

# **Tonal patterns and their restrictions in Santiago Laxopa Zapotec**

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# Outline

Upshot: Our description of tone in SLZ lends support to a nascent hypothesis that “word tone” patterns are derived, and languages do not specify a lexicon of tonal combinations directly.

- Background
  - Santiago Laxopa Zapotec (SLZ)
  - Methodology
- Tone in SLZ
  - Tonal typology
  - Three tonal registers
  - Restricted patterns in bimoraic nouns
- Analysis
  - Optimality Theoretic constraints can account for patterns
- Discussion
  - Comparison to other Zapotecan languages

# Santiago Laxopa Zapotec

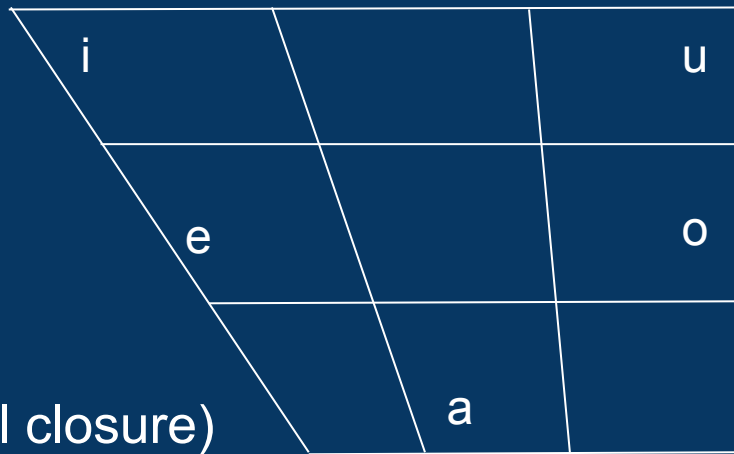
- Spoken by ~1000 mainly in Santiago Laxopa, Ixtlán, Oaxaca, Mexico
- Oto-Manguean, Northern Zapotec (Sierra Norte)
- Most speakers bilingual Spanish-SLZ



# The Vowel in SLZ

## 4 phonation types

- Modal V
- Checked V' (abrupt glottal closure)
- Laryngealized V'V (creaky and/or rearticulated)
- Breathy Vh



(cf. Yalálag Zapotec, Avelino 2010; Zochina Zapotec, Lopez Nicolas 2016; Quiavini Zapotec, Chávez Peón 2010)

# Methodology

Remote and in-person fieldwork beginning in 2020

- 5 consultants (3 female, 2 male)
- Meeting weekly with 2 consultants
- Word list, carrier sentences, humming/whistling
- Learned to hear tones before ever consulting Praat/acoustic measures

