Tone Rules and Representations in Yucunany Mixtepec Mixtec[*]
Mary Paster
UC Berkeley

1. Introduction
Recent work on 'emergent' phonological phenomena (Lindblom 1999, Wedel 2004, Blevins 2004) suggests that some of what is assumed to be part of UG may be learned rather than innate.

Mielke (2004) proposes that phonological features are learned, evidenced by the fact that three widely assumed feature sets are inadequate to capture some patterns found in the world's languages.

However, the inadequacy of the feature sets represented in Mielke's study may reflect the fact that we have not yet settled on the right universal features.

I argue that the tone system of Yucunany Mixtepec Mixtec supports the notion of universal features since this system fills an empirical void with respect to the systems predicted by a commonly accepted set of tone features.

Structure of the paper:
    -Background
    -Arguments for underlyingly specified L tone
    -Arguments for underlyingly specified M tone
    -Arguments for default H tone
    -Implications for tone features

2. Background
Pulleyblank 1986: in 3-tone languages (L-M-H), M is the default tone.

Yip 1980, Pulleyblank 1986: L is represented by [-raised] and H by [+upper]. These are assumed to be the 'marked' values of the universal tone features [±raised] and [±upper]. Thus, any 3-tone system will have M as the default tone, since any toneless tone-bearing unit is assigned the unmarked values [+raised] and [-upper] by default.

However, based on the behavior of 2-tone systems, we know that tonal markedness relations are not universal (Hyman 2001), so the markedness assumption should be discarded. Should the universal tone features be abandoned as well?

Predictions of the universal feature approach:
    -Upper limit of four level tones
    -3-tone systems can have L, M, or H as default tone; lack of attested cases is problematic

Predictions of an emergent feature approach:
    -No upper limit on the number of distinct level tones, except limits imposed by perceptibility
    -3-tone systems can have L, M, or H as default tone; lack of attested cases explained by history, perception, production, etc.

A few cases of five-level tone systems have been proposed, but four level tones does appear to be a general upper bound cross-linguistically. Thus, the issue of the default tone is crucial to deciding between the two approaches to tone features.

In Yoruba, M is default (Pulleyblank 1986). In Leggbo (Upper Cross, Nigeria), L is default (Paster 2003). In this paper, I describe a 3-tone system with H as the default tone. Thus, each of the predicted 3-tone system types is attested.

(1)
Default M (as in Yoruba) arises as follows:

Tone	Low	Mid	High
Underlying features	[-raised] Ø	Ø Ø	Ø [+upper]
Default feature assignment	 Ø-->[-upper]	Ø-->[+raised] Ø-->[-upper]	Ø-->[+raised]
Surface features	[-raised] [-upper]	[+raised] [-upper]	[+raised] [+upper]

Default L (as in Leggbo) arises as follows using the same features:

Tone	Low	Mid	High
Underlying features	Ø Ø	[+raised] Ø	[+raised] [+upper]
Default feature assignment	Ø-->[-raised] Ø-->[-upper]	 Ø-->[-upper]	
Surface features	[-raised] [-upper]	[+raised] [-upper]	[+raised] [+upper]

Default H could arise as follows:

Tone	Low	Mid	High
Underlying features	[-raised] [-upper]	Ø [-upper]	Ø Ø
Default feature assignment		Ø-->[+raised]	Ø-->[+raised] Ø-->[-upper]
Surface features	[-raised] [-upper]	[+raised] [-upper]	[+raised] [+upper]

-Mixtepec Mixtec (Otomanguean): spoken by 12,000 people (Ethnologue 2004) in Oaxaca, Mexico in and around San Juan Mixtepec. See also Pike and Ibach (1978) and Josserand (1983). The dialect described here is spoken in the town of Yucunany.

-Some criteria for specified vs. default tones:
Prominence in assimilatory processes, neutralized tones (Maddieson 1978), floating tones, tone rules, tonal distribution (Hyman 2001)

Note: in this practical Mixtec orthography to be used in this paper, H is represented by an acute accent, L by a grave accent, and M is not marked. Vowel length is not contrastive, so vowels are added as needed to accommodate contour tones. Stress is not contrastive and therefore not marked; unlike in the dialects discussed by de Lacy (2002), stress and tone do not appear to interact.

