Class 2: Expansion conventions

To do for next time

- Read K&K ch. 3 excerpt (pp. 45-62), K&K ch. 9 excerpt (pp. 331-339); study questions to be turned in in class Thursday

Overview: We've seen how the basic rule formalism works. Today we'll consider the mechanics and implications of notation like αvoice, ( ), { }, < >, *, C_0.

Expansion conventions

- Devices like parentheses, curly brackets ("braces"), and angle brackets are used to collapse related rules into a single *rule schema* (whose length is shorter = cost is lower).
- Rather than adjusting the definition of nondistinctness, SPE gives *expansion conventions* to turn those schemata into lists of rules that can then be applied using the simple definition of nondistinctness.

1. Lowercase Greek letters

➢ Variables that stand for +, –, or whatever values the theory says some feature can take (could be 1,2,3 for some features—can you think of any good candidates?).

C → [αvoice] / [αvoice] __ [αvoice]   expands into

C → [+voice] / [+voice] __ [+voice]
C → [–voice] / [–voice] __ [–voice]

2. Parentheses

➢ Used to indicate optionality.

- For example, the rule schema V → Ø / __(V)C# is expanded into these two rules (in that order—but we'll come back to that another day):

V → Ø / __VC#
V → Ø / __C#

o Do you ever need parentheses in a <u>feature matrix</u>?

- The rules that a schema expands into are *disjunctively ordered*.
  - Informally: you try to apply the first one
  - if its structural description is met, you apply that first rule and don't try any of the other rules from the same schema
  - if not, move on to the next rule and proceed in the same fashion.
- In other words, you never apply two rules of the same schema to a single word.

o How does the rule above apply to /bauk/?

(This is a bit too crude, because it doesn't give the right result for cases where different rules of a schema apply to different parts of a word—in those cases, we want multiple rules of the schema to apply to the same word, just in different places. We'll come back to that another day too.)

3. Braces, a.k.a. curly brackets

- Used to indicate multiple possibilities

For example, the rule schema $\begin{Bmatrix} \text{i} \\ \text{o} \end{Bmatrix} \rightarrow \text{Ø} / \_\_\text{V}$ is expanded into these two rules (in this order):

i → Ø / __V
o → Ø / __V

- o Can you imagine a way to translate parentheses into braces? Try it with V → Ø / __V(C)#

Some phonologists think that curly brackets are so powerful that the theory shouldn't allow them—that resorting to them is an admission of failure (either of the analyst or of the theory).

4. Super- and subscripts

- X_n^m means from *n* to *m* Xs
  - C_n : "*n* or more Cs" (most common is C_0)
  - V^m : "up to *m* Vs"
  - C_n^m : "anywhere from *n* to *m* Cs"

C → Ø/ __C_0# =
…
C → Ø/ __CCCC#
C → Ø/ __CCC#
C → Ø/ __CC#
C → Ø/ __C#
C → Ø/ __#

- The tricky thing is that we apply the *longest* rule whose structural description matches.

- o How would the schema above apply to /tabskt/?

5. Parentheses with star (But see discussion in Week 4 Anderson reading)

- (…)* means that the material in parentheses can occur zero or more times.

V → [+stress] / #C(VCVC)*__ expands to

V → [+stress] / #C__
V → [+stress] / #CVCVC__
V → [+stress] / # CVCVCVCVC __ *etc.*

- **With ()*, disjunctive ordering does *not* apply.**
  - Every version of the rule that can apply does apply—simultaneously.

- o How would the stress rule above apply to /badupidome/?
- o How would C → Ø/ __C*# apply to /tabskt/?

6. Angled brackets

➢ Like parentheses, but when the optional information is in more than one place.
  - A schema with angle brackets expands into two rules: the rule with the information in the angle brackets and the rule without that information.

