
Week 05 – Rule Application

October 7, 2008

1 Multiple Application Problem

1.1 Overview

- (1) The basic problem to be dealt with today is what to do with a form that, for some rule $A \rightarrow B / X \text{ ____ } Y$, contains multiple instances of XAY , either because XAY straightforwardly occurs twice in the form, or because there are multiple ways of interpreting XAY (e.g., it contains parentheses).
- (2) Multiple, non-overlapping matches
 - a. SPE p. 344: To apply a rule, the entire string is first scanned for segments that satisfy the environmental constraints of the rule. After all such segments have been identified in the string, the changes required by the rule are applied simultaneously.
 - b. Example: Remember Palauan vowel reduction from last time? Add to our previous rules one that stresses the penult:

$$\begin{array}{l} \text{stress:} \quad V \rightarrow [+stress] / \text{ ____ } (C_0V)C_0\# \\ \text{reduction:} \quad \left[\begin{array}{c} V \\ -long \\ -stress \end{array} \right] \rightarrow \text{\textcircled{a}} \\ \text{shortening:} \quad \left[\begin{array}{c} V \\ -stress \end{array} \right] \rightarrow [-long] \end{array}$$

★ How would those rules apply to an underlying representation like /ʔabiŋal/ʔ

- (3) Multiple matches: one instance's target is another's environment

Example: optional schwa deletion French (data originally from Dell 1970¹)

¹Dell, François (1970). Les règles phonologiques tardives et la morphologie dérivationnelle du français. MIT dissertation.

/suvənir/	→	[suvənir] or [suvnir]	‘to remember’
/pasəra/	→	[pasəra] or [pasra]	‘will pass’
/parvənir/	→	[parvənir] * [parvnir]	‘to reach’
/sufləra/	→	[sufləra] * [suflra]	‘will blow’
/ãri#dəve#partir/	→	[ãri#dəve#partir] or [ãri#dve#partir]	‘Henri had to go’
/ʒak#dəve#partir/	→	[ʒak#dəve#partir] *[ʒak#dve#partir]	‘Jacques had to go’

★ Write a rule for schwa deletion (assuming that these data are correct!).

★ What does the quote from SPE above predict for this form: /ty#dəvəne/ ‘you were becoming’

★ Actual result is (supposedly—I’ve heard that French speakers react differently): [ty#dəvəne] or [ty#dəvne] or [ty#dvəne], but not *[ty#dvne]. Discuss.

(4) Example from Colin Wilson (seen in your study questions): Woleaian² (Austronesian language from the Federated States of Micronesia with 1,631 speakers)

/mata/	mate	‘eye’	/mata+i/	metai	‘my eyes’
			/mata+mami/	matemami	‘our (excl.) eyes’
/yafar/	yefar	‘shoulder’	/yafar+ai/	yaferai	‘our (incl.) shoulders’
/parasa/	perase	‘switch’	/parasa+rasa/	peraserase	‘splash-intrans.’
/marama/	merame	‘moon’	/marama+li/	maremali	‘moon of’

(5) Two rules

- Final-V raising: $V \rightarrow [-\text{low}] / ______ \#$
- Dissimilation: $V \rightarrow [-\text{low}] / ______ C_0[-\text{cons}, +\text{low}]$

★ What does the quote from SPE above say should happen to /marama+li/?

²Data originally from Sohn, Ho-Min (1975). Woleaian Reference Grammar. Honolulu: University Press of Hawaii.

1.2 Possible solution I: directional application

- (6) Left-to-right: Scan the string for the leftmost eligible segment and apply the rule to it. Then scan the resulting form for the leftmost eligible segment, etc.

★ Does this work for Woleaian? French?

- (7) Right-to-left: Same thing but start with the rightmost eligible segment.

★ Does this work for Woleaian? French?

1.3 Possible solution II from Anderson (1974)

- (8)
1. Find all segments eligible for the rule and circle them.
 2. For each circled segment, underline the smallest environment that lets the segment meet the rule's structural description.
 3. If the rule is optional, you may uncircle some of the eligible segments and de-underline their environments.
 4. If any circled segment is contained in some other circled segment's underlined environment, uncircle (de-underline the environments of) as few segments as possible to get rid of these overlaps.
 5. Now apply the rule simultaneously to the remaining circled segments. (Of course, circling and underlining themselves have no theoretical status—this is just a convenient way to say that we are identifying two different types of thing, targets and environments)³

★ What does Anderson's proposal predict for the French string
/ty#vudre#kə#sə#kə#lə#bədo#/ 'you would like that what the beadle'?