3. L is underlyingly specified
L spreads onto a following H-toned mora within the prosodic word.

(2) a. Underlying H tone of pronominal clitics is reflected when root ends with H or M

Plain form		2sg familiar		1pl inclusive	
lúrrú	'donkey'	lúrrú **gú**	'your donkey'	lúrrú **gó**	'our donkey'
yo'ó	'rope'	yo'ó **gú**	'your rope'	yo'ó **gó**	'our rope'
tikwàá	'orange'	tikwàa **gú**	'your orange'	tikwàa **gó**	'our orange'
xá'nu̲	'cigarette'	xá'nu̲ **gú**	'your cigarette'	xá'nu̲ **gó**	'our cigarette'
tzàáku	'corral'	tzàáku **gú**	'your corral'	tzàáku **gó**	'our corral'
kàa	'metal'	kàa **gú**	'your metal'	kàa **gó**	'our metal'

b. H-toned clitics surface with LH rising tone after L-final root

Plain form		2sg familiar		1pl inclusive	
sòkò	'shoulder'	sòkò **gùú**	'your shoulder'	sòkò **gòó**	'our shoulder'
chá'à	'short'	chá'à **gùú**	'you are short'	chá'à **gòó**	'we are short'
ánaà	'heart'	ánaà **gùú**	'your heart'	ánaà **gòó**	'our heart'
ndàakù	'broom'	ndàakù **gùú**	'your broom'	ndàakù **gòó**	'our broom'
yuchì	'knife'	yuchì **gùú**	'your knife'	yuchì **gòó**	'our knife'

Low Tone Spreading:
(3)

```
 μ      μ
 |  _ _ /|
 |/      |
Tone   Tone
 |_____
 |       \
[-raised] [-upper]
```
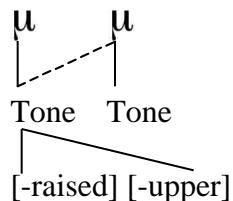
L occurs as a floating tone grammatical marker of the 1sg:

(4)

Plain form		1sg form	
vílú	'cat'	vílú**ù**	'my cat'
tìtzi	'stomach'	tìtzi**ì**	'my stomach'
la'la	'mucus'	la'l**à**	'my mucus'
xá'nu	'cigarette'	xá'n**ù**	'my cigarette'
yùúti	'sand'	yùúti**ì**	'my sand'

<u>Evidence for specified L tone</u>:
L tone is prominent in an assimilatory process and occurs as a floating tone grammatical marker.

4. M is underlyingly specified
M tone resists being overwritten by floating L Completive marker:

(5) a. Verb roots beginning with /k/ (and some others, exceptionally) take *nì*- in the Completive
   i. H-initial roots undergo LTS in the Completive

<u>Progressive</u>		<u>Completive</u>	
ká'à yù	'I am talking'	nìkàá'à yù	'I talked'
káviì	'he is flipping'	nìkàáviì	'he flipped'
kándiì	'he is jumping'	nìkàándiì	'he jumped'
kíkuù	'I am sewing'	nìkìíkuù	'I sewed'
skákiì	'he is driving'	nìskàákiì	'he drove'

   ii. M-initial roots surface with tones unchanged in the Completive

<u>Progressive</u>		<u>Completive</u>	
ka'vì yù	'I am reading'	nìka'vì yù	'I read (past)'
kanaà	'I am yelling'	nìkanaà	'I yelled'
ndasá	'he is gathering'	nìndasá	'he gathered'
syeyì nyà	'he is letting go'	nìsyeyì nyà	'he let go'

   b. Roots beginning with other segments take *n*- or no segmental marking, and prefixed floating L in Completive
   i. H-initial roots have their H replaced by the floating L in the Completive