Began with Pike's (1948) method

- Sorting disyllabic nouns into groups by tone patterns

Snider (2014) - building tone database, looking for patterns

- Comparing different types of carrier sentences

# **Tone in SLZ**

# Tonal Typology

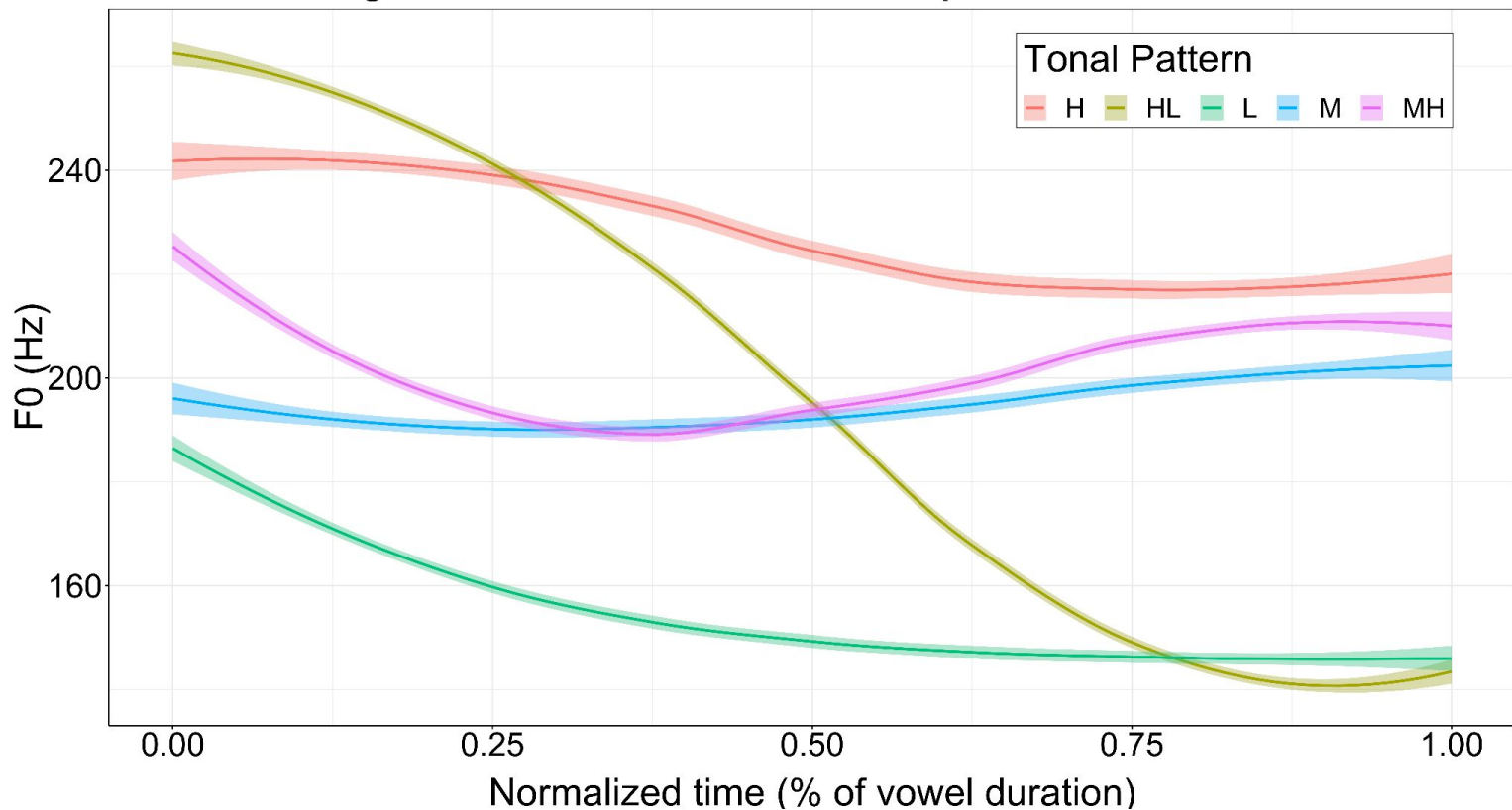
- Pike (1948) classifies tonal languages into two categories:
  - “Syllable Tone” (e.g. Gadsup (Trans-NG): Frantz & Frantz 1973)
    - Tonal contrasts on any syllable
    - → Lexical specification of tones on every syllable
  - “Word Tone” (e.g. Kukuya (Bantu): Hyman 1987)
    - Limited melodies, consistent across words of different lengths
    - → Lexical specification of one of a predefined set of licit tonal melodies

# The Tonal System in SLZ



- 3 tonal registers (H, M, L)
- 5 tonal patterns possible on a syllable
  - H
  - M
  - L
  - HL (Falling)
  - MH (Rising)



## FSR's average F0 contours across tonal patterns



## Tonal Restrictions in SLZ: Morae

- Only some syllables can host HL and MH
  - CV'V      *yu'u*<sup>HL</sup> 'house'       *yu'u*<sup>MH</sup> 'lime (cal)' 
  - CVC      *tsil*<sup>HL</sup> 'morning'      *jid*<sup>MH</sup> 'chicken'
  - CVV      *kua*<sup>HL</sup> 'masa'      *bduah*<sup>MH</sup> 'agave'
- These syllables are bimoraic (Chávez Peón 2010)
- We conclude: Single tones associate to the mora in SLZ