★ Does Anderson's proposal help with Woleaian?

³Anderson, Stephen (1974). *The Organization of Phonology*. New York: Academic. (See chapter 13.)

- (9) Tonkawa revisited (you read about it in K&K)
(Coahuiltecan language once spoken in Texas. Today's Tonkawa people are based in Oklahoma.)

/picena/	picn+o?	'he cuts it'	picna+n+o?	'he is cutting it'
	we+pcen+o?	'he cuts them'	we+pcena+n+o?	'he is cutting them'
	ke+pcen+o?	'he cuts me'	ke+pcena+n+o?	'he is cutting me'
	picen	'castrated one; steer'		
/notoxo/	notx+o?	'he hoes it'	notxo+n+o?	'he is hoeing it'
	we+ntox+o?	'he hoes them'	we+ntoxo+n+o?	'he is hoeing them'
	ke+ntox+o?	'he hoes me'	ke+ntoxo+n+o?	'he is hoeing me'
	notox	'hoe'		
/netale/	netl+o?	'he licks it'	netle+n+o?	'he is licking it'
	we+ntal+o?	'he licks them'	we+ntale+n+o?	'he is licking them'
	ke+ntal+o?	'he licks me'	ke+ntale+n+o?	'he is licking me'
/naxace/	naxc+o?	'he makes it a fire'	nxace+n+o?	'he is making it a fire'
	we+nxac+o?	'he makes them a fire'	we+nxace+n+o?	'he is making them a fire'
	ke+nxac+o?	'he makes me a fire'	ke+nxace+n+o?	'he is making me a fire'

- (10) Recall K&K's syncope rule Ch. 3: $V \rightarrow \emptyset / \#CVC \text{ ____ } CV$

★ If we simplify the rule to $V \rightarrow \emptyset / VC \text{ ____ } CV$, what problems do we run into?

1.4 Minimal vs. maximal application

- (11) Something to think about in these and other cases of potential multiple application: is the rule applying as often as possible or as seldom as possible? Is this something we might want a theory to make reference to?

2 Intrinsic Ordering Proposals

2.1 Review and Preview

- (12) Last time, we looked at some proposals for how to apply rules the structural description is met multiple times in some form.
- (13) Today, we examine some proposals that address rule orderings. Are there universal principles by which we can determine the order of rules?
- (14) We've mainly assumed that a language can impose any order it wants on rules. Many researchers have proposed that this is not the case—that rules are intrinsically ordered (and extrinsic rule ordering is required only in special circumstances)

- (15) Vocabulary
- a. *Extrinsic Ordering*: The ordering of rules for each language is language-specific
 - b. *Intrinsic Ordering*: The ordering of rules for each language is determined by universal principles

★ From a learning point of view, what is attractive about intrinsic ordering?

- (16) We look at two proposals with an interlude on the “Elsewhere Condition”
- a. Koutsoudas, Sanders and Noll 1974: simultaneous repeated application plus “proper inclusion precedence”
 - b. Anderson 1974: natural orders
 - c. We will also ask “What is the difference?”

2.2 Some relevant things to keep in mind

- (17) We have described different kinds of rule interactions.
- a. feeding – transparent – both rules apply
 - b. bleeding – transparent – one rule applies
 - c. counterfeeding –opaque – one rules applies (underapplication)
 - d. counterbleeding –opaque – both rules apply (overapplication)
 - e. none
- (18) Kiparsky (1968) observes that when languages change over time:
- a. We can describe these changes in terms of the grammars, as opposed to just surface sound change.
 - b. When we look at how the grammars change, many changes can be described in terms of a re-ordering of the rules.
 - (i) In particular, Kiparsky observes rules tend to reorder themselves so that they can apply to more forms.
 - (ii) In other words, from the perspective of historical change, feeding and counter-bleeding orderings appear to be favored.
- (19) This suggests a principle underlying rule-ordering, which we might state as “rules want to apply maximally”.

2.3 Goal of Koutsoudas et. al.

- (20) Adopt repeated simultaneous application as a universal principle of rule application and deal with the bleeding and counterfeeding cases with another principle.
- (21) We have already observed that repeated, simultaneous application of rules allows us to let rules apply “maximally”.