<u>Progressive</u>		<u>Completive</u>	
xchí'à	'he is grinding'	xchì'à	'he ground'
skániì	'he is throwing'	skàniì	'he threw'
t<u>íiì</u>	'I am holding'	nd<u>ìiì</u>	'I held'
tzákwì	'he is laughing'	ndzàkwì	'he laughed'
sává'ì	'he is making (food)'	sàvá'ì	'he made (food)'
cháiì	'he is writing'	nchàiì	'he wrote'

   ii. M-initial roots take on the floating L but retain their M tone in the Completive

 | <u>Progressive</u> | | <u>Completive</u> | |
   |---|---|---|---|
   | sketiì | 'he is running' | skèetiì | 'he ran' |
   | ndaka'yà | 'he is painting' | ndàaka'yà | 'he painted' |
   | ndaka'nì | 'he is folding' | ndàaka'nì | 'he folded' |
   | tzakià | 'he is putting down' | ndzàakià | 'he put down' |
   | tzakwià | 'he is crying' | ndzàakwià | 'he cried' |
   | cha'vià | 'he is paying' | nchàa'vià | 'he paid' |

Generalization: floating L tone prefix overwrites root-initial H but not M

H is lowered to M between L and H:

(6) a. <u>Plain form</u>   <u>With H-toned clitic</u>
    kwî̱í   'narrow/thin'   kwî̱i gú   'you (fam.) are narrow/thin'
    xínì̱í   'hat'   xínì̱i gó   'our (incl.) hat'
    tikwàá   'orange'   tikwàa gú   'your (fam.) orange'
    ikìí   'pumpkin'   ikìi gó   'our (incl.) pumpkin'
    nàmá   'soap'   nàma gú   'your (fam.) soap'
    nù̱ú   'face'   nù̱u gó   'our (incl.) face'

   b. <u>Plain form</u>   <u>Followed by H-initial word within NP</u>
    nàmá   'soap'   nàma ncháá   'blue soap'
    kòó   'snake'   kòo ncháá   'blue snake'
    î̱í   'leather'   î̱i ncháá   'blue leather'
    xínì̱í   'hat'   xínì̱i nchá'à   'black hat'
    ndzìtzìí   'wing'   ndzìtzìi kóló 'male turkey's wing'

This process can be analyzed as spreading of [-upper].

Gradient Smoothing (term from Hinton et al 1991):

(7)
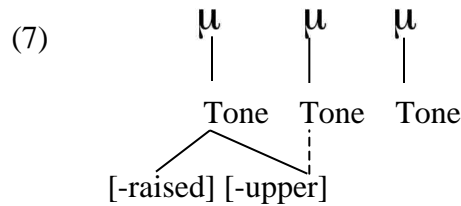
Evidence for specified M tone:
M tone is resistant to assimilation, and its feature [-upper] spreads via Gradient Smoothing.

5. H is the default tone
The floating L tone 1sg marker interacts with root tones in a way that implicates H as the default:

-HH roots surface with HHL (fall on the final syllable), while MM roots surface with ML (level L on the final syllable):

(8) a. HH roots surface with HHL in 1sg
    <u>Plain form</u>   <u>1sg form</u>
    nchá'á   'salsa'   nchá'áà   'my salsa'
    kóní   'female turkey'   kónî̱   'my female turkey'
    ndúchá   'goat'   ndúcháà   'my goat'
    lúrrú   'donkey'   lúrrúù   'my donkey'
    kóló   'male turkey'   kólóò   'my male turkey'
    lé'lú   'lamb'   lé'lúù   'my lamb'
    lítú   'baby goat'   lítúù   'my baby goat'

b. MM roots surface with ML in 1sg

Plain form		1sg form	
la'la	'mucus'	la'là	'my mucus'
machu	'mule'	machù	'my mule'
ve'e	'house'	ve'è	'my house'
mula	'mule'	mulà	'my mule'

QUESTION #1: What accounts for this discrepancy?

