Ling 403/603
Introduction to Phonology

DAY 13
CESAR KOIRALA
Take home message from the last lecture

- Alternation results because the phonological rules enforce their demands on the output of morphology (and syntax).

Morphemes (constant pronunciation)

Morphology (and syntax) rearranges the phonological environments of the phonemes

Phonology
<table>
<thead>
<tr>
<th>quote</th>
<th>quotable</th>
<th>quotation</th>
</tr>
</thead>
</table>
| [ˈkwʌut]v | [ˈkwʌut]v      | [ˈkwʌut]v  | Lexical entry for *quote*

**Lexicon**

**Morphological component**

| —         | [ˈkwʌutvəbəl]a | —         | —         | -able Affixation |
| —         | —             | [ˈkwʌutteɪʃən]n | -ation Affixation |
| [ˈkwʌut]v | [ˈkwʌutvəbəl]a | [ˈkwʌutteɪʃən]n | output of morphological component |

**Phonological component**

<table>
<thead>
<tr>
<th>/ˈkwʌut/</th>
<th>/ˈkwʌutəbəl/</th>
<th>/ˈkwʌutteɪʃən/</th>
<th>underlying forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>ʰt</td>
<td>—</td>
<td>—</td>
<td>Preglottalization</td>
</tr>
<tr>
<td>—</td>
<td>r</td>
<td>—</td>
<td>Tapping</td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>th</td>
<td>Aspiration</td>
</tr>
<tr>
<td>[ˈkwʌutʰ]</td>
<td>[ˈkwʌutəbəl]</td>
<td>[ˈkwʌutʰteɪʃən]</td>
<td>surface forms</td>
</tr>
</tbody>
</table>
A point to note...

- The ordering of the rules doesn’t matter in the example we just saw.
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><code>quote</code></td>
<td><code>quotable</code></td>
<td><code>quotation</code></td>
<td></td>
</tr>
<tr>
<td>`'kwout]'_v</td>
<td>`'kwout]'_v</td>
<td>`'kwout]'_v</td>
<td>Lexical entry for <em>quote</em></td>
</tr>
</tbody>
</table>

### Lexicon

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>`'kwout]'_v</td>
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<td>`'kwout]'_v</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>`'kwou't]'_verb</td>
</tr>
<tr>
<td>`'kwout]'_v</td>
<td>`'kwout]'_v</td>
<td>`'kwout]'_v</td>
<td>output of morphological component</td>
</tr>
</tbody>
</table>

### Morphological component

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>`'kwout]'_v</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>`'kwou't]'_verb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>`'t'</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>`'th'</td>
</tr>
<tr>
<td>`'kwou't]</td>
<td>`'kwour]'_v</td>
<td>`'kwou't]'_verb</td>
<td>surface forms</td>
</tr>
</tbody>
</table>
Let's see an example where the ordering matters...
Let's see an example where the ordering matters...

\[
\begin{align*}
\text{tripe} & \quad /\text{traip}/ & [\text{traip}] \\
\text{right} & \quad /\text{rait}/ & [\text{rait}] \\
\text{hiker} & \quad /\text{haikə}/ & [\text{haikə}] \\
\text{life} & \quad /\text{laiʃ}/ & [\text{laiʃ}] \\
\text{rifle} & \quad /\text{raɪfəl}/ & [\text{raɪfəl}] \\
\text{rice} & \quad /\text{raɪs}/ & [\text{raɪs}] \\
\text{tribe} & \quad /\text{traɪb}/ & [\text{traɪb}] \\
\text{ride} & \quad /\text{raɪd}/ & [\text{raɪd}] \\
\text{tiger} & \quad /\text{taɪɡər}/ & [\text{taɪɡər}] \\
\text{live} & \quad /\text{laiv}/ & [\text{laiv}] \\
\text{rival} & \quad /\text{raɪvəl}/ & [\text{raɪvəl}] \\
\text{rise} & \quad /\text{raɪz}/ & [\text{raɪz}] \\
\text{rye} & \quad /\text{raɪ}/ & [\text{raɪ}] \\
\text{ion} & \quad /\text{aiən}/ & [\text{aiən}] \\
\end{align*}
\]

\[/\text{ai}/ \text{ Raising}\]
Let's see an example where the ordering matters...