C → Ø / V<C>__<C>V (silly example) expands to

C → Ø / VC__CV
C → Ø / V__V

o Expand the following schema and apply it to *putod*, *luged*, and *fesil*.

$$\begin{bmatrix}+\text{syll}\\ \langle+\text{back}\rangle\end{bmatrix} \rightarrow [-\text{hi}]\ /\ \_\_\ C \langle \begin{bmatrix}+\text{syll}\\ +\text{back}\\ -\text{hi}\end{bmatrix} C\rangle \#$$

- You can also subscript angle brackets to show which ones go together:

$C \rightarrow \varnothing\ /\ V\langle_1 C\rangle_1\_\_\langle_2 s\rangle_2\langle_1 C\rangle_1 V\langle_2 h\rangle_2\#$ (even sillier rule) expands to

C → Ø / VC__sCVh#
C → Ø / V__sVh#
C → Ø / VC__CV#
C → Ø / V__V#

7. Transformational rules

➢ Useful for metathesis, coalescence…anything where more than one segment is affected at once.
- In SPE, these were given in two parts:

Structural description: $\underset{1}{\begin{bmatrix}+\text{syll}\\ +\text{low}\end{bmatrix}}, \underset{2}{\begin{bmatrix}+\text{syll}\\ +\text{hi}\\ \alpha\text{round}\end{bmatrix}}$

Structural change: $1\ 2 \rightarrow \begin{bmatrix}1\\ -\text{lo}\\ +\text{long}\\ \alpha\text{round}\\ \alpha\text{back}\end{bmatrix}, \begin{bmatrix}2\\ \varnothing\end{bmatrix}$

o What does this rule do?
o It may seem arbitrary to say that 1 changes and 2 deletes rather than the reverse. Try writing the rule the other way too.

- We'll use a simplified notation instead that collapses the structural description and structural change:

$$\underset{1}{\begin{bmatrix}+\text{syll}\\+\text{low}\end{bmatrix}}\;\underset{2}{\begin{bmatrix}+\text{syll}\\+\text{hi}\\\alpha\text{round}\end{bmatrix}} \rightarrow \begin{bmatrix}1\\-\text{lo}\\+\text{long}\\\alpha\text{round}\\\alpha\text{back}\end{bmatrix}$$

- What's wrong with just saying this:

$$\begin{bmatrix}+\text{syll}\\+\text{low}\end{bmatrix}\;\begin{bmatrix}+\text{syll}\\+\text{hi}\\\alpha\text{round}\end{bmatrix} \rightarrow \begin{bmatrix}-\text{lo}\\+\text{long}\\\alpha\text{round}\\\alpha\text{back}\end{bmatrix}$$

- Formulate a transformational rule for the metathesis seen in the warm-up problem.

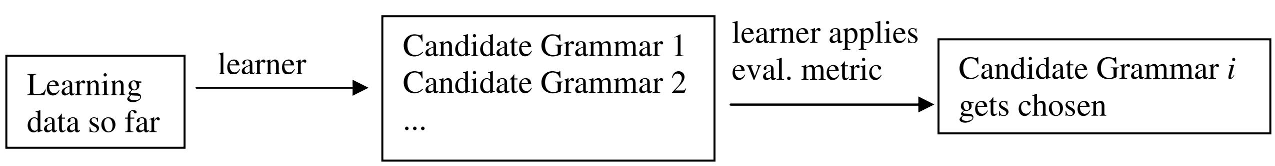
- In the directions for the warm-up problem, I said that you could use a rule of the form AB → BA, but that this was not quite adequate. Rewrite your transformational rule from above as a AB → BA rule. What's wrong with it?

8. How does the learner choose a grammar?

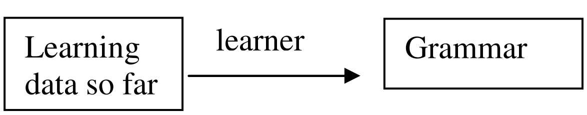
- SPE proposed that if more than one grammar can generate the observed linguistic data, the learner must have some ***evaluation metric*** for choosing one.
- The evaluation metric tentatively proposed in SPE is brevity: learner chooses the grammar with the fewest symbols. (What about ties?)
- If that's right, and if we've got the notation right too, then you can tell which grammar, out of some set of candidate grammars, the learner would choose.
- More plausibly, we want to find independent evidence as to which grammar is right, and then make sure our theory explains how/why the learner chose that one—this is a lot harder!

9. ***Excursus—skip if no time*: does the learner really have/need an evaluation metric?**

- Idea of evaluation metric suggests that learner constructs multiple grammars and chooses one.