2.3.1 Feeding

(22) Recall Karok Palatalization and Vowel Deletion

- a. V deletion: $V \rightarrow \emptyset / V \text{ ____}$
 b. Palatalization: $s \rightarrow \text{ʃ} / i(C) \text{ ____}$

(23) $/ni+uksup/$
 V deletion niksups
 Palatalization nikʃups

★ How does simultaneous, repeated application work?

2.3.2 Counter-bleeding

(24) Recall Counterbleeding opacity in Polish.

- a. ɔ -Raising: $\text{ɔ} \rightarrow u / C \text{ ____} [-\text{nasal}, +\text{voice}] \#$
 b. Final C-Devoicing: $[-\text{sonorant}] \rightarrow [-\text{voice}] / \text{ ____} \#$

(25) $/vɔz/$
 ɔ -Raising vuz
 Final C-Devoicing vus

★ How does simultaneous, repeated application work?

2.3.3 Proper inclusion precedence

(26) Latin American varieties of Spanish, extrinsically ordered (and rather abstract!) analysis:

- | | | | |
|----|---|----------------|-------------------|
| | | $/ake\lambda/$ | $/ake\lambda+os/$ |
| 1. | $\lambda \rightarrow l / \text{ ____} \#$ | akel | — |
| 2. | $\lambda \rightarrow j / \text{ ____} \#$ | — | akej+os |
| | | ‘that’ | ‘those’ |

★ What kind of rule ordering is this?

★ Try to apply these rules simultaneously and repeatedly to $/ake\lambda/$ —what’s the problem?

(27) Koutsoudas et. al. propose (following Sanders 1970):

For any representation R, which meets the structural descriptions of each of two rules A and B, A takes applicational precedence over B with respect to R if and only if the structural description of A properly includes the structural description of B. (p. 9)

(28) *the structural description of A properly includes the structural description of B* means

a. you can match B's structural description up with part of A's that it is nondistinct from, *and still have part of A's structural description leftover.*

★ How does the definition apply to the two Spanish rules? Which rule is A and which is B?

2.3.4 Bleeding

(29) Schaffhause dialect of Swiss German (example originally from Kiparsky 1968)

	Singular	Plural (umlaut context)		
underlying:	/bogə/	/bodə/	/bogə+PL/	/bodə+PL/
surface:	bogə	bədə	bøgə	bødə

(30) Analysis

a. V-fronting: $V \rightarrow [-\text{back}] / \textit{umlaut context, inc. plurals}$

b. o-rounding:⁴ $o \rightarrow \text{ɔ} / \text{---} \left[\begin{array}{l} +\textit{cons} \\ +\textit{cor} \\ -\textit{lat} \end{array} \right]$

	/bogə/	/bodə/	/bogə+PL/	/bodə+PL/
V-fronting:	---	---	bøgə	bødə
o-rounding:	---	bədə	---	---

★ Why is this ordering crucial?

★ What happens if we use the Koutsoudas et. al. approach?

⁴Actually, in the original it's not [+cor] but [-grave]. Grave is an acoustically based feature (roughly, lower frequencies are stronger for [+grave] segments), not much used these days. Labials and velars are [+grave]; dentals and alveolars are [-grave] (a.k.a. acute).

- (31) Koutsoudas et. al. propose that in all apparent cases of bleeding (and counterfeeding?), the rules need to be revised. In this case, they propose a context-free rule $\text{œ} \rightarrow \emptyset$

★ Apply this solution to /bodə+PL/.

★ What additional fact needs to be true in Schaffhause for this to work?

2.4 Interlude: The Elsewhere Condition

- (32) (Anderson 1969, Kiparsky 1973 and ff.)⁵

- (33) Kiparsky argues that disjunctive ordering doesn't really have anything to do with expansion conventions (though it happens to occur those cases). He proposes that what really drives disjunctive ordering is...

- (34) the Elsewhere Condition (p. 94):

Two adjacent [in the ordering] rules of the form

$A \rightarrow B / P \text{ — } Q$

$C \rightarrow D / R \text{ — } S$

are disjunctively ordered if and only if:

- the set of strings that fit [are nondistinct from] PAQ is a subset of the set of strings that fit RCS, and
- the structural changes of the two rules are either identical or incompatible

- (35) For a Malagasy-like stress rule schema, consider $V \rightarrow [+stress] / \text{ — } C(VC)\#$

- a. if we write it as two rules:

(i) $V \rightarrow [+stress] / \text{ — } CVC\#$

(ii) $V \rightarrow [+stress] / \text{ — } C\#$

★ ...how does the Elsewhere Condition say that these rules should apply?