\[ \text{tripe} \quad \text{/traɪp/} \quad [\text{traɪp}] \quad \text{tribe} \quad \text{/traɪb/} \quad [\text{traɪb}] \]

\[ \text{right} \quad \text{/raɪt/} \quad [\text{raɪt}] \quad \text{ride} \quad \text{/raɪd/} \quad [\text{raɪd}] \]

\[ \text{hiker} \quad \text{/haɪkə/} \quad [\text{haɪkə}] \quad \text{tiger} \quad \text{/taɪgə/} \quad [\text{taɪgə}] \]

\[ \text{life} \quad \text{/laɪf/} \quad [\text{laɪf}] \quad \text{live} \quad \text{/laɪv/} \quad [\text{laɪv}] \]

\[ \text{rifle} \quad \text{/raɪfəl/} \quad [\text{raɪfəl}] \quad \text{rival} \quad \text{/raɪvəl/} \quad [\text{raɪvəl}] \]

\[ \text{rice} \quad \text{/raɪs/} \quad [\text{raɪs}] \quad \text{rise} \quad \text{/raɪz/} \quad [\text{raɪz}] \]

\[ \text{rye} \quad \text{/raɪ/} \quad [\text{raɪ}] \quad \text{ion} \quad \text{/aɪən/} \quad [\text{aɪən}] \]

\[
\text{/aɪ/ Raising} \\
\text{aɪ} \rightarrow \text{ʌɪ} / \quad [\text{−syllabic}] \\
\text{−voice} \quad [\text{−voiceless consonant}] \\
\text{/aɪ/ is realized as [ʌɪ] when it precedes a voiceless consonant.} \]
Let's see an example where the ordering matters...

<table>
<thead>
<tr>
<th>Word</th>
<th>Phonemic</th>
<th>Phonetic</th>
<th>Word</th>
<th>Phonemic</th>
<th>Phonetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ada</td>
<td>/ˈeɪdə/</td>
<td>[ˈeɪdə]</td>
<td>Dan</td>
<td>/ˈdæn/</td>
<td>[ˈdæn]</td>
</tr>
<tr>
<td>ladder</td>
<td>/ˈlædər/</td>
<td>[ˈlædər]</td>
<td>adept</td>
<td>/əˈdept/</td>
<td>[əˈdept]</td>
</tr>
<tr>
<td>reading</td>
<td>/ˈriːdɪŋ/</td>
<td>[ˈriːdɪŋ]</td>
<td>Camden</td>
<td>/ˈkæmən/</td>
<td>[ˈkæmən]</td>
</tr>
<tr>
<td>edify</td>
<td>/ˈɛdɪfaɪ/</td>
<td>[ˈɛdɪfaɪ]</td>
<td>Hilda</td>
<td>/ˈhɪlda/</td>
<td>[ˈhɪlda]</td>
</tr>
<tr>
<td>sediment</td>
<td>/ˈsedɪmənt/</td>
<td>[ˈsedɪmənt]</td>
<td>Ogden</td>
<td>/ˈɒgdən/</td>
<td>[ˈɒgdən]</td>
</tr>
<tr>
<td>adolescent</td>
<td>/ˌædəˈlesənt/</td>
<td>[ˌædəˈlesənt]</td>
<td>Edgar</td>
<td>/ˈɛdɡər/</td>
<td>[ˌɛdɡər]</td>
</tr>
<tr>
<td>pad</td>
<td>/ˈpæd/</td>
<td>[ˈpæd]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Tapping

['siiŋŋ] ‘sitting’
['æɾm] ‘atom’
['hiɾiŋŋ] ‘hitting’

Rule: /t/ is realized as a tap when it occurs between two syllabic sounds of which the second is stressless.

/t/ → [ɾ] / [+syll]₁

₁Please refer to page 122 of your text book for the exact rule.
Let's see an example where the ordering matters...

