

## Tone Displacement in Zulu, and the Maintenance of Contrasts

**Daniel Silverman**

UCLA Department of Linguistics,  
 UCLA Center for Health Sciences, Division of Head and Neck Surgery  
 izzys80@oac.ucla.mvs.edu

1. Introduction:

- In Zulu, **H** tones in short syllables are displaced to a following syllable when preceded by a "depressor"--a consonant possessing both voicing and vocal fold spreading--unless another depressor is lexically or morphologically ordered to follow the **H**.
- (a) high tones are far more often phonologically active than low tones, in the form of spreading and/or displacement
- (b) spreading/displacement is far more often rightward than leftward
- (c) spreading/displacement is far more likely to take place when the pitch interval between the two tones is relatively great (Hyman and Schuh 1974)
- *articulatory, aerodynamic, acoustic, and auditory* constraints
- Optimality Theory (Prince and Smolensky 1992, McCarthy and Prince 1992)

2. Zulu tones:

- H**, **L**, and **HL** contours are phonologically and morphologically active (Cope 1960).

3. Zulu depressors:

<b>b<sup>h</sup></b>	<b>d<sup>h</sup></b>		<b>j<sup>h</sup></b>	<b>g<sup>h</sup></b>
	<b>g<sup>h</sup></b>	<b>g<sup>h</sup>  <sup>h</sup></b>	<b>g<sup>h</sup>!</b>	
<b>v</b>	<b>z</b>	<b>ɛ̃</b>		<b>ɣ</b>

4. Exemplification:

Depressors are underlined. Vowels bearing displaced tones are italicized.

- |    |                                      |                      |  |                    |
|----|--------------------------------------|----------------------|--|--------------------|
| a. | <b>ìsítà:lò</b>                      | (chair)              | <b>ìzítà:lò/ìzítà:lò</b>                   | (chairs)           |
| b. | <b>índ<sup>h</sup>ú:mà</b>           | (headman)            | <b>énd<sup>h</sup>ùné:mì</b>               | (to a headman)     |
| c. | <b>ìsíg<sup>h</sup>ò:kò</b>          | (hat)                | <b>ìzíg<sup>h</sup>ò:kò</b>                | (hats)             |
| d. | <b>ím<sup>h</sup>b<sup>h</sup>úz</b> | (goat)               | <b>é''m<sup>h</sup>b<sup>h</sup>úzì:mì</b> | (to a goat)        |
| e. | <b>zík<sup>h</sup>ò:má</b>           | (they being present) | <b>zík<sup>h</sup>ò:má</b>                 | (they are present) |

5. Articulatory Phonology (Browman and Goldstein 1986, 1989, 1990, 1991, 1992):  
modification: gestures are means to achieve *auditory* ends. Gestural score notation is enriched with auditory information.

■ = optimally recoverable  
 ■ = sub-optimally recoverable  
 ■ = unrecoverable

6. laryngeal configuration of a voiced aspirate:

glottal aperture:	higher:	■	
	lower:		
intercostal flexion:	higher:	■	
	lower:		
tension:	higher:	■	(for voicing)
	lower:	■	(for breathiness)
larynx:	higher:		
	lower:	■	

7. laryngeal configuration for high pitch (H):

glottal aperture:	higher:	
	lower:	■
intercostal flexion:	higher:	■
	lower:	
tension:	higher:	■
	lower:	
larynx:	higher:	■
	lower:	

8. additional facts:

--voiced aspirates are associated with pitch lowering at their offsets, i.e., on the following vowel (Hombert 1978)  
 --pitch rises are accomplished more slowly than pitch falls (Ohala and Ewan 1973, Sundberg 1973).

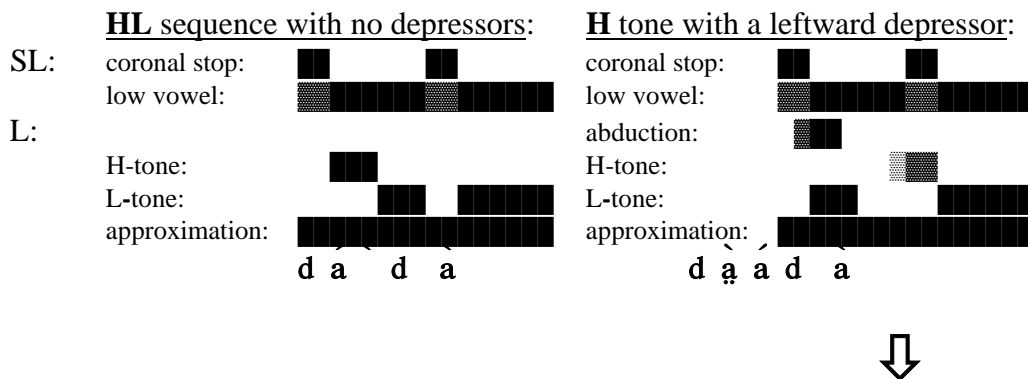
9. higher pitch followed by lower pitch:

H-tone:	■	■
L-tone:	■	■
	H	L

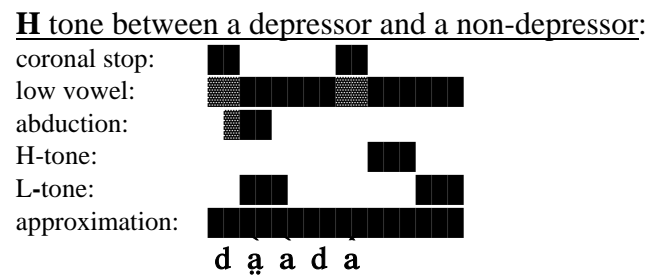
lower pitch followed by higher pitch:

H-tone:		■
L-tone:	■	■
	L	H

10. superimposition of supralaryngeal values:

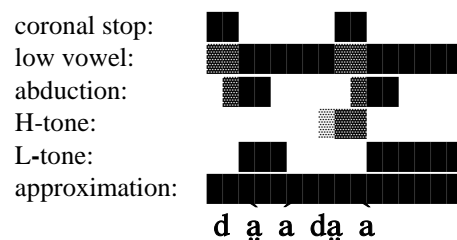


11. tone displacement:

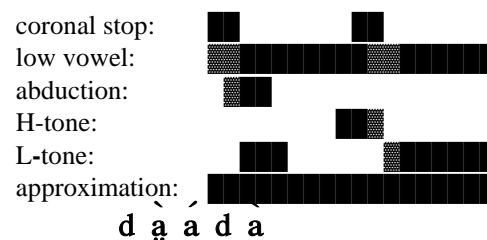


12. no tone displacement:

H tone flanked by depressors:



H tone on a long vowel:



13. History (Hyman and Schuh 1974):  
telescoping etc.

14. Optimality Theory (Prince and Smolensky 1993, McCarthy and Prince 1993):  
--the grammar may be viewed as a struggle between ease of perception and ease of production (Martinet 1952, Lindblom 1990)  
--Optimality Theory allows us to formally express this struggle as a series of ranked, ordered constraints

14. (a) **recover:** render contrasts auditorily recoverable, though not necessarily auditorily optimal
- (b) **economize:** maximize articulatory ease
- (c) **overlap:** implement gestures simultaneously in order to increase speaking rate

15.

	Recover	Economize
íẏà:lò		*
ìẏà:lò	*	
ɛ̃íẏà:lò		
é''mb <sup>h</sup> ùzì:mì	*	*
é''mb <sup>h</sup> ùzì:mì	*	*
ɛ̃é''mb <sup>h</sup> ùzì:mì	*	