quad /dibumpo/ \quad /griluda/\]

\textit{labialization}

\textit{harmony}

\[
/dalbuge/ \quad /dibumpo/ \quad /griluda/\]

\textit{harmony}

\textit{labialization}

12. Intrinsic vs. extrinsic rule ordering
Can we tell just from looking at a list of rules what order they should apply in? There have been proposals to do just that—that is, to impose an *intrinsic* rule ordering (an ordering that is determined by properties of the rules themselves, or maybe properties of the rules and the UR).

But if each language can order the rules the way it likes, rule ordering is *extrinsic*.

13. Evidence for extrinsic rule ordering?
What we need is languages or dialects that form a (near-) minimal pair for the ordering of some rules. Let’s try an example from SPE.

\textit{Canadian raising} rule of English: /\textit{a};/,/\textit{æ}/ become [\textit{AI}],[\textit{E}] before voiceless consonants.

\[
[\textit{jaidend} \quad \textit{jaait}] \quad [\textit{gæud5}] \quad \textit{[kh=utf]}\]

‘ride’ ‘right’ ‘gouge’ ‘couch’

o Does anyone in the class (besides me) have this rule in their everyday speech?

o Write the rule (use your feature charts!).

\textit{Ling 200A, Phonological Theory I. Fall 2003, Zuraw/Martin}
Pig Latin rule of children’s English language game: Initial consonant(s), if any, are moved to the end of the word, and [eɪ] is added to the end.

\[p^h\text{tg }\text{læ?n}\] becomes \[igp^heɪ \text{ æ?nleɪ}\]

- Write the rule informally (we haven’t yet reviewed the transformational notation that is needed).

- If you have Canadian raising and are reasonably adept in Pig Latin, transform the following words into Pig Latin and have your neighbor carefully transcribe them:

  - ice
  - try
  - might
  - sigh
  - Kie
  - Ike

- Now let’s compare notes and see how many dialects we’ve got

Types of rule interaction

14. Feeding

Rule 1 feeds Rule 2 if, at least in some cases, 2 is applicable to a form that has undergone 1 but not to the same form if it had not undergone 1.

Example: Guinaang Kalinga

(dialect of Lubuagan Kalinga, Austronesian language from the Philippines with 12,000-15,000 speakers)

<table>
<thead>
<tr>
<th>Dopá</th>
<th>‘fathom’</th>
<th>Dimpána</th>
<th>‘he measured by fathom’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gobá</td>
<td>‘firing (pots)’</td>
<td>Gimbána</td>
<td>‘she fired’</td>
</tr>
<tr>
<td>?omós</td>
<td>‘bath’</td>
<td>?immósna</td>
<td>‘she bathed’</td>
</tr>
<tr>
<td>Botá?</td>
<td>‘broken piece’</td>
<td>Bintá?na</td>
<td>‘she broke’</td>
</tr>
<tr>
<td>?odáw</td>
<td>‘requesting’</td>
<td>?indáwna</td>
<td>‘he requested’</td>
</tr>
<tr>
<td>Bosát</td>
<td>‘sudden break’</td>
<td>Binsátina</td>
<td>‘he snapped’</td>
</tr>
<tr>
<td>Ponú</td>
<td>‘filling’</td>
<td>Pinnúna</td>
<td>‘she filled’</td>
</tr>
<tr>
<td>To?póp</td>
<td>‘satisfaction’</td>
<td>Tin?pópna</td>
<td>‘he satisfied’</td>
</tr>
<tr>
<td>Sogób</td>
<td>‘burning’</td>
<td>Siogóbna</td>
<td>‘he burned’</td>
</tr>
</tbody>
</table>

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doŋól  ‘report’  diŋjólna  ‘he heard’
ʔolót  ‘tightening’  ʔillótña  ‘he made tight’
ʔowá  ‘doing, making’  ʔiŋwána  ‘he made, did’

○ Can we get feeding without linear rule ordering? What about simultaneous application?

15. **Bleeding**

Rule 1 bleeds Rule 2 if, at least in some cases, 2 is *not* applicable a form that has undergone 1 but would be applicable to the same form if it has not undergone 1.

*Example*: English plural

<table>
<thead>
<tr>
<th>English</th>
<th>Palaeo-Yukaghir</th>
</tr>
</thead>
<tbody>
<tr>
<td>pi-z</td>
<td>‘peas’</td>
</tr>
<tr>
<td>tʰou-z</td>
<td>‘toes’</td>
</tr>
<tr>
<td>dal-z</td>
<td>‘dolls’</td>
</tr>
<tr>
<td>pʰæn-z</td>
<td>‘pans’</td>
</tr>
<tr>
<td>daq-z</td>
<td>‘dogs’</td>
</tr>
<tr>
<td>læb-z</td>
<td>‘labs’</td>
</tr>
<tr>
<td>kʰiln-z</td>
<td>‘kilns’</td>
</tr>
<tr>
<td>kʰlæsp-s</td>
<td>‘clasps’</td>
</tr>
<tr>
<td>mit-s</td>
<td>‘mitts’</td>
</tr>
<tr>
<td>blook-s</td>
<td>‘blokes’</td>
</tr>
<tr>
<td>kʰaf-s</td>
<td>‘coughs’</td>
</tr>
<tr>
<td>glæs-iz</td>
<td>‘glasses’</td>
</tr>
<tr>
<td>fiz-iz</td>
<td>‘fizzes’</td>
</tr>
<tr>
<td>bæntʃ-iz</td>
<td>‘branches’</td>
</tr>
<tr>
<td>bædʒ-iz</td>
<td>‘badges’</td>
</tr>
<tr>
<td>wʃ-iz</td>
<td>‘wishes’</td>
</tr>
<tr>
<td>ɡæreʒ-iz</td>
<td>‘garages’</td>
</tr>
</tbody>
</table>

○ Can we get bleeding without linear rule ordering?

**Next time**: Phonological opacity

**To do**
- Required: Read K&K ch. 4 (Yokuts section) and turn in study questions on Thursday
- Get started on Palauan assignment (due Tuesday).