

# 24.901/931, 2026

## Introduction to Phonology

### Lecture 7

# Quiz1 on Thursday

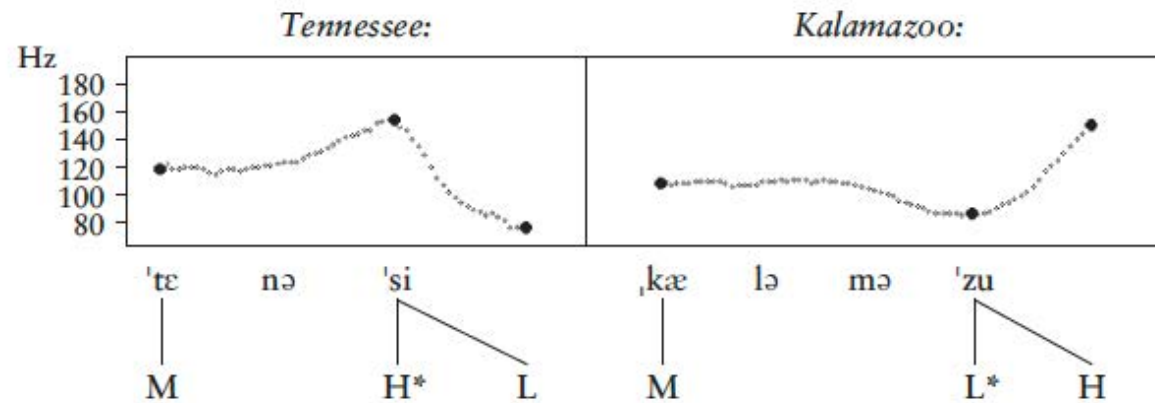
- Bring pencils and erasers.
- You will write a rule or more to account for some simple alternations.
- Use DFs (in Hayes 2009 or class notes)
- Check that the outputs of your rule(s) match exactly the SRs given.
- ExtraCredit: See if you can simplify your account.

Observe that some effects are more general than the alternations shown.

That can lead to a simplification of the grammar.

- Slides on rules & constraints that define phoneme inventories.

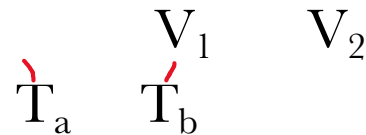
Contour tones (e.g. Fall, Rise) are composed of level tones (e.g. H, L)



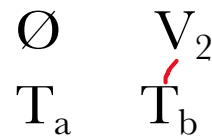
# One argument in outline

- In tone languages, when Vs delete, their tone often surfaces on a nearby V.
- That nearby V has a level T in other contexts but a contour in this case
- One analysis, matching Lomongo data below:

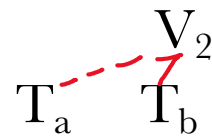
(i) UR with level Ts:



(ii)  $V_1$  deletes, but not its T:



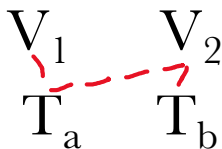
(iii)  $T_a$  reassociates:



# Alternative

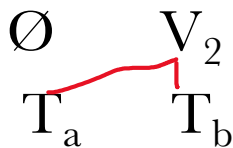
- Do we know that  $T_a$  associates to  $V_2$  **after**  $V_1$  deletes?
- Maybe we don't. Another scenario:

(i)  $T_a$  spreads to  $V_2$ :



A diagram illustrating the spread of tone  $T_a$  from  $V_1$  to  $V_2$ . Above the diagram are the labels  $V_1$  and  $V_2$ . Below them are  $T_a$  and  $T_b$ . A red dashed line connects  $T_a$  to  $T_b$ , with a small red tick mark at the  $T_a$  end and a red arrowhead at the  $T_b$  end, indicating the direction of spread.

(ii)  $V_1$  deletes:



A diagram illustrating the deletion of  $V_1$  and the resulting tone association. Above the diagram are the labels  $\emptyset$  and  $V_2$ . Below them are  $T_a$  and  $T_b$ . A red solid line connects  $T_a$  to  $T_b$ , with a small red tick mark at the  $T_b$  end, indicating the final association.