-Most M-final roots surface with final level L in the 1sg, losing their M tone:

(9) a. MM-final roots surface with ML in 1sg (reproduced from (8) above)

Plain form		1sg form	
la'la	'mucus'	la'là	'my mucus'
machu	'mule'	machù	'my mule'
ve'e	'house'	ve'è	'my house'
mula	'mule'	mulà	'my mule'

b. Most HM-final roots surface with final HL in 1sg

Plain form		1sg form	
tá̠'a	'relative'	tá̠'à̠	'my relative'
xá'n̠u	'cigarette'	xá'n̠ù	'my cigarette'
ma̠a tzá'n̠u	'grandmother'	ma̠a tzá'n̠ù	'my grandmother'
só'o	'deaf'	só'ò	'I am deaf'

-Roots with the pattern LM and LHM retain their final M tone:

(10) a. LM roots surface with LML in 1sg

kwà'a	'sister (man's)'	kwà'aà	'my sister (man's)'
sì'i̠	'leg'	sì'i̠ì̠	'my leg'
tìtzi	'stomach'	tìtzìì	'my stomach'
kàa	'metal'	kàaà	'my metal'
sò'o	'ear'	sò'oò	'my ear'
nù'u̠	'tooth'	nù'u̠ù̠	'my tooth'

b. LHM roots surface with LHML in 1sg

Plain form		1sg form	
yùúti	'sand'	yùútìì	'my sand'
tzàáku	'corral'	tzàákuù	'my corral'
yòóso	*metate*	yòósoò	'my *metate*'
kàása	'sister's husband'	kàásaà	'my sister's husband'
tìíchi	'avocado'	tìíchìì	'my avocado'

QUESTION #2: How does root-initial L affect the behavior of M across a H, causing LHM roots to pattern with LM roots rather than with other HM-final roots?

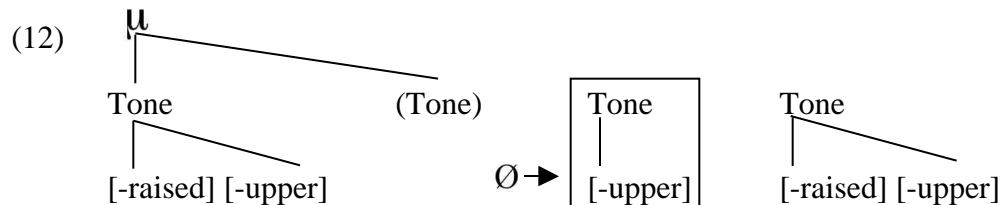These questions can be answered if we posit the following tone processes:

-Lexical tones are linked to the root underlyingly or on the first cycle.
-M is delinked when followed by a floating L tone.

Mid Delinking:

(11)
```
        μ
        ‖
     Tone          Tone
       |            ╱|
   [-upper]   [-raised] [-upper]
```
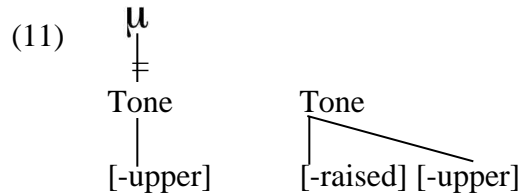
-Then, M is inserted following linked L and optional H when followed by floating L.

Mid Insertion:

(12)
```
        μ
        |‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾
     Tone            (Tone)      ┌──────┐    Tone
      ╱|                         │ Tone │     ╱|
 [-raised] [-upper]        Ø ➤   │  |   │  [-raised] [-upper]
                                 │[-upper]│
                                 └──────┘
```

<u>NOTE</u>:This rule is suggestive of unspecified H tone, since it can 'see' the tone features of the initial L across a H. If H had features under the Tone node, it should block this rule.

