Rule Ordering

Rule Ordering

- Sometimes the order of rules matters.
- We are going to tackle one long example on Brazilian Portuguese today. (Data from Major 1985; Nobre and Ingemann 1987, plus some additional data from Dr. Kie Zuraw.)

Major, Roy C. 1985. Stress and Rhythm in Brazilian Portuguese. *Language* 61(2). 259–282.
Nobre, Maria Alzira & Frances Ingemann. 1986. Oral vowel reduction in Brazilian Portuguese. In Robert Channon (ed.), *In honor of Ilse Lehiste: Ilse Lehiste Pühendusteos*, 195–206. de Gruyter.

Brazilian Portuguese

The vowel alternations in this data occur only in very casual speech

1. Identify alternations in *root morphemes*

2. Choose an underlying form for each root

3. Write a phonological rule to account for the alternations (plus an additional rule for /a/)

4. Draw a phonemicization diagram

Brazilian Portuguese - Step 1

- Identify alternations in **root** morphemes. (I've already given you the morpheme boundaries.)
- [-ə], [-i], and [-u] are actually 3 different suffixes, so there's no suffix allomorphy

1. [ˈfɛst-ə]   'party'   [fisˈt͡ʃ-iv-u]   'festive'
2. [ˈʃik-i]   'chic'   [ʃiˈk-ez-ə]   'elegance'
3. [ˈsek-ə]   'drought'   [siˈk-uɾ-ə]   'dryness'
4. [ˈʃɛk-i]   'check'   [ʃiˈk-ad-u]   'checked'
5. [ˈsak-ə]   'sack'   [səˈk-ɔl-ə]   'handbag'
6. [ˈʃɔk-i]   'shock'   [ʃuˈk-ad-u]   'shocked'
7. [ˈsok-u]   'punch'   [suˈk-et͡ʃ-i]   'ramrod'
8. [ˈsuk-u]   'juice'   [suˈk-oz-u]   'juicy'

Phonetic studies have found that some of these final "[u]"s are really more like [ʊ], and some of the unstressed "[i]"s are really more like [ɨ].

Brazilian Portuguese - Step 2

- Choose an underlying form for each root. If the root alternates, you have 2 obvious choices. If it doesn't alternate, you have 1 obvious choice.

1. [ˈfɛst-ə]   'party'   [fisˈt͡ʃ-iv-u]   'festive'
2. [ˈʃik-i]   'chic'   [ʃiˈk-ez-ə]   'elegance'
3. [ˈsek-ə]   'drought'   [siˈk-uɾ-ə]   'dryness'
4. [ˈʃɛk-i]   'check'   [ʃiˈk-ad-u]   'checked'
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Phonetic studies have found that some of these final "[u]"s are really more like [ʊ], and some of the unstressed "[i]"s are really more like [ɨ].

Brazilian Portuguese - Step 3

Write a phonological rule to account for the alternations. (For /a/, you'll need to write a separate rule.)

Brazilian Portuguese - Step 4

Draw phonemicization diagrams.

Brazilian Portuguese Coronals

Use these data to develop a phonemic analysis of the sounds: [t, d, t͡ʃ, d͡ʒ]

- Identify the environment that each occurs in.
- Can you find any complementary distribution?
- Make a phonemicization diagram.
- Write a rule to account for the distribution.

[ˈd͡ʒiə]	'day'	[d͡ʒi]	'of'
[ˈt͡ʃiə]	'aunt'	[ˈtrẽzitu]	'traffic'
[iˈdad͡ʒi]	'age'	[ˌakriˈd͡ʒitu]	'I believe'
[kõˈt͡ʃigu]	'with	[pirˈdɛw]	'she lost'
[siˈdad͡ʒi]	'city'	[ˈdẽt͡ʃĩs]	'teeth'
[ˈd͡ʒisi]	'she said'	[ˈt͡ʃĩpiku]	'typical'
[ˈdɛsis]	'of these'	[ˌasiˈdẽt͡ʃĩ]	'accident'
[viziˈtar]	'to visit'	[mutuˈristə]	'driver'
[gusˈtow]	'she liked'	[isˈtavə]	'was'
[ˈdezd͡ʒi]	'since'	[uˈzẽdu]	'using'
[d͡ʒisiˈd͡ʒiw]	'she decided'	[ẽˈkwẽtu]	'while'
[vuˈlẽt͡ʃĩ]	'driving'	[d͡ʒiriˈʒiə]	'was driving'
[ˈpɔd͡ʒi]	'you can'	[ˈtrist͡ʃĩ]	'sad'
[ˈmuwtə]	'fine'	[d͡ʒiˈẽt͡ʃĩ]	'ahead'
[əˈte]	'even'	[ˈd͡ʒisu]	'of this'
[ˈʒẽt͡ʃĩ]	'people'		

Brazilian Portuguese Coronals - Step 1

Identify the environment that each of the sounds occurs in.