- Why this is significant:
  - (i) “floating” (unassociated) Ts are widely invoked, but alternative scenario does without.
  - (ii) This alternative can undermine the idea that contours = concatenated level tones:  
maybe  $V_2$  just carries a contextual variant of  $T_b$  not a concatenated  $T_a \frown T_b$

## Slightly different pattern (Etsako, Niger-Congo, Elimelekh 1976)

- V-Deletion is optional.
- When it applies,  $V_2$  surfaces with  $T_a \frown T_b$ . ( $T_a = T$  of deleted  $V$ )
- When it doesn't,  $V_2$  carries only  $T_b$
- This suggests  $T_a \frown T_b$  is directly caused by  $V_1$  deletion,
- An independent process  $T_b \rightarrow T_a \frown T_b$  would have applied regardless.

|    | V1 Deletion applies    | V1 deletion doesn't apply |
|----|------------------------|---------------------------|
| 1. | $\emptyset$<br>$T_a$   | $V_2$<br>$T_b$            |
| 2. | $T_a$ — $V_2$<br>$T_b$ | $V_1$<br>$T_a$            |
|    |                        | $V_2$<br>$T_b$            |

# Summary

- Occurrence of contours can be directly associated with loss of a V
- The T of the lost V surfaces on a nearby V,  
in same position relative to other Ts as it had in isolation/UR.
- Simplest account is that the SR contour  $T_a \frown T_b < UR / T_a T_b /$
- We infer:  
Deletion targets just the V. Not any T it carries.  
A process rescues the T.

A real system:

Lomongo V-deletion & T rescue

# Lomongo (Bantu, Congo, the DRC, Lovins 1971)

- tonal options in isolated words

|      |     |        |          |
|------|-----|--------|----------|
| High | <á> | béfé   | ‘trees’  |
| Low  | <à> | fàkàlà | (name)   |
| Rise | <ǎ> | bǎmǎ   | ‘others’ |
| Fall | <â> | êmbè   | ‘sing’   |

In phrases, 2 further options: Rise-Fall (ã), Fall-Rise (ã̃)  
These occur only after the loss of a  $V_1$  before RF/FR  $V_2$ .

# Tonal consequences of vowel loss

| Gloss         | Separately     | Combined, $V_1$ lost | T consequences                        |
|---------------|----------------|----------------------|---------------------------------------|
| ‘with fork’   | là; ìtókò      | lìtókò               | LL→L <span>V→Ø/_V</span>              |
| ‘two trees’   | bètámhá; bэфé  | bètámbéfé            | HH→H <span>b→Ø/V_V</span>             |
| ‘with baby’   | là; bóhá       | lǒhá                 | LH→Rise (R)                           |
| ‘these birds’ | mpùlú; ìné     | mpùdʒwîné            | HL→Fall <span>uV→wV<br/>lw→dʒw</span> |
| ‘may S enter’ | Sóngóló; ôtswè | Sóngólôtswè          | HF→F                                  |
| ‘F comes in’  | Fàkàlà; ôtswà  | Fàkàlôtswà           | LF→RF                                 |

Analysis, if contours = sequences of level Ts

| Pattern | UR                             | V <sub>1</sub> lost                 | Tone relinks                        |
|---------|--------------------------------|-------------------------------------|-------------------------------------|
| HL→F    | mpulu ine<br>       <br>L H LH | mpudɔwine<br>     <br>L <b>H</b> LH | mpudɔwine<br>     <br>L <b>H</b> LH |
| LH→R    | la ɔna<br>     <br>L H L       | l ɔna<br>   <br><b>L</b> H L        | l ɔna<br>     <br><b>L</b> H L      |

a      a  
| = |  
H   X  
|  
H

X      tone in process  
         of linking to X  
T

More analysis, if contours = sequences of level Ts

| Pattern | UR                                             | V→Ø/_ V                                               | Tone relinks                                          |
|---------|------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------|
| HF→F    | songolo ɔtswɛ<br>        /\    <br>H   HH HL L | songol ɔtswɛ<br>        /\    <br>H   H <b>H</b> HL L | songol ɔtswɛ<br>        /\    <br>H   H <b>H</b> HL L |
| LF→RF   | fakala ɔtswa<br>        /\    <br>L   LL HL L  | fakal ɔtswa<br>        /\    <br>L   L <b>L</b> HL L  | fakal ɔtswa<br>        /\    <br>L   L <b>L</b> HL L  |

|                               |                  |
|-------------------------------|------------------|
| X                             | X                |
| /\                            |                  |
| T <sub>i</sub> T <sub>i</sub> | = T <sub>i</sub> |

T<sub>i</sub> T<sub>i</sub> on one X = 2 identical sets of articulatory instructions, to be carried out within the same time slice: they amount to 1 such set.