This rule is motivated by the fact that LM and LHM roots surface with a M tone in 1sg; it could alternatively be seen as blocking of Mid Delinking in the same context; the difference is not crucial.
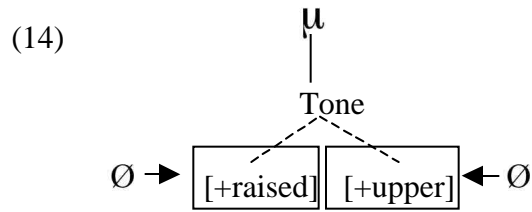
-Then, floating tones are associated to the edgemost tone-bearing unit.
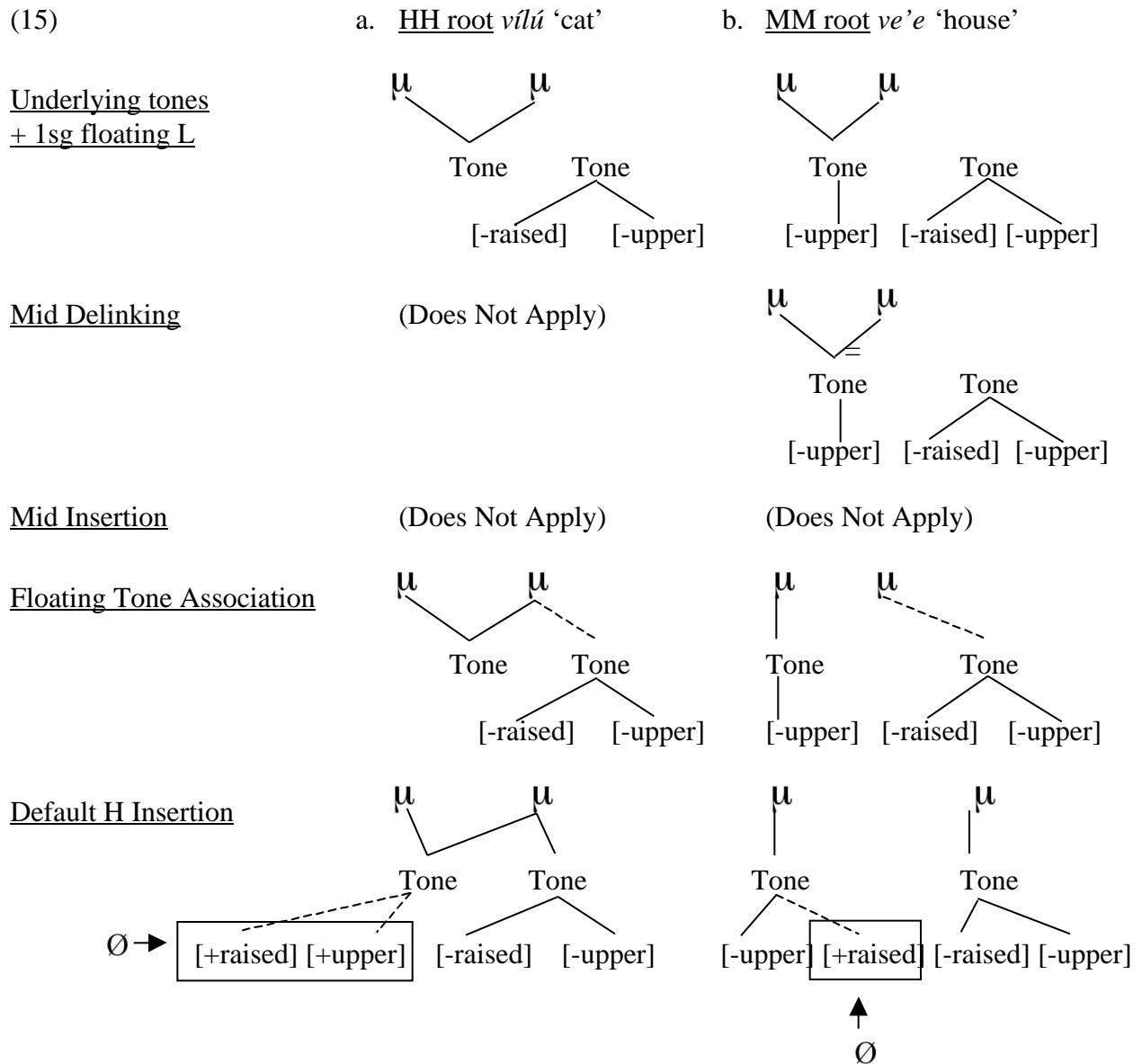
Floating Tone Association:

(13)
```
        μ
        |‾ ‾ ‾ ‾ ‾ ‾ ‾ ‾ ‾ ‾
     ( Tone )             Tone
       ╱|                  ╱|
 ( [-raised] ) ( [-upper] )   ( [-raised] ) ( [-upper] )
```
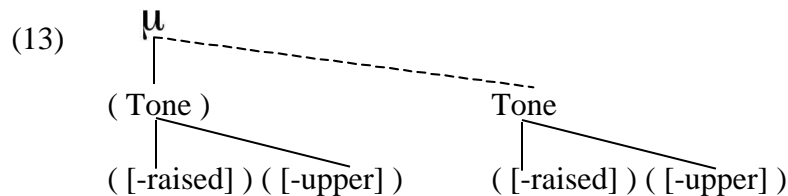
-Finally, Tone nodes with no values for the tone features are assigned [+raised] and [+upper].

Default H Insertion:

(14)

μ
|
Tone

Ø → [+raised] [+upper] ← Ø

The different behavior of HH and MM roots is derived as follows:

(15) a. <u>HH root</u> *vílú* 'cat' b. <u>MM root</u> *ve'e* 'house'

<u>Underlying tones</u>
<u>+ 1sg floating L</u>

a.

μ　　　μ

Tone　　Tone

[-raised]　[-upper]

b.

μ　　　μ

Tone　　　Tone

[-upper]　[-raised] [-upper]

<u>Mid Delinking</u>　(Does Not Apply)

b.

μ　　　μ

Tone　　　Tone

[-upper]　[-raised] [-upper]

<u>Mid Insertion</u>　(Does Not Apply)　(Does Not Apply)

<u>Floating Tone Association</u>

a.

μ　　　μ

Tone　　Tone

[-raised]　[-upper]

b.

μ　　　μ

Tone　　　Tone

[-upper]　[-raised]　[-upper]

<u>Default H Insertion</u>

a.

μ　　　μ

Tone　　Tone

Ø → [+raised] [+upper]　[-raised]　[-upper]

b.

μ　　　μ

Tone　　　Tone

[-upper] [+raised] [-raised] [-upper]

↑
Ø

8

Surface tones

μ   μ   μ   μ

Tone   Tone   Tone   Tone

[+raised] [+upper] [-raised] [-upper]   [-upper] [+raised] [-raised] [-upper]

HHL *vílúù* 'my cat'   ML *ve'è* 'my house'

The different behavior of LHM and other HM-final roots is derived as follows:

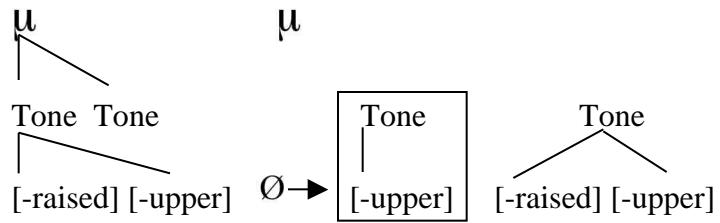(16)   a.   <u>LHM root *yùúti* 'sand'</u>
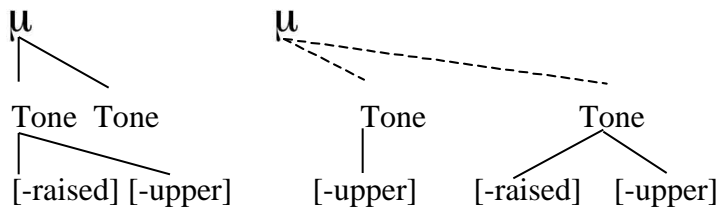
<u>Underlying tones
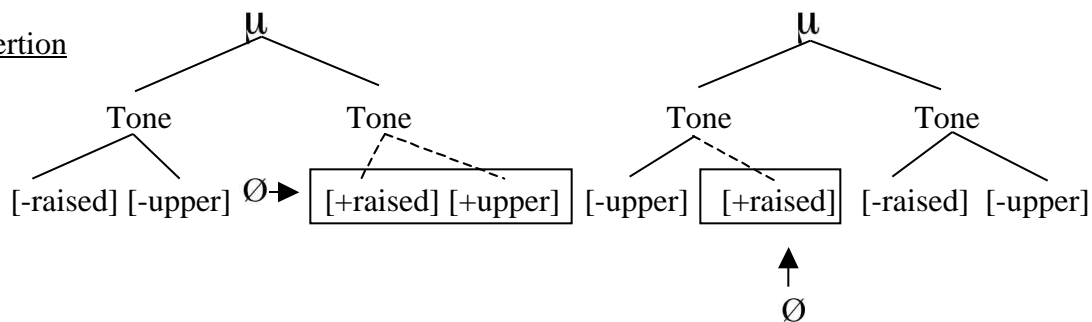+ 1sg floating L</u>