Brazilian Portuguese Coronals - Step 2

Environments:
[t] not before [i]
[d] not before [i]
[t͡ʃ] before [i]
[d͡ʒ] before [i]

Can you find any complementary distribution?

Brazilian Portuguese Coronals - Step 3

Make phonemicization diagrams.

Brazilian Portuguese Coronals - Step 4

Write phonological rules for the alternations.

- Rule in prose: coronal stops become post-alveolar affricates in the environment preceding a high front vowel

Rule Ordering

Now we have two rules:

- Mid-vowel raising:

- Palatalization:

(plus the one for /a/, but ignore it for now)

Rule Order #1

'to be able'	*'it can'*	
/ ˈpɔd /	/ ˈpɔd /	**Lexical entries of roots**
		Morphology:
		Stem Formation: X → Xe if [+2nd Conjugation] Infinitive Formation: X → Xɾ if [–finite]
		Phonology:
		Stress Shift: *just trust me*
		Mid Vowel Raising:
		Palatalization:
[ ]	[ ]	**Surface forms**

Rule Order #2

'to be able'	*'it can'*	
/ ˈpɔd /	/ ˈpɔd /	**Lexical entries of roots**
		Morphology:
ˈpɔde	ˈpɔde	Stem Formation: X → Xe if [+2ⁿᵈ Conjugation]
ˈpɔdeɾ	--	Infinitive Formation: X → Xɾ if [–finite]
		Phonology:
pɔˈdeɾ	--	Stress Shift: *just trust me*
		Palatalization:
		Mid Vowel Raising:
[ ]	[ ]	**Surface forms**

Rule Ordering

- The correct pronunciations are [puˈdeɾ] and [ˈpɔd͡ʒi]
  - So only one of these orderings is correct for Brazilian Portuguese (Order #1)
- The other ordering isn't *theoretically* wrong; it's just not correct for this language.
- The correct ordering here is an example of a **feeding** rule order: one rule "feeds" the next, by creating a form that it can apply to.
  - Mid vowel raising *feeds* palatalization by creating the environment [i] that palatalization needs in order to apply
  - Mid vowel raising > Palatalization

More Rule Orderings

- Determine the correct ordering of *Mid Vowel Raising* and *Low Vowel Raising*. You should be able to account for [səˈk-ɔl-ə].

- Assume the underlying form, after all morphological rules but before any phonological rules, is /ˈsakɔla/, and then stress shifts to saˈkɔla

'handbag'	
/ ˈsakɔla /	**Lexical entries of roots + morphology**
	Phonology:
saˈkɔla	Stress shift
	Low Vowel Raising
	Mid Vowel Raising
	Surface Form

More Rule Orderings

- Determine the correct ordering of *Mid Vowel Raising* and *Low Vowel Raising*. You should be able to account for [səˈk-ɔl-ə].

- Assume the underlying form, after all morphological rules but before any phonological rules, is /ˈsakɔla/, and then stress shifts to saˈkɔla

'handbag'	
/ ˈsakɔla /	**Lexical entries of roots + morphology**
	Phonology:
saˈkɔla	Stress Shift
	Mid Vowel Raising
	Low Vowel Raising
	Surface Form

More Rule Orderings

- The correct ordering here is an example of a **counterfeeding** rule order: one rule *could have fed* the other, but comes too late to do so.

Mid vowel raising > Low vowel raising

[i]-insertion

- There's a rule that inserts [i] after certain consonants, if they're not already followed by a vowel.

- We can see this in a lot of loanwords:

'hiphop'	(showing just the Phonology component)
/ ˌhipˈhop /	
ˌhipiˈhopi	Epenthesis: Ø → [i] / [-son, -cont]__ { [-syll],]$_{word}$ }
[ˌhipiˈhopi]	

the { } brackets
mean "X or Y"

- List some consonants that this rule *should* apply after (based on the features it uses)

Fun fact: this is often spelled *riprop*, because *r*, at the beginning of a syllable, spells something close to [h].

[i]-insertion

- Another loanword: 'internet' /ˌĩtarˈnɛt/ → [ˌĩtərˈnɛt͡ʃi].

- Determine where the Epenthesis rule is ordered in our sequence of rules (there are 4 choices) to make this derivation work.

- Ignore the Stress Shift rule — it's not relevant for this word.

- Make sure your ordering is consistent with the one we picked in Step 3: Mid Vowel Raising > Low Vowel Raising, Mid Vowel Raising > Palatalization

[i]-insertion

- Ignoring stress shift, determine where the Epenthesis rule is ordered in our sequence of rules (there are 4 choices) to make this derivation work. Ignore the Stress Shift rule — it's not relevant for this word.