# Timing relations

- Vowels and tones represented as *independent events*
- They can be simultaneous, if beginnings and ends coincide

Or can be partly overlapping in time

Or sequenced in time

This conception can apply to relations between other pairs of Fs:  
e.g. nasality vs. other Fs;  $[\pm\text{cont}]$  and  $[\pm\text{strident}]$  vs. other Fs

$[\text{+labial}]$

|

X =  $[\text{mb}]$

/ \

$[\text{+nas}]$   $[\text{-nas}]$

$[\text{+coronal, -anterior}]$

|

X =  $[\text{tj}]$

/ \

$[\text{-cont}]$   $[\text{+cont, +strid}]$

a

|

X

|

H

a

i

|

|

X

X

/ \

/ \

H

L

a

e

|

|

X

X

|

|

H

L

# Autosegments

- Some pairs of features are necessarily aligned in time:  
passive articulator – active articulator
- But others need not be:  
vowel Fs — tones; [ $\pm$ nasal] — place (oral constriction)
- Their beginnings and ends need not coincide
- *Autosegmental phonology* assumes such independent features exist, provides representations to express these hypotheses about independence of timing.

# More evidence for tones as autosegments

# Mende (Niger Congo; Sierra Leone; Leben 1974)

- Tonal melodies in Mende roots: H, L, F (HL), R (LH), RF (LHL)
- Tonal melody = sequence of distinct tonal targets, level tones or components of contours
- Preview: Mende requires
  - Constraints on *tonal melodies* independent of Vs carrying them
  - Constraints on the *association* between Vs and Ts
  - Both classes of constraints simplify the analysis compared to one that views Ts as inseparable from Vs

## Tones on one-V words in Mende

|    |     |     |     |      |
|----|-----|-----|-----|------|
| kó | kpà | mbǎ | mbû | mbǎ̀ |
| H  | L   | LH  | HL  | LHL  |

# Tone in Mende stems

á=high, à = low, ǎ = rise, â = fall, ǎ̂ = rise-fall

|      |           |       |          |         |              |
|------|-----------|-------|----------|---------|--------------|
| kó   | war       | pélé  | house    | háwámá  | waistline    |
| kpà  | debt      | bèlè  | trousers | kpàkàlì | tripod chair |
| mbû  | owl       | ngílà | dog      | félàmà  | junction     |
| mbǎ  | rice      | fàndé | cotton   | ndàvúlá | sling        |
| mbǎ̂ | companion | njàhâ | woman    | nìkìlì  | groundnut    |

forms representative of most Mende stems, according to Leben 1972, 1974.

Contour Ts as sequences of level Ts;  
and sequences of 1 or more  $T_i$ s as  $T_i^*$

|     |      |           |       |          |         |              |
|-----|------|-----------|-------|----------|---------|--------------|
| H*  | kó   | war       | pélé  | house    | háwámá  | waistline    |
| L*  | kpà  | debt      | bèlè  | trousers | kpàkàlì | tripod chair |
| HL* | mbû  | owl       | ngílà | dog      | félàmà  | junction     |
| LH* | mbǎ  | rice      | fàndé | cotton   | ndàvúlá | sling        |
| LHL | mbǎ̀ | companion | njàhâ | woman    | nìkìlì  | groundnut    |

## Extended to 4, 5σ words

| 1 V | 2 VV | 3 VVV | 4 VVVV | 5 VVVVV |
|-----|------|-------|--------|---------|
| H   | H*   | H*    | H*     | H*      |
| L   | L*   | L*    | L*     | L*      |
| HL  | HL   | HL*   | HL*    | HL*     |
| LH  | LH   | LH*   | LH*    | LH*     |
| LHL | LHL  | LHL   | LHL*   | LHL*    |

*badagama* with LHL\*

1. bàdàgámà?
2. bàdágámà?
3. bàdágàmà?
4. bàdâgàmà?
5. bǎdàgàmà?

# Generalizations

- No HLH, LHLH words (*\*bádàgá*, *bádàgâ*).
- No HHL, LLH words (*\*bádágà*, *\*bàdàgá*).
- HL (*mbû*) and LHL (*njàhâ*) words ok, but not HLL(*\*njâhà*).
- No HL HL words, e.g. *\*njâhâ*.
- Every T<sub>1</sub>-T<sub>2</sub> seq. on 1 V is also found on VCVs.
- Every T<sub>1</sub>-T<sub>2</sub> seq. on 2 syllables is also found on 1.

Each generalization requires some mechanism to guarantee it.