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<tr>
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<th>Pronunciation (Phonetic)</th>
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<td>['lædə]</td>
</tr>
<tr>
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<td>[,ædəˈlesənt]</td>
</tr>
<tr>
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<td>/ˈdæn/</td>
<td>['dæn]</td>
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<td>[ə'dept]</td>
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</tbody>
</table>

Tapping (revised)
Let's see an example where the ordering matters...

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<td>edify</td>
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</tr>
</tbody>
</table>

Tapping (revised)

\[
\begin{align*}
\text{[+anterior]} & \rightarrow r/\text{[−consonantal]} \quad \text{[+syllabic]} \quad \text{[−stress]} \\
\text{−continuant} &
\end{align*}
\]

An alveolar stop is realized as \( r \) when it is preceded by a vowel or \( l \), and followed by a stressless vowel.
Let's see an example where the ordering matters...

- If these rules apply one by one (in ordered fashion), so that one rules output is the other’s input, there are two possible outcomes of the same two rules.
Let's see an example where the ordering matters...

{lai/ Raising precedes Tapping

<table>
<thead>
<tr>
<th>write</th>
<th>writing</th>
<th>ride</th>
<th>riding</th>
</tr>
</thead>
<tbody>
<tr>
<td>/'raɪt/</td>
<td>/'raɪt-ɪŋ/</td>
<td>/'raɪd/</td>
<td>/'raɪd-ɪŋ/</td>
</tr>
<tr>
<td>'raɪt</td>
<td>'raɪt-ɪŋ</td>
<td>'raɪd</td>
<td>'raɪd-ɪŋ</td>
</tr>
<tr>
<td>[ˈraɪt]</td>
<td>[ˈraɪt-ɪŋ]</td>
<td>[ˈraɪd]</td>
<td>[ˈraɪd-ɪŋ]</td>
</tr>
</tbody>
</table>

underlying forms
{lai/ Raising
Tapping
surface forms
Lets see an example where the ordering matters...

/play/ Raising precedes Tapping

- write /'rait/ write
- writing /'raɪ-tɪŋ/ writing
- ride /'rait/ ride
- riding /'raɪŋ/ riding

underlying forms

Tapping

/surface forms

/play/ Raising applies here. /play/ Raising doesn’t apply here.
Lets see an example where the ordering matters...

**Tapping precedes /ai/ Raising**

<table>
<thead>
<tr>
<th>write</th>
<th>writing</th>
<th>ride</th>
<th>riding</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ˈwrait/</td>
<td>/ˈwrait/</td>
<td>/ˈraid/</td>
<td>/ˈraid/</td>
</tr>
<tr>
<td>'wrait</td>
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<td>'raid</td>
<td>'raid</td>
</tr>
<tr>
<td>[ˈwrait]</td>
<td>[ˈwrait]</td>
<td>[ˈraid]</td>
<td>[ˈraid]</td>
</tr>
</tbody>
</table>

underlying forms

Tapping

/ai/ Raising

surface forms
Let's see an example where the ordering matters...

Tapping precedes /aɪ/ Raising

write /'rɛɪt/ writing /'riːtɪŋ/ ride /'raɪd/ riding /'raɪdɪŋ/ underlying forms

Tapping /aɪ/ Raising

surface forms

/æ/ Raising doesn't apply here. /æ/ Raising doesn't apply here.
Conclusion...ordering of the rules matter!

- If these rules apply one by one (in ordered fashion), so that one rules output is the other’s input, there are two possible outcomes of the same two rules.
If these rules apply one by one (in ordered fashion), so that one rules output is the other’s input, there are two possible outcomes of the same two rules.

The crucial point is that, in the given example, /aI/ raising depends on the voicing of the following consonant, and tapping changes the voicing of /t/. As a result /aI/ raising cannot apply if tapping applies first.
Conclusion...ordering of the rules matter!

