Between Stress and Tone
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Reconstructing Tonogenesis in Zapotec*

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What is the role of tone in Zapotec languages?

And Change said, 'let the consonants guarding the vowel to the left and the right contribute some of their phonetic features to the vowel…''
(Matisoff, 1973:73)

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Abbreviations and symbols used for Teotitlán del Valle Zapotec and San Pablo Güilá Zapotec data: POT – Potential Aspect, SG – singular, PL – plural, INC – inclusive, IN – inanimate, ˩ low tone, ˧ high tone, ˨˧ high-rising tone, ˧˩ falling tone, <dx> - [d\], TdVZ – Teotitlán del Valle Zapotec, SPGZ – San Pablo Güilá Zapotec.

1. Background

- Zapotec languages belong to the larger Otomanguean language family, as do Popolocan, Otopamean, Mixtecan, Chinantecan, Chiapanec-Mangue and Amuzgoan languages. Within the Zapotecan family are Zapotec and Chatino languages. The vast majority of Zapotec variants are spoken in the state of Oaxaca, Mexico.

Figure One shows Oaxaca in the greater context of Mexico

Figure One: Oaxaca

1.1 Literature Review

- **Primary contrast is tone (2/15)**
  with predictable glottalization
  Coatlán-Loxicha, Tlacochahuaya Zapotec
- **Primary contrast is phonation (4/15)**
  with predictable and/or unimportant tone
  Mitla, San Juan Guelavía, San Lucas Quiaviní, Zoogocho Zapotec
- **Both tone and phonation are primary (9/15)**
  Cajonos, Isthmus (Pickett and Black, 2002), Juarez, San Agustín Mixtepec, San Juan Mixtepec, San Pablo Güilá, Texmelucan, Yalálag, Zaniza Zapotec
- **Pitch Accent System (1/15)**
  Isthmus (Mock, 1983)

- Most Zapotec languages have a fortis/lenis contrast in consonants which are reconstructed as being old geminates (Swadesh 1947), e.g.

1.2 Esposito's Acoustic Study

- Esposito (2003) concludes 'that Santa Ana del Valle Zapotec can also be described as having a primary contrast in tone', and in fact, 'There are two arguments that tone is more basic. It seems that when the phonation is weakened, the tonal pattern remains, preserving some level of distinction' (83-85). Specifically, she finds that modal voice is concomitant with high or high-rising pitch, breathy voice is concomitant with low pitch, and creaky voice is concomitant with falling pitch.

- Such findings could be interpreted as evidence of tonogenesis

1.3 Tonogenesis

- In Vietnamese, voiced obstruents produced breathy voice on the following vowel, which led to lower pitch. There was a point intermediate when low pitch and breathy voice were concomitant. In fact, the Vietnamese model of tonogenesis 'has become one in which the pitch characteristics found in the tones are derived directly from the phonetics of voice-quality distinctions' (Thurgood, 2002).

- Tone often develops on vowels following a voicing contrast in obstruents. Voiced obstruents lead to low tone and voiceless obstruents lead to high tone (Yip, 2002:35).

- Languages with multiple contrasts on obstruents will also yield tones, but not as consistently. As example, Lahu low-falling tone developed from plain obstruents in PLB tone 1 and mid tone developed from the aspirated and glottalized obstruents (Matisoff, 1970).

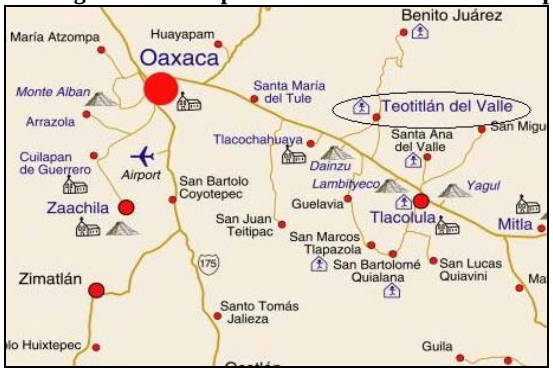
- Haudricourt reports that fortis consonants merged with voiceless aspirated to yield a high tone (1968, 1972) in Hombert (1978).