Hypothesis: all sequences of identical Ts contain just 1 T

|         |    |                                                                                                                |
|---------|----|----------------------------------------------------------------------------------------------------------------|
| pélé    | H  | $\begin{array}{c} p \ \varepsilon \ l \ \varepsilon \\ \quad \vee \\ \quad \quad H \end{array}$                |
| kpàkàlì | L  | $\begin{array}{c} kp \ a \ k \ a \ l \ i \\ \quad \quad \vee \quad \diagup \\ \quad \quad \quad L \end{array}$ |
| ndàvúlá | LH | $\begin{array}{c} nd \ a \ v \ u \ l \ a \\ \quad   \quad \quad \vee \\ \quad L \quad \quad H \end{array}$     |

A consequence of the OCP  
(Obligatory Contour Principle)  
Leben 1972, 2019  
Adjacent, identical feature values  
are prohibited (within morphemes)

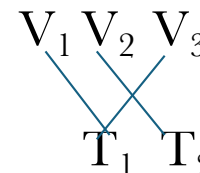
|     |                   |                    |                     |
|-----|-------------------|--------------------|---------------------|
| H   | kó<br> <br>H      | pélé<br> <br>H     | háwámá<br> <br>H    |
| L   | kpà<br> <br>L     | bèlè<br> <br>L     | kpàkàlì<br> <br>L   |
| HL  | mbû<br> <br>H L   | ngílà<br> <br>H L  | félàmà<br> <br>H L  |
| LH  | mbă<br> <br>LH    | fândé<br> <br>L H  | ndàvúlá<br> <br>L H |
| LHL | mbẵ<br> <br>L HL | njàhâ<br> <br>L HL | nìkílì<br> <br>LH L |

# We need

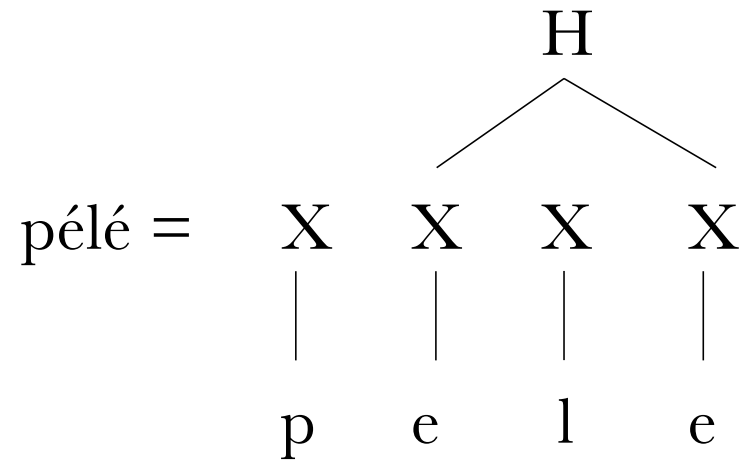
- Rules to generate all and only the attested Mende melodies
- Rules to ensure that Ts and Vs become aligned in some way:
  - to ensure that T-contours occur only in .....
  - to ensure that T-plateaux (long Ts) occur only in .....

# Autosegmental analysis (Leben's 1974)

- Constraints on tone melodies in Mende:
  - any one tone from the set {H, L} is ok.
  - any T sequence from this set is ok, *if OCP allows it*: \*...HH..., \*...LL...  
except HLH: \***HLH**.
- General constraints + rules on how Ts link up to Vs
  - Every T must be linked to a V: \***Floating T**
  - Every V must be linked to a T: \***T-less V**
  - Association lines don't cross. \***CrossedLines**.
  - Rule 1: Associate Ts to Vs, one-to-one, LR, = 1<sup>st</sup> T to 1<sup>st</sup> V.
  - Rule 2: Spread T onto any toneless V  
Link any floating T to nearest V.



## Reminder: T's link to Xs



|    |      |       |        |       |                                                |
|----|------|-------|--------|-------|------------------------------------------------|
| UR | bele | ngila | felama | njaha | Every T linked to V?<br>Every V linked to a T? |
|    | L    | H L   | H L    | L HL  |                                                |

|    |      |       |        |       |                                                |
|----|------|-------|--------|-------|------------------------------------------------|
| UR | bele | ngila | felama | njaha | Every T linked to V?<br>Every V linked to a T? |
|    | L    | H L   | H L    | L HL  |                                                |
| R1 | bèle | ngílà | félàma | njàhá | Tones link up, L-R<br>one to one.              |
|    | L    | HL    | HL     | L H L |                                                |