## Tonal Restrictions in SLZ: Words

- Bimoraic nouns only demonstrate three of the nine possible tone combinations
  - HL      *yu'u*<sup>HL</sup> 'house'                      *be*<sup>H</sup>*ku*'<sup>L</sup> 'dog'
  - LL      *xa*'*ag*<sup>L</sup> 'sheriff'                      *la*<sup>L</sup>*ge*<sup>L</sup> 'leaf'
  - MH      *yu'u*<sup>MH</sup> 'lime (cal)'                      *byi*<sup>M</sup>*ne*<sup>H</sup> 'bird'
  - \*HH, \*HM, \*MM, \*ML, \*LH, \*LM
- SLZ looks like a “word tone” language
  - Predefined set of three melodies

## Other Tonal Phenomena in SLZ

- Tonal alternation in the verb in 1SG (Bickmore & Broadwell 1998; Broadwell, Foreman & Bickmore 2008; Uchihara & Gutierrez 2020)
- H-triggered downstep (Brinkerhoff, Duff & Wax Cavallaro 2021)
  - Useful diagnostic for the presence of H
  - May explain why previous description (Long & Cruz 2000 on Zoogocho Zapotec) suggested sentence-initial super-high tones

# Analysis

## Word tone? - No need

- 3 tonal patterns possible on a bimoraic noun
  - HL, LL, MH (\*HH, \*MM, \*LH...)
- Shih & Inkelas (2019), McPherson (forthcoming) - Word tone is epiphenomenal, no “lexicon of melodies”
- OT-style constraints can account for the different tone distributions we observe in SLZ
- Tone/prominence in the input
  - 1 peak per word?
    - H tone? Pitch accent? Stress?

# Constraints

\*H

Assign one violation for every H tone.

\*M

Assign one violation for every M tone.


PEAK-TO-H

Assign one violation for every Peak in input which lacks an associated H in output.

\*INCLINE


Assign one violation for every level of upward tonal displacement between two adjacent morae (see Xu & Sun 2002; Yip 2002).

# \*H ≫ \*M (≫ \*L)


$\mu\mu$	*H	*M	*L
HH	** W		L
MM		** W	L
 LL			**
HL	* W		*
HM	* W	* W	L
ML		* W	*
MH	* W	* W	L
LM		* W	*
LH	* W		*



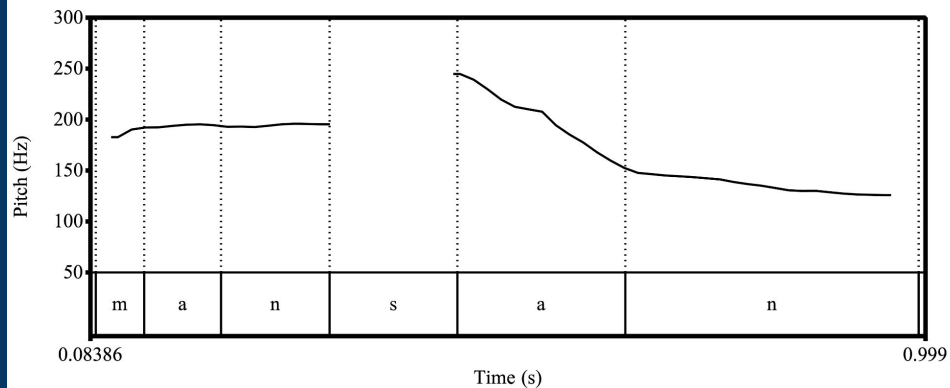
# Falls are HL

$\mu\mu$	PEAK-TO-H	*H	*M
HH		** W	L
MM	* W	L	** W
LL	* W	L	L
 HL		*	L
HM		*	*
ML	* W	L	*
MH	* W	*	*
LM	* W	L	*
LH	* W	*	L