μ   μ

Tone Tone   Tone   Tone

[-raised] [-upper] [-upper]   [-raised] [-upper]

<u>Mid Delinking</u>

μ   μ

Tone Tone   Tone   Tone

[-raised] [-upper] [-upper]   [-raised] [-upper]

<u>Mid Insertion</u>

μ   μ

Tone Tone   Tone   Tone

[-raised] [-upper]   Ø→ [-upper]   [-raised] [-upper]

<u>Floating Tone Association</u>

μ   μ

Tone Tone   Tone   Tone

[-raised] [-upper]   [-upper]   [-raised]   [-upper]
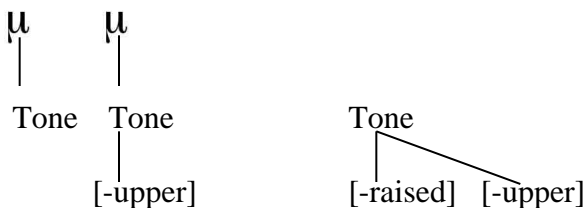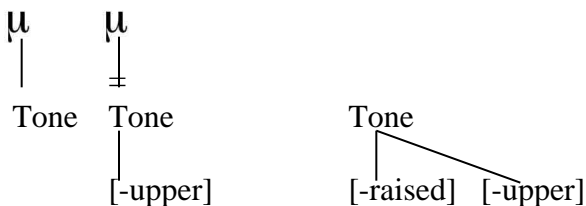
Default H Insertion

Surface tones
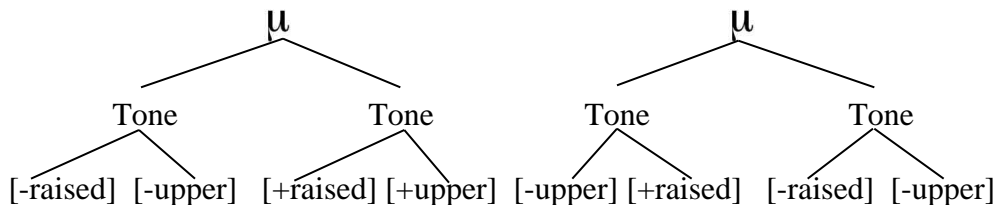
LHML *yùútìì* 'my sand'

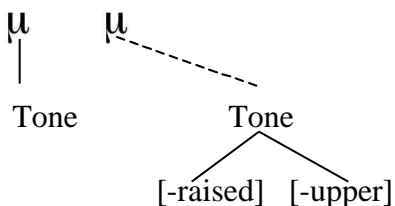b. HM root *tá'a* 'relative'

Underlying tones
+ 1sg floating L

Mid Delinking

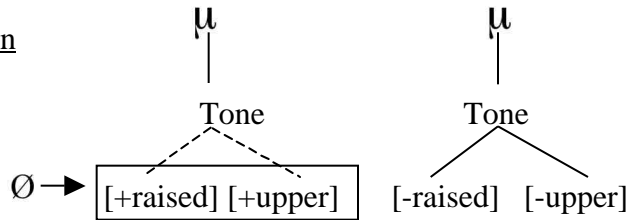
Mid Insertion   (Does Not Apply)
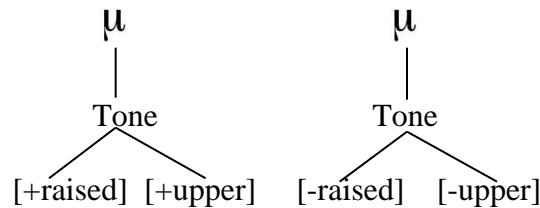
Floating Tone Association