|    |      |       |        |       |                                                           |
|----|------|-------|--------|-------|-----------------------------------------------------------|
| UR | bele | ngila | felama | njaha | Every T linked to V?<br>Every V linked to a T?            |
|    | L    | H L   | H L    | L HL  |                                                           |
| R1 | bèle | ngílà | félàma | njàhá | Tones link up, L-R<br>one to one.<br>Every T linked to V? |
|    | L    | HL    | HL     | L H L |                                                           |
| R2 | bèlè |       | félàmà |       | T spreads to left-over V                                  |
|    | L    |       | H L    |       |                                                           |

|    |        |       |        |       |                                                |
|----|--------|-------|--------|-------|------------------------------------------------|
| UR | bele   | ngila | felama | njaha | Every T linked to V?<br>Every V linked to a T? |
|    | L      | H L   | H L    | L HL  |                                                |
| R1 | bèle   | ngílà | félàma | njàhá | Tones link up, L-R<br>one to one.              |
|    | L      | HL    | HL     | L H L | Every T linked to V?                           |
| R2 | bèlè   |       | félàmà |       | T spreads to left-over V                       |
|    | V<br>L |       | H L    |       |                                                |
| R2 |        |       |        | njàhâ | Left-over T links up to<br>nearest V           |
|    |        |       |        | L H L |                                                |

|    |      |       |         |                           |
|----|------|-------|---------|---------------------------|
| UR | bele | ngila | felama  | njaha                     |
|    | L    | H L   | H L     | L HL                      |
| R1 | bèle | ngílà | félàma  | njàhá                     |
|    | L    | HL    | H L     | L H L                     |
| R2 | bèlè |       | *félàmá |                           |
|    | L    |       | H L     | crossed association lines |
| R3 |      |       |         | njàhâ                     |
|    |      |       |         | L H L                     |

- This is an autosegmental analysis:
  - Rules generate T melodies separately from Vs.
  - Constraints + rules determine how Ts and Vs link up
- Advantage:

By treating Ts as separate entities, analysis predicts all Mende tone patterns from 5 simple constraints:

**OCP; \*HLH; \*FloatingT; \*TonelessV; \*CrossedLines**

- The 2rules just regulate implementation of the constraints.
- All constraints are inviolable. They limit how rules may apply.

## The analysis is *consistent* with the OCP

- But is the OCP needed to explain anything?
- Suppose the same analysis holds, minus OCP
- Then HHL is a possible melody
- On  $2\sigma$  word, e.g. *bada*, it yields *bádâ*. Unattested.
- On a  $3\sigma$  word, e.g. *badaga*, it yields *bádágà*. Unattested.
- These can be generated by Rule 1 from HHL.
- Same for LLH melody: *bàdă*, *bàdàgá*. Unattested.

# Has the analysis answered these q's?

- why no HLH, LHLH words (*\*bádàgá*, *bádàgá*, )?
- why no HHL, LLH (*\*bádágà*, *\*bàdàgá*)?
- why are HL *mbû* and LHL *njàhâ* ok, but not HLL(*\*njâhà*)?
- why no HL HL words, e.g. *\*njâhâ* ?
- every T<sub>1</sub>-T<sub>2</sub> seq. on 1 V is also found on VCVs. Why?
- every T<sub>1</sub>-T<sub>2</sub> seq. on 1 VCV is also found on 1 V. Why?

# Has the analysis answered these q's?

- why no HLH, LHLH words (*\*bádàgá*, *bádàgá*, )?  
\*HLH
- why no HHL, LLH (*\*bádágà*, *\*bàdàgá*)?  
OCP blocks HHL, LLH; LR association blocks H:L, L:H
- why are HL *mbû* and LHL *njàhâ* ok, but not HLL(*\*njâhâ*)?  
one-T-to-one-V association first
- why no HL HL words, e.g. *\*njâhâ* ?  
\*HLH
- every T<sub>1</sub>-T<sub>2</sub> seq. on 1 V is also found on VCVs. Why?  
same melodies
- every T<sub>1</sub>-T<sub>2</sub> seq. on 1 VCV is also found on 1 V. Why?  
same melodies

# Chizigula

(Tanzania, Bantu; Kenstowicz and Kisseberth 1990 in Inkelas & Zec (eds))

V = H tone. Vowels left unmarked are Low-toned

Stress on penult V. Stressed V underlined. Two tonal classes of verbs

| to do                      | to request                 | glosses                |
|----------------------------|----------------------------|------------------------|
| ku-dama <u>a</u> n-a       | ku-lombé <u>é</u> z-a      | (plain Vb)             |
| ku-dama n- <u>i</u> z-a    | ku-lombez- <u>é</u> z-a    | ‘to Vb-for’            |
| ku-dama n-iz- <u>a</u> n-a | ku-lombez-ez- <u>a</u> n-a | ‘to Vb-for-each other’ |

What are the URs? Why do they differ from the SRs?