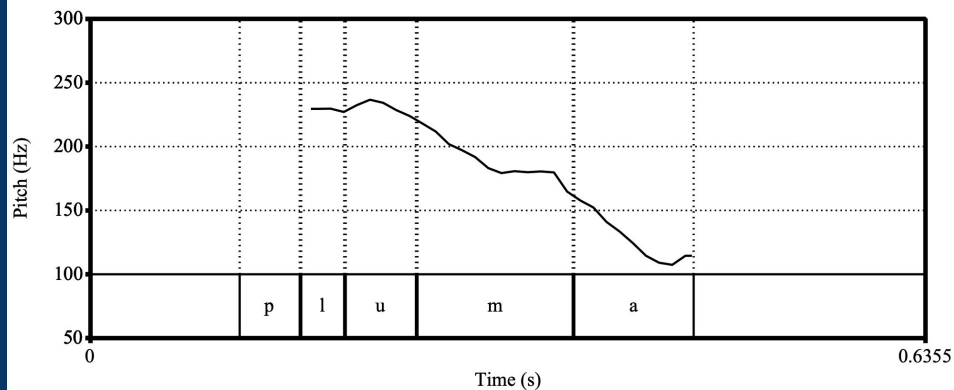
# Rises are MH

<i>μί</i>	PEAK-TO-H	*H	*INCLINE	*M
HH		** W	L	L
MM	* W	L	L	** W
LL	* W	L	L	L
HL	* W	*	L	L
HM	* W	*	L	*
ML	* W	L	L	*
 MH		*	*	*
LM	* W	L	*	*
LH		*	** W	L

# Loanwords




*mansan* MHL  
Sp. *mansána*  
'apple'




*pluma* HL  
Sp. *plúma*  
'pen'



# Loanwords

plúma (Sp. <i>pluma</i> )	PEAK-TO-H	*H	*INCLINE	*M
H.H		** W		
M.M	* W	L		** W
L.L	* W	L		
H.M		*		* W
 H.L		*		
M.H	* W	*	* W	* W
M.L	* W	L		* W

# Loanwords

mansán (Sp. <i>mansana</i> )	PEAK-TO-H	*H	*INCLINE	*M
H.HH		*** W		
M.MM	* W			*** W
L.LL	* W			
L.HM		*	** W	* W
L.HL		*	** W	
 M.HL		*	*	*
M.HM		*	*	** W
M.HH		** W		

# Discussion

# Understanding tone in SLZ

- A new observation: SLZ words show a limited set of tonal combinations
- Canonical classification: A “word tone” system
- Our proposal: The lexicon specifies an accented mora, tonal patterns fall out from constraints on tone co-occurrence
- Upshot: SLZ falls into a class of similar languages, and lends support to a nascent hypothesis in the phonology of lexical tone: “word tone” patterns are derived, and languages do not specify a lexicon of tonal combinations directly.

# Parallels across Zapotecan

- Zenzontepec Chatino (Campbell 2014)
  - Three tonal values (H, M, Ø/L) with limited combinations
  - Similar gaps: \*ML, \*HH (\*MM, \*LH only derived morphologically)
  - Only one H per word
  - Other similarities: H-triggered downstep
  - Major differences: H-spreading, differences in tone specification
- Yalálag and Zoochina Zapotec (Avelino 2004, Lopez Nicolas 2004)
  - Three syllabic tones (H, L, HL) → Two tonal values hosted on the mora?
  - Less combinatorial gaps: Not fully investigated, but HH attested



## Zapotecan is tonally diverse

- Other Zapotecan languages demonstrate patterns that are more complex:
  - Zacatepec Chatino (Villard 2015): Four tonal values, almost no restrictions on co-occurrence
  - San Lucas Quiaviní Zapotec (Chávez Peón 2010): Monomoraic contours
- In the approach outlined by McPherson (in press), we expect languages all along a continuum from “syllable tone” to “word tone”.
- The puzzle going forward will be modelling the possible and impossible steps along that continuum, and descriptions of tone in Zapotecan and Oto-Manguean as a whole will help contribute to further understanding.