Tapping precedes /aɪ/ Raising

write
/'wrait/
—
/'wrait/

writing
/'waɪtɪŋ/
—
/'waɪtɪŋ/

ride
/'raɪd/
—
/'raɪd/

riding
/'raɪdɪŋ/
—
/'raɪdɪŋ/

underlying forms
Tapping
/aɪ/ Raising
surface forms
doesn’t apply here.

/aɪ/ Raising
doesn’t apply here.
Conclusion...ordering of the rules matter!

- For millions of speakers, /aI/ raising depends on the phonemic voicing of the following consonant.
Conclusion...ordering of the rules matter!

- For millions of speakers, /aɪ/ raising depends on the phonemic voicing of the following consonant.

<table>
<thead>
<tr>
<th>write</th>
<th>writing</th>
<th>ride</th>
<th>riding</th>
</tr>
</thead>
<tbody>
<tr>
<td>/'sait/</td>
<td>/'sait-ɪŋ/</td>
<td>/'raɪd/</td>
<td>/'raɪd-ɪŋ/</td>
</tr>
<tr>
<td>['sait]</td>
<td>['saitɪŋ]</td>
<td>['raɪd]</td>
<td>['raɪdɪŋ]</td>
</tr>
<tr>
<td>cite</td>
<td>cited</td>
<td>side</td>
<td>sided</td>
</tr>
<tr>
<td>/'sait/</td>
<td>/'sait-əd/</td>
<td>/'saɪd/</td>
<td>/'saɪd-əd/</td>
</tr>
<tr>
<td>['sait]</td>
<td>['saitəd]</td>
<td>['saɪd]</td>
<td>['saɪdəd]</td>
</tr>
<tr>
<td>white</td>
<td>whiter</td>
<td>wide</td>
<td>wider</td>
</tr>
<tr>
<td>/'waɪt/</td>
<td>/'waɪt-ə/</td>
<td>/'waɪd/</td>
<td>/'waɪd-ə/</td>
</tr>
</tbody>
</table>

/al/ raising applies before tapping.
Conclusion...ordering of the rules matter!

- For millions of other speakers, /aI/ raising depends on the phonetic voicing of the following consonant.
Conclusion...ordering of the rules matter!

- For millions of other speakers, /aI/ raising depends on the phonetic voicing of the following consonant.

```
write /'rait/  writing /'rait-ing/  ride /'raid/  riding /'raid-ing/  
['rait]     ['rait-ing]     ['raid]     ['raid-ing]  
cite /'sait/  cited /'sait-ed/  side /'said/  sided /'said-ed/  
white /'wait/  whiter /'wait-ər/  wide /'ward/  wider /'ward-ər/  
['wait]     ['wait-ər]     ['ward]     ['ward-ər]
```

Tapping applies before /aI/ raising.
Conclusion...ordering of the rules matter!

Analytically, it is usually fairly easy to determine how two rules must be ordered. One simply tries both possibilities, seeing which one outputs the observed phonetic forms. Often, both will, in which case the ordering doesn’t matter.
English Plural morphemes

1. Account for the 3 allomorphs.
2. Give the derivations of [piz] and [mits]
3. Give the derivation of [glasiz].
4. Does the ordering of rules matter?

<table>
<thead>
<tr>
<th>Singular Form</th>
<th>Plural Form</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>dag-z</td>
<td>'dogs'</td>
</tr>
<tr>
<td>læb-z</td>
<td>'labs'</td>
</tr>
<tr>
<td>kʰɪln-z</td>
<td>'kilns'</td>
</tr>
<tr>
<td>kʰæsp-s</td>
<td>'clasps'</td>
</tr>
<tr>
<td>mit-s</td>
<td>'mitts'</td>
</tr>
<tr>
<td>bloʊk-s</td>
<td>'blokes'</td>
</tr>
<tr>
<td>kʰaf-s</td>
<td>'coughs'</td>
</tr>
<tr>
<td>glas-iz</td>
<td>'glasses'</td>
</tr>
<tr>
<td>fiz-iz</td>
<td>'fizzes'</td>
</tr>
<tr>
<td>b.rænf-iz</td>
<td>'branches'</td>
</tr>
<tr>
<td>bædʒ-iz</td>
<td>'badges'</td>
</tr>
<tr>
<td>wɪʃ-iz</td>
<td>'wishes'</td>
</tr>
<tr>
<td>gərəqʒ-iz</td>
<td>'garages'</td>
</tr>
</tbody>
</table>
Illustrating rule order with Hasse diagrams