## Person agreement prefixes

|                        |                           |                  |
|------------------------|---------------------------|------------------|
| to chase               | to finish                 |                  |
| ku-gul <u>u</u> s-a    | ku-bindil <u>í</u> z-a    | (plain V)        |
| ku-gulus- <u>í</u> z-a | ku-bindiliz- <u>í</u> z-a | ‘to V-for’       |
| na-ku-gul <u>u</u> s-a | na-ku-bindil <u>í</u> z-a | ‘I am V-ing you’ |

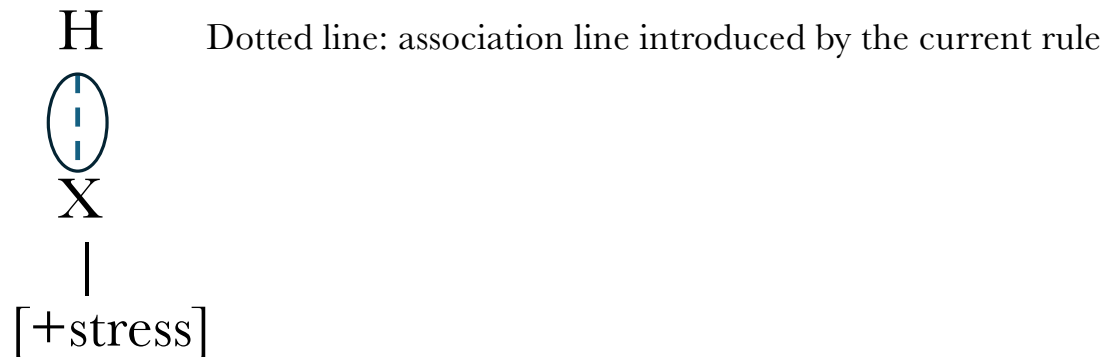
Person agreement: *ku* ‘you-O’, *ni* ‘me-O’, *na* ‘I’, *a* ‘he/she’

| to chase               | to finish                 |                   |
|------------------------|---------------------------|-------------------|
| ku-gul <u>u</u> s-a    | ku-bindil <u>i</u> z-a    | ‘to V’            |
| ku-gulus- <u>i</u> z-a | ku-bindiliz- <u>i</u> z-a | ‘to V-for’        |
| na-ku-gul <u>u</u> s-a | na-ku-bindil <u>i</u> z-a | ‘I am V-ing you’  |
| a-ni-gul <u>u</u> s-a  | a-ni-bíndil <u>i</u> z-a  | ‘he is V-ing me’  |
| a-ku-gul <u>u</u> s-a  | a-ku-bíndil <u>i</u> z-a  | ‘he is V-ing you’ |

where are the extra H coming from?

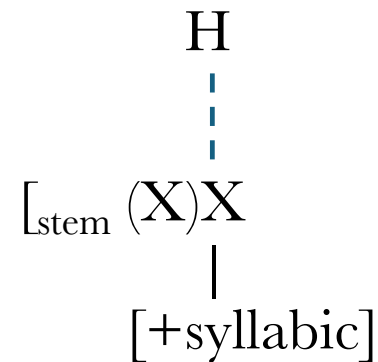
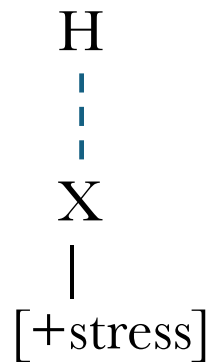
# The rules

- Stress:  $[+syllabic] \rightarrow [+stress] / \_C_0 V \#$
- Link H to stressed V.
- Note: this H is not inserted, that would require a rule:  $\emptyset \rightarrow H$



# The rules

- Stress:  $[+syllabic] \rightarrow [+stress] / \_C_0V\#$
- (i) Link H to stressed V
- (ii) Link H to 1<sup>st</sup> stem V



Maybe 1<sup>st</sup> stem V has some stress too

# Angas (Chadic, Nigeria)

$\bar{a}$  = M,  $\tilde{a}$  = MH,  $\hat{a}$  = ML

What are the tone changes?