'internet'	
/ ˌĭtarˈnɛt /	**Lexical entries of roots + morphology**
	Phonology:
	Mid vowel raising
	Low vowel raising
	Epenthesis
	Palatalization
[ ]	Surface form

[i]-deletion

- There's also an optional rule that deletes **unstressed [i]**, especially word-finally

[ˈʃik-i] or [ˈʃik]	'chic'
[ˈʃɛk-i] or [ˈʃɛk]	'check'
[ˈʃɔk-i] or [ˈʃɔk]	'shock'
[iˈdad͡ʒi] or [iˈdad͡ʒ]	'age'
[ˌasiˈdẽt͡ʃi] or [ˌasiˈdẽt͡ʃ]	'accident'
[ˈtrist͡ʃi] or [ˈtrist͡ʃ]	'sad'

- Determine where this new rule of Vowel Deletion should go in our rule ordering (there are 5 possibilities).

- Again, make sure it's consistent with the orderings we've determined so far, and ignore Stress Shift.
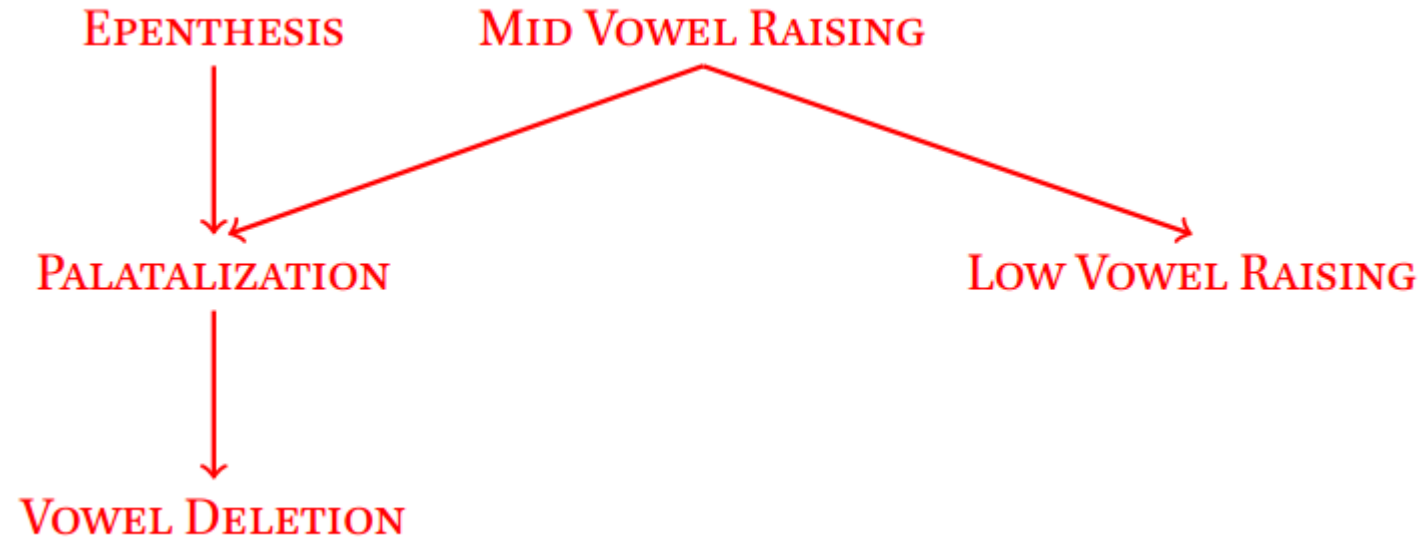
[i]-deletion

‘it burns (2nd conjugation)’	
/ ˈard /	**Lexical entries of roots**
	Morphology:
	Stem Formation: X → Xe if [+2nd Conjugation]
	Phonology:
	Mid vowel raising
	Low vowel raising
	Epenthesis
	Palatalization
	Vowel deletion
	Surface forms

Rule Ordering

- Palatalization > Vowel deletion is crucial here
- If we reversed the ordering, we'd have **bleeding**—one rule "bleeds" the other by destroying forms that it could have applied to.
- In the Brazilian Portuguese case, we instead have **counterbleeding**—a rule that *could have bled another rule* comes too late to do so.
- What's funny about this surface form here is that the /d/ takes on the allophone that it has before [i]—even though the [i] is gone.
- This is typical of counterbleeding: **the rule applies, but then its environment disappears.**

Hasse diagrams

- Not specific to linguistics (used in many fields to represent ordering relations):

- Hasse diagrams allow us to represent what we do and do not know about ordering relations

Bottom line

- When you have multiple rules, you should be able to determine their ordering—you can always use trial and error if it doesn't jump out at you.
- You should be able to identify whether an ordering between two rules is
  - feeding
  - counterfeeding
  - bleeding
  - counterbleeding
- **Next time**: More practice with rule ordering, and some special ordering types