★ Let's discuss: How does the elsewhere condition compare to proper inclusion precedence? Are there cases where the two conditions apply differently?

⁵Kiparsky, Paul (1973). Elsewhere in phonology. In Stephen Anderson & Paul Kiparsky (eds.) A Festschrift for Morris Halle. New York: Holt, Rinehart & Winston.

2.5 Anderson (1974) and natural orderings

2.5.1 Self-feeding

- (36) Takelma example from Anderson Chapter 9 (Penutian language that was once spoken in Oregon)
- [a] becomes [i] if followed by [i]:
/alxīxamis/ → [alxīximis] one who sees us
 - and any preceding [a]s follow suit:
/ikūmanananink^h/ → [ikūminininink^h] he will fix it for him
/lohōnananin/ → [lohōnininin] I caused him to die for him
 - unless a voiceless C intervenes:
/lohōnananhi/ → [lohōnananhi] ?
/alsegesakhsanik^h/ → [alsegesakhsinik^h] we keep nodding to one another

- ★ Recall the rule that simultaneously applies to all the eligible vowels—why was Anderson against it and what was his solution?

$$a \rightarrow i / \left[\begin{array}{c} \text{---} \\ -stem \end{array} \right] \left(\left[\begin{array}{c} -syll \\ +voice \end{array} \right]_0 a \right)^* \left[\begin{array}{c} -syll \\ +voice \end{array} \right]_0 i$$

- ★ Is Anderson's solution different in this case from Koutsoudas et. al.'s proposal?

- ★ Something to think about: do cases in which rules can't be allowed to apply to their own output have anything principled in common?

2.5.2 Natural Orderings

- (37) Icelandic (Indo-European language from Iceland with 250,000 speakers)

- (38) umlaut and syncope

barn	'child'	börn+um	'child-dat.pl.'
svant	'hungry-neut.nom.sg.'	svöng+u	'hungry-neut.dat.sg.'
kalla	'[I] call'	köll+um	'[we] call'
hamar	'hammer'	hamr+i	'hammer-dat.sg.'
fífill	'dandelion'	fífi+i	'dandelion-dat.sg.'
morgunn	'morning'	morgn+i	'morning-dat.sg.'

(39) Analysis

a. Umlaut : $a \rightarrow \ddot{o} / \text{---} C_0u$ b. Syncope: $\left[\begin{array}{l} +syll \\ -stress \end{array} \right] \rightarrow \emptyset / C \text{---} C+V$

★ If syncope precedes umlaut, what kind of ordering results for the UR /katil+um/ 'kettle-dat.pl'?

★ For /jak+ul+e/ 'glacier-dat.sg.'?

★ What about umlaut before syncope for /katil+um/?

★ For /jak+ul+e/?

(40) As we observed with Karok (HW #2), whether a rule ordering is feeding, bleeding, etc. depends on the particular forms involved.

		<i>+r/∅</i>		<i>+um</i>
/katil/	ketill	'kettle'	kötlum	'kettle-dat.pl'
/ragin/	regin	'gods'	rögnum	'gods-dat.pl'
/alen/	alin	'ell of cloth'	ölnum	'ell of cloth-dat.pl'

		<i>+ul+r</i>		<i>+ul+e</i>
/bagg/	böggull	'parcel'	böggli	'parcel-dat.sg.'
/jak/	jökull	'glacier'	jökli	'glacier-dat.sg.'
/jat/	jötunn	'giant'	jötnei	'giant-dat.sg.'

			<i>+ul+an</i>	
/pag/	þöggull	'taciturn'	þöglan	'taciturn-masc.acc.sg.'

(41) If the rules are right, we have an ordering paradox! How does Anderson resolve it?

(42) Anderson's definition of natural order:

... where only one of the two possible orders for a given pair of rules is feeding, the feeding order is the natural one; and that where only one of the two possible orders is bleeding, the other order [i.e. counterbleeding] is the natural one. In all other cases [...] no natural order is (yet) defined.
(p. 147)

- (43) Anderson proposes that at least some pairs of rules are left unordered by a language's grammar and so apply in their natural order in each case. (See Anderson ch. 12 for some amendments to this proposal.)

★ Again, is this different from the Koutsoudas et. al. proposal?

★ So if a grammar consists of a list of rules and some statements about their orderings, what does a change of the type observed by Kiparsky involve?

★ Can you think of other ways to deal with Icelandic?