Default H Insertion

HL _tá_'_à_ 'my relative'

Affectionate names derived from Spanish names take all-H tone pattern:
(17) Rósá   'Rosa'   Máríú 'Mario'   Níná 'Emersinda'
      Pálá   'Paula'   Pálú 'Pablo'   Kándí 'Candida'

Other Spanish loans have an invariant HML tone pattern regardless of their stress pattern in Spanish (e.g., _árroòz_ 'rice' (<Sp. _arróz_); _lítruù_ 'liter' (<Sp. _lítro_); _míiìl_ 'thousand' (<Sp. _míl_)).

Evidence for default H:
The process of elimination suggests default H since L and M are specified underlyingly. Also, H tone is invisible for the purposes of a tone rule, and the assumption of default H allows for a coherent analysis of the tonal system.

6. Conclusion
The use of the two tone features [±raised] and [±upper] predicts the existence of 3-tone systems with L, M, or H as the default tone.

3-tone languages with M and L as default tones have already been documented; in this paper, I have presented data from Yucunany Mixtepec Mixtec and argued that this is an example of a 3-tone language with H as the default tone.

The fact that all three of these types of 3-tone language exist supports the proposal that [±raised] and [±upper] are universal features.

These features can also easily handle 2-tone systems; a next step would be to examine how well they account for 4-tone systems.

If the present results hold, we should assume this to be the standard set of tone features rather than assuming that every learner creates a set of tone features from scratch.

Appendix: Attested tone patterns on roots

L	CVV	*chù̱ù̱*	'star'	*ì̱ì̱*	'nine'
	CVCV	*sòkò*	'shoulder'	*sùtù*	'priest'
M	CVV	*ngwii*	'fox'	*ve'e*	'house'
	CVCV	*mula*	'mule'	*machu*	'mule'
H	CVV	*ncháá*	'blue'	*nchá'á*	'salsa'
	CVCV	*kóló*	'male turkey'	*lóchí*	'vulture'
LM	CVV	*chàa*	'man'	*kàa*	'metal'
	CVCV	*tzànu̱*	'brother's wife'	*tìka*	'cricket'
LH	CVV	*stàá*	'tortilla'	*nù̱ú̱*	'face'
	CVCV	*kùmí*	'four'	*nàmá*	'soap'
MH	CVV	*yo'ó*	'rope'	*che'é*	'cute'
	CVCV	*yatá*	'old'		
HM	CVV	*xí'a*	'hawk'		
	CVCV	*tzóko*	'possum'	*tzíka*	'far'
HL	CVV	*cháì*	'chair'	*kwá'à*	'red'
	CVCV	not attested			
ML	CVV	*yoò*	'drinking vessel'	*saà*	'bird'
	CVCV	*xitò*	'uncle'	*tutù*	'paper'
LML	CVV	*xàaà*	'chin'	*xìoò*	'dress, skirt'
	CVCV	*ndàakù*	'broom'		
LHM	CVV	*tzàáa*	'new'		
	CVCV	*yòóso*	'*metate*'	*yùúti*	'sand'
MLH	CVV	*vìí*	'healthy-looking'		
	CVCV	*yosòó*	'grassy plain'	*ixìí*	'hair'
MHM	CVV	*Skwiía*	'Santiago Juxtlahuaca'		
	CVCV	*kotóo*	'*sarape*'		
HML	CVV	*Jwá̱a̱à*	'Juan'	*pá̱ìì*	'*rebozo*'
	CVCV	*ánaà*	'heart'	*súkuù*	'high'
HLH	CVV	*chîí*	'fingernail'	*î̱í̱*	'skin'
	CVCV	*xîní*	'hat'		

References

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Department of Linguistics
1203 Dwinelle Hall
Berkeley CA 94720-2650

paster@socrates.berkeley.edu