- In the case of /aI/ raising and tapping, we saw that one rule needs to precede the other in order to capture the behaviors of dialects. Such ordering can be shown in the form of graphs as follows.
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Chimwiini morphology

Infinitive Formation
V → kuV when [+infinitive]

For example, the infinitive of the verb stem /reːb/ ‘stop’ is [ku-reːb-a].
Chimwiini morphology

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For example, the infinitive of the verb stem /re:b/ ‘stop’ is [ku-re:b-a].

Final Vowel Attachment
XC → XCa in verbs
If a verb would otherwise end in a consonant, add /-a/:
Chimwiini morphology

Infinitive Formation
\[ V \rightarrow kuV \quad \text{when } [+\text{infinitive}] \]

For example, the infinitive of the verb stem /reːb/ ‘stop’ is [ku-reːb-a].

Final Vowel Attachment
\[ XC \rightarrow XCa \quad \text{in verbs} \]
If a verb would otherwise end in a consonant, add /-a/.

/-e.\. is the applicative suffix. It means that the action of the verb is done on behalf of someone. ([l] is the IPA symbol for a lateral flap.)

Applicative Formation
\[ V \rightarrow Vel \quad \text{when } [+\text{applicative}] \]

The applicative form of [ku-reːb-a] is [ku-reːb-\l-a], which means ‘to stop for someone’.
Chimwiini morphology

/-an/ is the reciprocal suffix. It means that the entities doing the action of the verb do the action to each other.

**Reciprocal Formation**

V → V/ăn when [+reciprocal]

For example, [ku-.dirk-a] means ‘to reach’, and [ku-.dirk-an-a] means ‘to reach one another’.
Chimwiini morphology

/-an/ is the reciprocal suffix. It means that the entities doing the action of the verb do the action to each other.

Reciprocal Formation
V → Van when [+reciprocal]

For example, [ku-ṣirk-a] means ‘to reach’, and [ku-ṣirk-an-a] means ‘to reach one another’.

/-oːw/ is the passive suffix; its meaning is “to be Verbed.”

Passive Formation
V → Voːw when [+passive]

For example, [ku-big-a] means ‘to hit’, and [ku-big-oːw-a] means ‘to be hit’.
Ordering of morphological rules in Chimwiini

/re:b/

lexical entry for ‘stop’

Morphological component:

Applicative Formation
Reciprocal Formation
Final Vowel Attachment
Infinitive Formation
Chimwiini phonology

Minimal and near-minimal pairs, of which the following are examples, show that vowel length in Chimwiini is phonemic.

\[
\begin{array}{ll}
[x-ku:1-a] & \text{‘to extract’} \\
[x-te:k-a] & \text{‘to load (an animal)’} \\
[x-pe:le:k-a] & \text{‘to be able to be swept’} \\
[ku-bar:ram-a] & \text{‘to talk’} \\
\end{array}
\]

\[
\begin{array}{ll}
[x-kul-a] & \text{‘to grow’} \\
[x-tek-a] & \text{‘to fetch’} \\
[x-pele:k-a] & \text{‘to send’} \\
[ku-balam-a] & \text{‘to promise’} \\
\end{array}
\]
Chimwiini phonology

Minimal and near-minimal pairs, of which the following are examples, show that vowel length in Chimwiini is phonemic.

\[
\begin{align*}
[x-ku:l-a] & \quad \text{‘to extract’} & [x-ku:l-a] & \quad \text{‘to grow’} \\
[x-te:k-a] & \quad \text{‘to load (an animal)’} & [x-tek-a] & \quad \text{‘to fetch’} \\
[x-pe.lek-a] & \quad \text{‘to be able to be swept’} & [x-pe.lek-a] & \quad \text{‘to send’} \\
[ku-ba:ram-a] & \quad \text{‘to talk’} & [ku-balam-a] & \quad \text{‘to promise’}
\end{align*}
\]