# Duxklhenhu' lhe'! (Thank you!)



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# Appendix

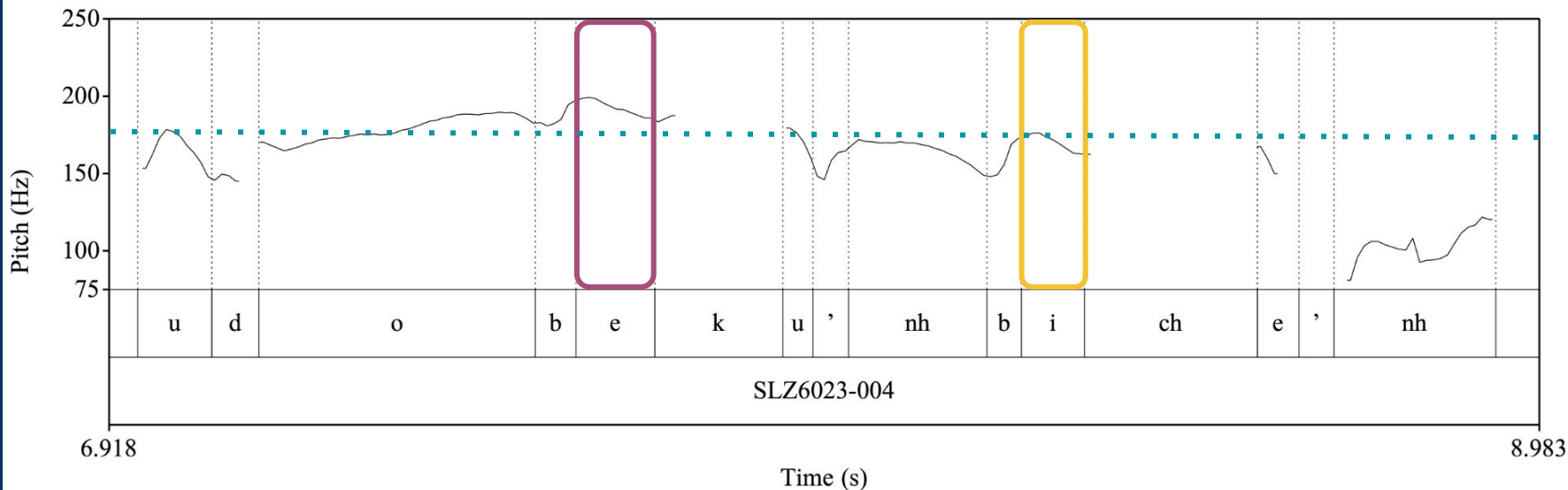
## Tone and Phonation in SLZ

- Like other Zapotecan languages, tone and phonation are independent from each other, with the exception of Breathy Voice.

	Modal	Breathy	Checked	Laryngealized
H	✓	—	✓	✓
M	✓	—	✓	✓
L	✓	✓	✓	✓
HL	✓	—	✓	✓
MH	✓	(✓)	—	✓