- Or, learner constructs preliminary grammar; considers making a minimal change; accepts change if causes improvement (according to metric); repeats (i.e., "hill-climbing").
- Or: learner follows algorithm that develops a single grammar, never considering alternatives



- ...and we can state an evaluation metric such that the grammar arrived at always scores at least as well as any alternatives
- ...or, we are unable to state such an evaluation metric (except the one that just runs the algorithm and then assigns a winning score to the result).

10. ***Example:*** **French elision/liaison** (SPE p. 353 ff.)

- By the logic above, a theoretical innovation is held, in SPE, to be a good one if it allows more concise descriptions of attested/common phenomena than of unattested/uncommon phenomena.

		obstruent- or nasal-initial	liquid-initial	vowel-initial	glide-initial
		/**g**arson/ 'boy'	/**l**ivr/ 'book'	/**ɛ**nfant/ 'child'	/**w**azo/ 'bird'
obstruent- or nasal-final	/pəti**t**/ 'small'	pəti_ garsõ	pəti_ livr	pətit ãfã	pətit wazo
liquid-final	/ʃɛ**r**/ 'dear'	ʃɛr garsõ	ʃɛr livr	ʃɛr ãfã	ʃɛr wazo
vowel-final	/l**ə**/ 'the'	lə garsõ	lə livr	l_ ãfã	l_ wazo
glide-final	/pare**j**/ 'similar'	parej garsõ	parej livr	parej ãfã	parej wazo

For the sake of reconstructing the argument, use the archaic feature [vocalic] and the still-current feature [consonantal]:

	vocalic	*consonantal*
obstruents	–	+
nasals	–	+
liquids	+	+
glides	–	–
vowels	+	–

- Propose rules to account for the C- and V- deletions, without using Greek-letter variables.

- Revise the rules, using Greek-letter variables

- Do Greek-letter variables allow us to compress these two rules:

$\begin{bmatrix} +\text{voc} \\ -\text{back} \end{bmatrix} \rightarrow \text{Ø} \, / \, \_\_ \, \# \, [-\text{cons}]$ "nonback vowels and liquids delete before vowels and glides"

$\begin{bmatrix} -\text{high} \\ +\text{cons} \end{bmatrix} \rightarrow \text{Ø} \, / \, \_\_ \, \# \, [+\text{nasal}]$ "nonhigh consonants and glides delete before nasals"

- o According to SPE's logic, how should the typology guide us in deciding whether to allow the same Greek-letter variable to apply to different features within a rule?

11. (*skip if no time*) Reasoning above relies on assumptions about linguistic typology:

- Assume a rule is cross-linguistically common only if it's favored by learners—i.e., learners tend to mislearn, in the direction of a more-favored grammar.
- Assume that learners favor short/simple/whatever rules.
- Therefore, rules that are cross-linguistically common should tend to be short.
- Therefore, our theory of rules, which determines what type of notation length is calculated on, should make common rules shorter than uncommon ones.
- Therefore, a theoretical innovation is good if it makes common rules shorter than uncommon ones.

=> We're not really using "short" (or "simple") in any fixed sense. Rather, we're tailoring the notation to make the rules that we think learners favor appear short. [And of course, that first assumption is questionable...]

This leads us into slippery territory in deciding whether shortness is the right criterion:

- Are learners innately endowed with a certain notation, which they use to calculate grammar length? (i.e., shortness really is the evaluation criterion)
- Or is it the case that learners employ some other evaluation metric entirely, but we've created a system of notation that makes goodness according to the real evaluation metric translate into shortness in our notation?

Something for you to think about, though no answers will be forthcoming: We've seen how to evaluate a particular description or even a theoretical innovation, given a framework like SPE.

- o But how do you evaluate the framework itself—in particular, how can we evaluate a principle such as "if more than one grammar can generate the observed linguistic data, the learner chooses the grammar with the fewest symbols"?

Next time: What if the grammar contains more than rule? We'll see the SPE approach to rule interaction, <u>extrinsic ordering</u> (what until now you've probably known as just "ordering").

References

Chomsky, N. (1964). *Current Issues in Linguistic Theory*. The Hague: Mouton.

Chomsky, N. (1965). *Aspects of the Theory of Syntax*. Cambridge, Mass.: MIT Press.