Preantepenultimate Shortening
Shorten a vowel when at least three vowels follow it.
Chimwiini phonology

/re:b/  

lexical entry for ‘stop’

Morphological component:
  Applicative Formation
  Reciprocal Formation
  Final Vowel Attachment
  Infinitive Formation

Phonological component:
  Output of morphology = phonological underlying form
  Preantepenultimate Shortening
  surface form

re:b-e.l
re:b-e.l-an
re:b-e.l-an-a
ku-re:b-e.l-an-a

/ku-re:b-e.l-an-a/
  e
[kurebelana]
More examples of preantepenultimate shortening

[boz-e'l-e]  ‘he stole’  [boz-e'l-en-i]  ‘what did he steal?’
[d30h3ari]  ‘jewel’  [d30h3ari-je]  ‘her jewel’
[x-fa:n-a]  ‘to do’  [x-fa:n-iliz-a]  ‘to do with’
[x-sa:meh-a]  ‘to forgive’  [x-sa:meh-an-a]  ‘to forgive one another’
Chimwiini phonology

Phrase-Final Shortening

[+syllabic] → [-long] \( / \) \( \text{Phrase} \)

Vowels become short at the end of a phrase.
Chimwiini phonology

There is also an environment in which Chimwiini vowels show up as long: whenever they are final in a word, but not final in the phrase. This can be seen in the following forms:

- [na] ‘by’  [naː noka] ‘by a snake’
- [kolko] ‘than’  [kolkoː mi] ‘than me’
- [kama] ‘like’  [kamaː mp'aka] ‘like a cat’
- [hudʒɔ] ‘the one who eats’  [hudʒɔː mbele] ‘the one who eats first’
Chimwiini phonology

There is also an environment in which Chimwiini vowels show up as long: whenever they are final in a word, but not final in the phrase. This can be seen in the following forms:

[nə] ‘by’  
[kolko] ‘than’  
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[hudʒo] ‘the one who eats’  

[naː noka] ‘by a snake’  
[kolkoː mi] ‘than me’  
[kamaː mpʰaka] ‘like a cat’  
[hudʒoː mbele] ‘the one who eats first’

Word-Final Lengthening

[+syllabic] → [+long] / ___ \_word
Chimwiini phonology

- What should be the ordering of word-final lengthening and phrase-final shortening?

Here is a representative derivation. It assumes that the syntax has formed a complete phrase, /kama mpʰaka/ ‘like’ + ‘cat’, that is, ‘like a cat’.

/kama mpʰaka/  output of syntax = underlying form of phonology
  a:  a:  Word-Final Lengthening
  a  Phrase-Final Shortening
  [kama: mpʰaka]  Preantepenultimate Shortening
                  surface form
If Phrase-Final Shortening were (wrongly) ordered before Word-Final Lengthening, the derivation would give the wrong output, as follows:

{/kama mpʰaka/}  
 | -  
 | a:   a:  
 | -  
 *[kamaː mpʰakaː]  

output of syntax = underlying form of phonology
Phrase-Final Shortening
Word-Final Lengthening
Preantenepenultimate Shortening
surface form
Chimwiini phonology

- What should be the ordering of word-final lengthening and preantepenultimate shortening?
Chimwiini phonology

- What should be the ordering of word-final lengthening and preantepenultimate shortening?

| [kuna]  | ‘to drink’ |
| [kahawa] | ‘coffee’ |
| [kuna kahawa] | ‘to drink coffee’ |
/kuna kahawa/ underlying form
a: a: Word-Final Lengthening
a Preantepenultimate Shortening
a Phrase-Final Shortening
[kuna kahawa] surface form
If Word-Final Lengthening were ordered after Preantepenultimate Shortening, we would get the wrong result, as follows:

/kuna kahawa/

---

aː aː

*a[kunaː kahawa]*

underlying form
Preantepenultimate Shortening
Word-Final Lengthening
Phrase-Final Shortening
predicted surface form