- Voiceless geminates yielded high pitch while voiceless singletons yielded mid pitch in Cèmuhî (Gussenhoven, 2004).

2. Teotitlán del Valle Zapotec

- Teotitlán del Valle Zapotec (TdVZ) is a Valley variant spoken about 30 kilometers east of Oaxaca City by approximately 5,000 people. The location of the village in reference to the capitol is shown in Figure Two.

Figure Two: Map of Teotitlán in reference to capitol



2.1 Phonological Sketch

- Teotitlán Zapotec, like many other variants of Zapotec displays a fortis/lenis contrast in obstruents in word-initial position. Word-medially and finally the contrast in consonants is best described as one of gemmination.

- Tone is used minimally in TdVZ. The majority of roots have low tone although a few nouns have high or rising pitch. High pitch is found in three morphemes: the potential aspect, first person singular and first person plural exclusive.

2.2 Acoustic Study

- In this study I examine F0 on the vowel of 113 monosyllabic, un-possessed nouns. Each token was said three times in isolation and a fourth time in a carrier phrase. Five speakers, four females and one male participated. Using *Praat*, I measured F0 on the third glottal pulse, the midpoint and vowel-finally. I compared the measurements following fortis obstruents with those following lenis obstruents. Results for two female speakers are shown below.

Table One: TdVZ – S.G.

	Fortis	**Lenis**
Average F0 vowel initial	216	205
Average F0 mid vowel	203	201
Average F0 vowel final	200	200

Table Two: TdVZ – A.R.

	Fortis	**Lenis**
Average F0 vowel initial	186	174
Average F0 mid vowel	170	163
Average F0 vowel final	147	146

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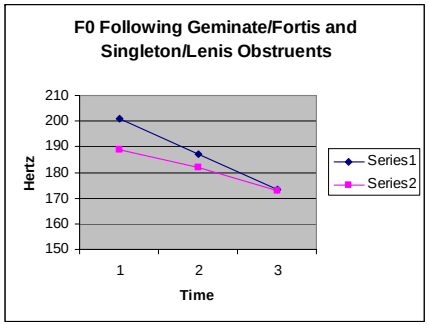
Figure Three: Results of Study



Series 1 represents pitch following geminate/fortis obstruents

Series 2 represents pitch following singleton/lenis obstruents

The points correspond to beginning, mid and end points of vowel.

3. Comparative Morphology – Potential Aspect

- Teotitlán Zapotec is conservative historically, preserving geminates in some environments and primarily CVCV syllable structure whereas other dialects of Zapotec have lost unstressed syllables.
- San Pablo Güilá Zapotec is more innovative and has contrastive lexical tone: rising, high-level, low and falling (Lopez Cruz 1997).
- The structure of the verb is Aspect-Root-Subject in both languages. Roots are generally monosyllabic; the dearth of disyllabic roots has not been considered in this study.
- In both languages, marking potential aspect displays two steps in a diachronic trajectory. Arbitrarily labeled, Type I is the older form, marked by a prefix, while Type II displays the newer form, in which a mutation of the verbal root and tone marks the aspect.

3.1 Type I

(1) (a) TdVZ (b) SPGZ
gú-*zyàts-ù'* ***gí-****syá'ts-ù'*
POT-decrease-2ND SG POT-decrease-2ND SG
'you will decrease (something)

3.2 Type II

3.2.1. Teotitlán del Valle Zapotec

- If the root in TdVZ begins with a lenis stop (b, d, g) and has low pitch, Type II Potential aspect marking will be used.
- If the above conditions are met, the following changes will occur:

(2) Root: *bà'n* *dèd* *gèz*

kwá*n-ù'* ***té****d-ù'* ***ké****z-ù'*
POT.steal.2ND.SG` POT.bypass.2ND.SG POT.hug.2ND.SG
'you will steal' 'you will bypass' 'you will hug'

- The fact that Type II marking will not occur if the tone is high is shown in (3) below.

(3) Root: *dúp*

gú-*dúpù'*
POT-gather-2ND.SG
'You will gather (something)'

- Note that in (4) potential aspect is marked with the CV prefix characterized by Type I. Despite the fact that the tone of the root is low, the expected alternation does not occur. The initial consonant of the root must be a lenis stop.