|                    |               |                    |                   |                    |                   |
|--------------------|---------------|--------------------|-------------------|--------------------|-------------------|
| ténj               | ‘rope’        | ténj               | ‘rope (case)’     | tênj               | ‘rope (modified)’ |
| mús                | ‘cat’         | mús                | ‘cat (case)’      | mûs                | ‘cat (mod.)’      |
| t <sup>ɛ</sup> én  | ‘hoe’         | t <sup>ɛ</sup> én  | ‘hoe (case)’      | t <sup>ɛ</sup> ên  | ‘hoe (mod.)’      |
| ɲí                 | ‘elephant’    | ɲí                 | ‘elephant (case)’ | ɲî                 | ‘elephant (mod.)’ |
| ʔās                | ‘dog’         | ʔās                | ‘dog (case)’      | ʔās                | ‘dog (mod.)’      |
| ʒwāl               | ‘boy’         | ʒwāl               | ‘boy (case)’      | ʒwāl               | ‘boy (mod.)’      |
| jēm                | ‘child’       | jēm                | ‘child (case)’    | jēm                | ‘child (mod.)’    |
| màs                | ‘locust bean’ | màs                | ‘bean (case)’     | màs                | ‘bean (mod.)’     |
| pùk                | ‘soup’        | pùk                | ‘soup (case)’     | pùk                | ‘soup (mod.)’     |
| ʔàs                | ‘tooth’       | ʔàs                | ‘tooth (case)’    | ʔàs                | ‘tooth (mod.)’    |
| d <sup>3</sup> ólì | ‘ape’         | d <sup>3</sup> ólǐ | ‘ape (case)’      | d <sup>3</sup> ólì | ‘ape (mod.)’      |

Data from Odden Intro Phonology 2013

# Angas simplified

| <b>Tone</b> | <b>N in isolation</b> | <b>N case-marked</b> | <b>N modified</b> |
|-------------|-----------------------|----------------------|-------------------|
| H           | tén̄                  | tén̄                 | tên̄              |
| M           | ʒwāl̄                 | ʒwāl̄                | ʒwāl̄             |
| L           | màs                   | măs                  | màs               |
| H L         | dʒólì                 | dʒólǐ                | dʒólì             |

Is there any constant change in case-marked Ns?  
In the modified Ns?

Across-the-Board (ATB) tone changes

# Shona. $V = \text{High}$ ; $V = \text{Low}$

(Bantu, Zimbabwe; Odden 1986 *Language*, Myers 1997 *NLLT*)

| H       | L          | LH    | HL*                              |
|---------|------------|-------|----------------------------------|
| bángá   | sadza      | badzá | séndere                          |
| ‘knife’ | ‘porridge’ | ‘hoe’ | ‘place forbidden<br>for farming’ |

# Prefix Lowering

(Bantu, Zimbabwe; Odden 1986 *Language*, Myers 1997 *NLLT*)

| N          | with N     | like N  | of N     |
|------------|------------|---------|----------|
| mbwá 'dog' | né-mbwà    | sé-mbwà | ché-mbwà |
|            | sé-nè-mbwá |         |          |

# Prefix Lowering

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|            | sé-nè-mbwá |         |          |
| H → L/H_   |            |         |          |

Rule is simpler if stated on T melodies, ignoring V's and Cs.

Compare  $V[+highT] \rightarrow V[+lowT] / V[+highT]C_0 \_$

# ATB changes in Shona

(Bantu, Zimbabwe; Odden 1986 *Language*, Myers 1997 *NLLT*)

| N                   | with N         | like N         | of N            | gloss     |
|---------------------|----------------|----------------|-----------------|-----------|
| mbwá H              | né-mbwà        | sé-mbwà        | ché-mbwà        | dog       |
| hóvé H*             | né-hòvè        | sé-hòvè        | ché-hòvè        | fish      |
| mbúndúdzí H*        | né-mbùndùdzì   | sé-mbùndùdzì   | ché-mbùndùdzì   | army worm |
| hákàtá H*L          | né-hàkàtá      | sé-hàkàtá      | ché-hàkàtá      | bones     |
| bénzìbvùnzá<br>H*LH | né-bènzìbvùnzá | sé-bènzìbvùnzá | ché-bènzìbvùnzá | fool      |

# Questions

- Given  $H \rightarrow L / H + \_\_$  (+ = a prefix boundary)  
= H becomes L after H in another morpheme.
- Why  $né-mbúndúdží \rightarrow né-mbùndùdzì?$   
Why not strictly local effect  $*né-mbùndúdží?$

$T^i T^i = \text{long } T^i$  'long' = 1T linked to more than 1V

| N                   | with N                                   |
|---------------------|------------------------------------------|
| mbwá<br> <br>H      | né - mbwà<br>         <br>H       H→L    |
| hóvé<br>∨<br>H      | né-hòvè<br>        ∨<br>H       H→L      |
| mbúndúdzí<br>∨<br>H | né-mbùndùdzì<br>        ∨<br>H       H→L |