# Downstep: H after local H trigger



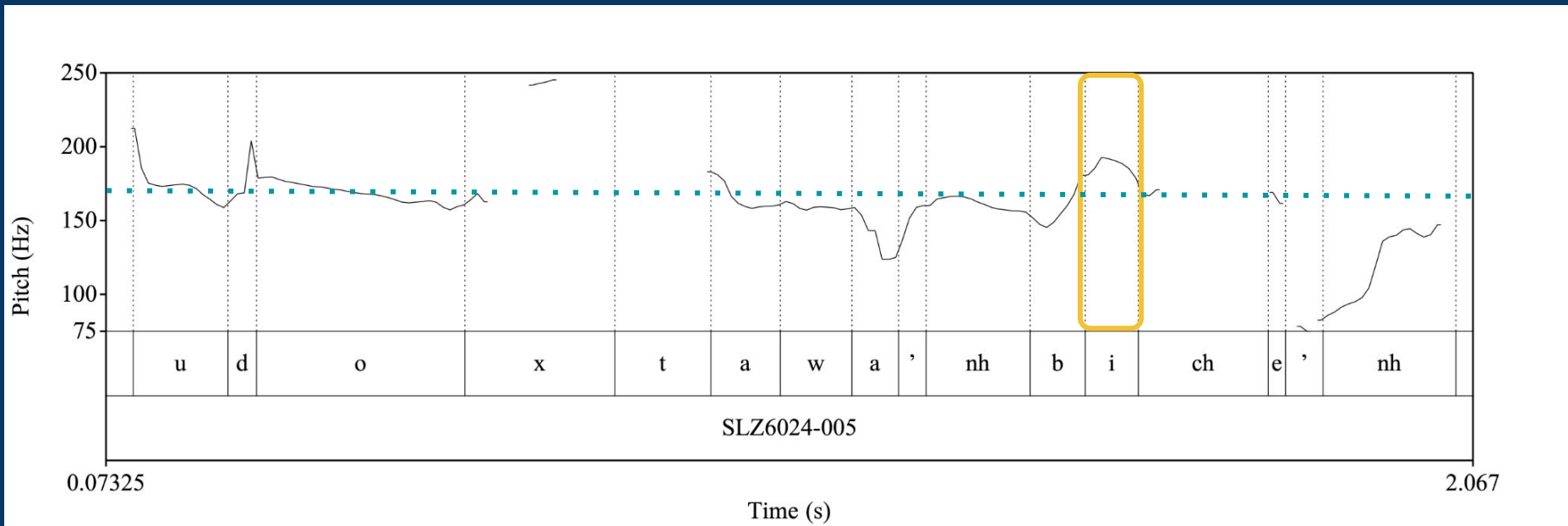
Udo<sup>L</sup>  
ate

be<sup>H</sup>ku'nh<sup>L</sup>  
dog

bi<sup>H</sup>che'nh<sup>L</sup>.  
chapulín

(The dog ate the chapulín.)

# Compare to: **H** after no local H trigger



Udo<sup>L</sup>  
ate

xta<sup>L</sup>wa'nh<sup>L</sup>  
grandmother.my

**bi**<sup>H</sup>che'nh<sup>L</sup>.  
chapulín

(My grandmother ate the chapulín.)

# Tonal patterns in trimoraic nouns

- LLL            *ya'a<sup>LL</sup>do<sup>L</sup>*            'mountain'            *μμμ*
- HLL            *we<sup>H</sup>lo'o<sup>LL</sup>*            'caterpillar'            *ήμμ*
- MHL            *kwa<sup>M</sup>nax<sup>HL</sup>*            'garlic'            *μήμ*
- MMH            *nu'u<sup>MM</sup>l<sup>e</sup>he<sup>H</sup>*            'woman'            *μμί*
- Predicted gaps:
  - \*M: \*MLL, \*LML, \*LLM, \*MML, \*MLM, \*LMM, \*MMM, \*HLM, \*HML, \*MHM
  - \*H: \*HHL, \*HLH, \*LHH, \*HHM, \*HMH, \*MHH, \*HHH
  - \*Incline: \*MLH, \*LMH, \*LLH, \*LHL, \*LHM

# Community materials: The Game of Tones for SLZ

- Within [Nido de Lenguas](#), a collaboration with Senderos, a non-profit led by our consultant Fe Silva-Robles, we work to share the beauty and value of Oaxacan languages around the Monterey Bay region
- As part of our research, we developed a “Game of Tones” for SLZ
  - Interactive listening game to guide players to hear tonal contrasts
  - Available in [Spanish](#) and [English](#) at the Nido de Lenguas website
  - Thanks to Andrew Hedding and Matthew Kogan for their assistance