(4) Root: *lùb*

gú*-lùb-û'*
POT-sweep-2ND.SG
'You will sweep'

- The final restriction on Type II potential marking in TdVZ is shown below in (5); if the subject is either of the first person plurals (inclusive or exclusive), Type II will not apply. The *gá*[1] prefix is used.

(5) Root: *bà'n* *dèd* *gèz*

ga*-bà'-nù* ***ga****-dèd-ùn* ***ga****-gèz-ùn*
POT-steal-1ST.PL.INC POT-bypass-1ST.PL.INC POT-hug-1ST.PL.INC
'we will steal' 'we will bypass' 'we will hug'

3.2.2. San Pablo Güilá Zapotec

- If the root in SPGZ begins with a stop or liquid the following root alternations will take place: *b~kw, d~t, g~k, l~nd, r~ty*. In SPGZ the tone of the root plays a different role. If the tone is high-rising in the root it becomes high-level in the potential, and if it is low it becomes low-falling in the potential.
- In (6) the alternations with lenis stops are exemplified.

(6) Root: *bàa'n* *duu'by* *gèe's*

kwâa*n-ù'* ***túu'****by-ni*[2] ***kêe'****s-ù'*
POT.steal-2ND.SG POT.be involved-3RD.SG.IN POT.hug-2ND.SG
'you will steal' 'it will become involved' 'you will hug'

- Note that in (7) *r-* and *l-* initial roots employ Type II potential marking.

(7) Root: *rùu'g* *làa'*

tyûu*'g.ní* ***ndâ****-ù'*
POT.be.cut-3RD.SG.IN POT.untie-2ND.SG
'it will be cut' 'you will untie yourself'

.

[1] This is a conditioned variant of *gú*, which is characteristic of Type I; *gá* is always used exclusively with first person plural.
[2] This root does not have a first person conjugation. It is only conjugated in the third person in SPGZ.

- The data in (8), repeated from (6) above, show that roots with a high-rising tone will also employ Type II marking.

(8) Root: *du'by*

túu'*by-ni*
POT-be.involved-1ST.PL.INC
'it will become involved'

- Note that in (9) Type II marking is employed despite first person plural subject.

(9) Root: *bàa'n*

kwâa*n-nú*
POT.steal-1ST.PL
'we will steal'

3.3 Summary

- The more innovative variant, SPGZ, uses Potential Marking II in the most environments, suggesting that tone has a greater functional load in the more innovative language.

Table Three: Tonal Changes in Potential Aspect in TdVZ and SPGZ

	Root-initial consonant is lenis stop	**Root-initial consonant is liquid**	**First person plural**	**High tones**	**Low tones**
TdVZ	**Yes**	**No**	**No**	**No**	**Yes**
SPGZ	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

3.4 Free Variation in TdVZ

- In first person plural, high tone can be realized on the aspectual prefix *or* on the verbal root, in which case, low tone occurs on the prefix. This is shown in (10) and (11). This suggests that speakers are aware tone is relevant in marking potential aspect but have not yet spread it across all verbal paradigms.

(10)

bà'n	dèd	gèz
gá- bà'n -ùn	gá-dèd-ùn	gá-gèz-ùn
pot-steal-1ST.PL.INC	pot-bypass-1ST.PL.INC	pot-hug-1ST.PL.INC
'we will steal'	'we will bypass'	'we will hug'

(11)

bàn	dèd	gèz
gà-bá'n-ùn	gà-déd-ùn	gà-géz-ùn
pot-steal-1ST.PL.INC	pot-bypass-1ST.PL.INC	pot-hug-1ST.PL.INC
'we will steal'	'we will bypass'	'we will hug'

4. Summary and Diachronic Implications

- Fortis/geminate versus lenis/singleton may be a conditioning environment for tonal contrast
- Results from an acoustic study show higher pitch on vowels following geminate/fortis obstruents than when following singleton/lenis obstruents.
- Tone is employed in more environments to mark potential aspect in SPGZ than in TdVZ. Thus the observation can be made that historical innovation correlates with increased function of tone.
- Table Four shows the tendency in Zapotec languages for the transition from CV polysyllabic words to complex monosyllabic words associated with an increase in tone and vocalic features.

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