Non-adjacent Hs don't form one H:

|                                                                                                  |                                                                                                                                      |                                                                                                                                      |
|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| bénzíbvùnzá                                                                                      | né-bénzíbvùnzá                                                                                                                       | * né-bénzíbvùnzá                                                                                                                     |
| $\begin{array}{c} \diagup \quad \diagdown \\ \text{H} \quad \text{L} \quad \text{H} \end{array}$ | $\begin{array}{c} \diagup \quad \diagdown \\ \text{H} \quad \text{H} \rightarrow \text{L} \quad \text{L} \quad \text{H} \end{array}$ | $\begin{array}{c} \diagup \quad \diagdown \\ \text{H} \quad \text{H} \rightarrow \text{L} \quad \text{L} \quad \text{L} \end{array}$ |

(They couldn't, without crossing lines)

Do we predict *sé-ne-hóvé* ‘like with fish’?

|          |    |    |      |
|----------|----|----|------|
| UR       | se | ne | hove |
|          |    |    |      |
|          | H  | H  | H    |
|          | se | ne | hove |
| Lowering |    |    |      |
|          | H  | L  | H    |

Do we predict *sé-ne-hóvé* ‘like with fish’?

|           |    |    |      |
|-----------|----|----|------|
| UR        | se | ne | hove |
|           |    |    |      |
|           | H  | H  | H    |
|           | se | ne | hove |
| Lowering? |    |    |      |
|           | H  | L  | H    |

What excludes *sé-nè-hòvè* ‘like with fish’?

|           |    |    |      |
|-----------|----|----|------|
| (1)       | se | ne | hove |
|           |    |    |      |
|           | H  | H  | H    |
|           | se | ne | hove |
| Lowering1 |    |    |      |
|           | H  | H  | L    |

|            |    |    |      |
|------------|----|----|------|
| (2)        | se | ne | hove |
|            |    |    |      |
|            | H  | L  | L    |
|            | se | ne | hove |
| Lowering 2 |    |    |      |
| + OCP      | H  |    | L    |

# Many approaches to a solution

1. Lowering operates *directionally*, LR

|     |    |    |      |
|-----|----|----|------|
| (1) | se | ne | hove |
|     |    |    |      |
|     | H  | H  | H    |

|     |    |    |      |
|-----|----|----|------|
| (2) | se | ne | hove |
|     |    |    |      |
|     | H  | L  | H    |

|     |    |    |      |
|-----|----|----|------|
| (3) | se | ne | hove |
|     |    |    |      |
|     | H  | L  | H    |

- Minimal number of changes must affect UR, consistent with SR result that OCP is satisfied.
- All else equal, HLH is preferred to HL:
- Prefer to change prefix, except 1<sup>st</sup> prefix in word.

## Shona summary

- $H \rightarrow L / H + \_\_$
- H becomes L after H in prefix
- ATB effect arises from prohibition on \*HH in one morpheme.
- If HH exist in UR, they merge into long H:.
- If LL arise in intermediate representations, perhaps they also merge into L:.
- Have not resolved one q: how a process applies when it has multiple foci

Recall *né-mbúndúdzí*  $\rightarrow$  *né-mbùndùdzì*

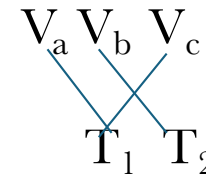
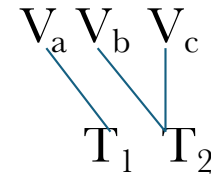
- Why not strictly local effect *\*né-mbùndúdzí*?
- If a language showed such a strictly local effect, could you analyze it?
- What would be the rule? Would it be consistent with the OCP?

# Summary of patterns inspected

- Tone stability:  
non-tonal Fs can delete or coalesce, leaving tones behind.
- ATB changes:  
one long tone, linked to many Vs across Cs
- Tones unlinked to Vs in UR  
may seek to land on some V in SR
- Vs unlinked in UR to any Ts
- ATB tonal changes

# Interpreting \*CrossedLines

- Association = overlap in time
- Intuition: pairs of events that overlap in time have mutually consistent precedence relations
- If  $V_a$  —  $T_1$
- If  $V_b$  —  $T_2$
- And if  $T_1$  precedes  $T_2$
- Then  $V_a$  precedes  $V_b$
- In the crossed-lines case  
 $T_1$  precedes  $T_2$ , but  $V_c$  does not precede  $V_b$



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*24.901 Introduction to Phonology* Spring 2026

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